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A WOMB OF ONE'S OWN:

ARTIFICE, ARTIFICIALITY, AND *TAKWĪN* IN THE JĀBIRIAN CORPUS

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Abstract

"A Womb of One's Own: Theorizing Artifice, Artificiality, and *Takwīn* in the Jābirian Corpus," explores how categories of making are theorized within the Jābirian corpus, the most extensive Arabic collection of alchemical, pharmacological, philosophical, and occult-scientific treatises from the 8th-10th centuries attributed to Jābir ibn Ḥayyān. It does so by placing the use and appearance of two terms, *ṣanʿa* and *takwīn*, into cross-disciplinary conversation with a wide selection of early Arabo-Islamic texts on craft, artisanry, and creation.

Ṣanʿa refers to both artifice, broadly conceived, and the art of alchemy specifically. Situated within and around the corpus' theorizations of *ṣanʿa* are key techniques, ingredients, and rituals necessary for practices that complicate and confuse clearly-delineated categories of human, natural, and divine making, including *takwīn*, the semi-religious production of new and unique lifeforms in an alchemical laboratory. *Takwīn* has customarily been translated as "artificial generation". However, this translation carries assumptions and interpretations about the content of Jābirian writings that have become deeply and problematically naturalized. "A Womb of One's Own" argues that understanding *takwīn* as "artificial generation" flattens the actual theorization of notions of artifice, artificiality, and *takwīn* that the Jabirian corpus undertakes.

Takwīn should be understood as a category of creative action that is included within an interdisciplinary theorization of artifice (*ṣanʿa*) in the 8th-10th centuries, found in not only alchemical texts but also works of craftsmanship, literary criticism, religious literature, philosophy, and more. Artifice in this broader cultural conceptualization is theorized as a particular type of careful, creative action that scales cosmologically. Furthermore, artifice perpetually participates in positive divine imitation by way of an aesthetics of wonder (*ʿajab*). Thus to translate and understand *takwīn* as "artificial generation" misses the way *takwīn* and, more broadly, human creative artifice, was understood as part of a larger and universal system of creative, devotional making.

for Zach (I hope the first of many)

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Introduction

> "Likewise, if you want the transposition of the body of a young girl with the face of a man, or the intelligence of a man with the body of an adolescent, or if other variations are preferred, it is possible, and the vessel is made in the shape which is desired. Then, after that, a sphere is constructed…in order that it [the model] be in its [the sphere's] middle, as a circle within a circle...The model is totally hollow, and each part of it separated from the other parts, so that there is a section for the head, and another section for its two shoulders, its chest, and its belly, and its extremities, its two arms, and its hands…Take from the organs of the animal and the flesh and the remedies and the medicaments and the likes of that according to the method of the science of Balance. Then combine everything in its place— and begin with placing the bones, then the flesh, the nerves, the veins, the arteries, the cartilage, and all of its nails—and cover the model bit by bit as you prefer, and finally raise it by what holds it fast."
>
> *K. al-tajmī'*, Jābirian corpus

> "I saw—with shut eyes, but acute mental vision—I saw the pale student of unhallowed arts kneeling beside the thing he had put together. I saw the hideous phantasm of a man stretched out, and then, on the working of some powerful engine, show signs of life and stir with an uneasy, half-vital motion. Frightful must it be, for supremely frightful would be the effect of any human endeavor to mock the stupendous mechanism of the Creator of the world."
>
> Mary Shelley, Author's Introduction, 1831 *Frankenstein*

From the visage of Frankenstein to the fingers of ChatGPT, the anxiety of artificial intelligence and the consequences of the creation of artificial life haunt the intellectual and cultural landscape of the 20th and 21st centuries. Discourse of the artificial is laden with ethical and religious concerns; the artificial does not exist without invocation of the natural and/or the super/supra-natural, either. Even as the topic is popular, it is significant, with far-reaching philosophical implications and tangible effects on peoples' lives, bodies, and environments.

The artificial is not, however, a creation of modernity. Though its present form may be a *construction* of modernity, insofar as our understanding of the category now is necessarily shaped by our location as readers in the 21st century, the consideration of what the artificial is, and what its implications are, is an ancient one. The quote that begins this introduction is not the

oldest example, but it is my favorite. It is part of the instructions for constructing what might easily be termed an "artificial womb" as part of the process of *takwīn*, often translated as "the artificial creation of life", in the *k. al-tajmīʿ*, a treatise that is among a collection of 8th-10th century Arabic alchemical texts called the Jābirian corpus.

The Jābirian corpus is the most extensive Arabic collection of alchemical works, attributed to the enigmatic practitioner Jābir ibn Ḥayyān (d. c.200/815?), and one of the most influential series of texts within the Islamic alchemical and occult scientific traditions. The Jābirian corpus is the starting point of numerous fundamental alchemical paradigms that persist over approximately a thousand years in the Islamic world.[1] The Jābirian corpus' reach extends beyond alchemy, as well: to delimit it as purely 'alchemical' is, in fact, to make a claim about both genre and disciplinary ghettoization that this dissertation challenges. The Jābirian corpus contains a vast number of talismanic, astrological, pharmacological, philosophical, and occult treatises and early forms of a number of key medieval Islamic occult scientific concepts.[2]

However, the Jābirian corpus and Islamic alchemy more broadly remain understudied and undertheorized.[3] In comparison with the reinvigorated contemporary pursuit of academic studies

[1] As one scholar of Islamic alchemy, Tuna Artun, writes, "Within this Arabic textual tradition, the works attributed to Jābir ibn Ḥayyān are of fundamental significance, as the Jābirian corpus established some of the basic paradigms within which alchemical operations were to be carried out in the Islamic world." Tuna Artun, "Hearts of Silver and Gold: The Production of Alchemical Knowledge in the Early Modern Ottoman World," diss. Princeton University, 2013, pg. 64. Jābirian ideas are cited throughout later alchemical writings, appearing in works by the most notable alchemists of medieval and early modern Islamic history, including, but not limited to, al-Ṭughrā'ī (d. 515/1121), Ibn Arfaʿ Ra's (fl. sixth/twelfth century), al-ʿIrāqī (fl. seventh/thirteenth century), al-Jildakī (fl. mid-eighth/fourteenth century), and the early modern Ottoman ʿAli Çelebi corpus (tentative dates range from the 15th to early 17th centuries). See Paul Kraus, *Jābir ibn Ḥayyān, Contribution à l'histoire des idées scientifiques dans l'Islam* (Cairo, Imprimerie d l'Institut français d'archéologie orientale, 1942-43), vol 1:189-197, where Kraus provides a list of authors who reference Jābirian writings in their works.

[2] See, for example, Michael Ebstein, *Mysticism and Philosophy in Al-Andalus: Ibn Masarra, Ibn al-ʿArabi, and the Ismāʿili Tradition* (Brill, 2014); Noah Gardiner, "Esotericism in a Manuscript Culture: Ahmad al-Buni and His Readers Through the Mamluk Period," (Phd Diss, University of Michigan, 2014); Denis Gril, "The Science of the Letters," in *The Meccan Revelations: Selected Texts of* al-Futūhāt al-Makkiyya*,* vol 2, ed. Michel Chodkiewicz (Pir Press, 2004); Liana Saif, "From Ġāyat al-ḥakīm to Šams al-maʿārif: Ways of Knowing and Paths of Power in Medieval Islam," *Arabica* 64, no. 3-4 (2017): 297-345.

[3] Peter Zirnis presents an excellent narrative of the history of Jābirian scholarship in Peter Zirnis, "The Kitāb Usṭuqus al-Uss of Jābir ibn Ḥayyān (PhD diss., New York University, 1979)," 1-12. The same can also be said for

of Islamic occult sciences, there is a notable dearth of scholarly work on Islamic alchemy and on texts typically classified as alchemical.[4] Furthermore, Jābirian alchemy is the best and most studied aspect of the Islamic alchemical tradition; yet if we were to delineate a field of Jābirian studies, it would be defined by a powerful emphasis on historical contextualization and controversial aspects of the so-called "Jābir problem": scholars have been unable to conclusively determine the existence of a historical Jābir ibn Ḥayyān, determine whether a single author (who may or may not be the historical Jābir) or a collection of authors wrote the Jābirian corpus, or provide conclusive dating of the individual treatises or corpus on whole. It is likely due to the coupled complexity of Jābirian historicity and its prized place within the field that academic studies of the Jābirian corpus have dwindled, even while the majority of Jābirian writings remain untranslated, unedited, or unstudied.[5]

This ossification of the field presents a related series of problems: not only has little new knowledge about Jābirian alchemy been produced due to an overdeveloped methodological focus, but assumptions and interpretations of the content of Jābirian writings made by scholars up to a century ago have become deeply naturalized, including at the level of foundational

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the introduction of S. N. Haq's *Names, Natures and Things: The Alchemist Jābir ibn Ḥayyān and His Kitāb Al-Aḥjār (Book of Stones)* (Dordrecht, Kluwer Academic Publishers: 1994), 3-33. See also Forster, EI3, "Jābir b. Ḥayyān".

[4] Between 2017 and 2020, four volumes on the Islamic occult sciences were published, and only one article within one volume mentioned alchemy. Similarly, only two dissertations from 2010-2020 in the subfield of Islamic occult sciences studies have focused on alchemy (Tuna Artun and Nicholas Harris). A few projects focused on medieval Islamic alchemy have developed in Europe: Regula Forster has coordinated a grant on Ibn ʿArfa Ra's (d. 1197), Richard Todd has published an article on Ibn ʿArfa Ra's and is working on a monograph about the broader history of medieval Islamic alchemy, Liana Saif is undertaking a project on the Jābirian *K. al-nukhab* as part of a larger grant (European Research Council, "The origin and early development of philosophy in tenth-century al-Andalus: the impact of ill-defined materials and channels of transmission"), and Gabriele Ferrario is participating in another ERC Project, 'Alchemy in the Making: From ancient Babylonia via Graeco-Roman Egypt into the Byzantine, Syriac and Arabic traditions', working on Arabic and Hebrew alchemical texts. Since 2020, there has been a continual uptick in work on alchemy, especially in Europe, but by and large, it is the least pursued subfield of Islamicate occult studies.

[5] Since 1994, one monograph (Haq, *Names, Natures, Things*), one dissertation (Kathleen Malone O'Connor, *The alchemical creation of life (takwīn) and other concepts of Genesis in medieval Islam*), and a smattering of articles (see work by Thijs Delva, Leonardo Capezzone, Regula Forster, and Paula Carusi) have treated the Jābirian corpus. Liana Saif's upcoming project, mentioned above, and Masayo Watanabe's 2023 dissertation "Nature in the Books of Seven Metals – Ǧābirian Corpus in Dialogue with Ancient Greek Philosophy and Byzantine Alchemy" mark the newest additions.

methods of approaching the corpus. For example, the idea that Arabic alchemical works are simply vessels for Greek philosophical ideas narrows interpretations and understandings of Jābirian cosmology and alchemical practice. To give another, the designation of the Jābirian corpus as an Ismāʿīlī work is itself an interpretation of esotericism and occultism within the Jābirian corpus as well as an interpretation which makes claims about the historical development of the Ismāʿīliyya alongside the Jābirian corpus.

The translation of *takwīn* as "the artificial generation of life" is another key example of a naturalized assumption, which unfortunately flattens the actual theorizations not just of artificiality, but also of related concepts of artifice and even technology, that are made within the Jābirian corpus. It is significant to assume that the Jābirian corpus' self-proclaimed ultimate goal was understood by its medieval interlocutors within the same discourse on artificiality that exists in the 20th and 21st centuries, and to reflect that consistency of meaning through translation across a millennium. As my research shows, to translate *takwīn* as "artificial generation" is not exactly historically accurate. This is both with regards to the adjective 'artificial' but also the term 'generation', which is an "über-Aristotelianization" of the idea of *takwīn*. Surely, *takwīn* does contain reference to Aristotelian ideas and theorizations, but it is also a uniquely Arabo-Islamic term tied to specific early Islamic theological and philosophical concepts. It is a type of making that sits at the intersection of the human, the natural, and the divine. As for artificiality, *takwīn* is an idea integrated within a cultural understanding of what it means to make or craft as a human in the cosmological system of the Muslim 8th-10th centuries, associated with the crafting of talismans and with certain modes of production. It is better understood as a part of the same theorization of artifice (*ṣanʿa*) on the basis of qualities that include careful planning and cosmological scaling than as "artificial" creation. *Takwīn* also participates in the same aesthetics

of *ʿajab*, wherein what is crafted produces a sense of wonderment. Thus, *takwīn* in the Jābirian corpus emerges as part of a larger and universal system of creative, devotional making that both produces wonders and that is itself (as a process) a wonder. To suggest that the creative action of *takwīn* is distinct from natural or divine creative action by virtue of the ontology of the agent performing it–to label it "artificial"–misses the way *takwīn* and, more broadly, human creative artifice, was understood in the 8th-10th centuries and in the Jābirian corpus specifically.

As such, the critical approach of this dissertation is twofold. First, I am arguing for a move within the subfield of Jābirian studies beyond the "Jābir problem", which distracts us from the wealth of anthropological and cultural content that the corpus bequeaths to us. This challenges the "ghettoization" of Jābirian research, wherein the Jābirian corpus is only read alongside alchemical texts and/or natural philosophy. Second, I am arguing that modern approaches to artificiality, which have been understood firmly through the lens of a positivist history of science, are not sufficient for theorizing the approach to human making and creative action that the Jābirian corpus offers. The Jābirian corpus presents us with a view of the human-made that includes a cosmically-scalable vision of creative action, a consistent theorization of wonder, and a valuation of the esoteric.

I make these arguments by more thoroughly assessing theorizations of artifice and artificiality within and around the Jābirian corpus, engaging new methodological principles that place the Jābirian corpus into a broader, interdisciplinary, and intratextual conversation about the meaning of artifice and artificiality in the 8th-10th centuries. I examine how the Jābirian corpus understands *takwīn* through a series of close readings, and compare its paradigms of artifice and artificiality to contemporaneous sources. I argue that, within the Jābirian corpus, *takwīn* is understood as a category of creative action that is included within a cross-generic theorization of

artifice (*ṣanʿa*) in the 8th-10th centuries, found in not only alchemical texts but also works of craftsmanship, literary criticism, religious literature, philosophy, and more.

Artifice, in this broader cultural theorization, is understood as a specific type of careful, creative action that scales across the entire cosmology, meaning that natural, divine, and human agents all participate in this creative process. Artifice also perpetually participates in positive divine imitation by way of an aesthetics of wonder (*ʿajab*). Jābirian discourse is not outside of either this cultural theorization or this aesthetics of *ʿajab*, as can be seen through careful examinations of the idea of *ṣanʿa* across Jābirian treatises. *Ṣanʿa* often refers to the 'art of alchemy' in the Jābirian corpus, but Jābirian texts play with the dual meanings of *ṣanʿa* as 'alchemy' and *ṣanʿa* as 'artifice' and also associate the same qualities (careful making, cosmological scalability) with *ṣanʿa* as do discourses on craft and making from non-alchemical or occult-scientific sources. This demonstrates both the presence of a theory of artifice in the 8th-10th centuries and also the participation of texts often siloed within our genre categorizations in that broader cultural conversation. Furthermore, Jābirian texts routinely engage concepts of wonder when discussing artifice. The presence of wonder highlights how reifying distinct categories of medieval Islamic 'science', as opposed to 'art' or 'craft', is an inaccurate projection of present understandings onto the past, and challenges problematic understandings of the relationship of alchemy to European chemistry and of Arabic scientific sources to Greek ones by showing how the Jābirian corpus is thoroughly a part of its cultural context instead of a vessel for ancient material or a unique hierophany of chemical brilliance.

The Jābir problem and previous scholarship on Jābir

As I have stated, the dominant interpretative framework of the subfield of Jābirian studies is the "Jābir problem": the cluster of questions about historicity, authorship, and identity that have structured and continue to structure inquiries into the Jābirian corpus since the 19th century. In its hegemony, this framework forecloses upon the ability of contemporary scholars to pursue new lines of inquiry into the Jābirian corpus. Furthermore, it contains a series of problems that have not been unpacked and challenged within Jābirian studies.[6] As such, I outline here the ways in which the paradigm of the "Jābir problem" has structured previous scholarship on the corpus through the present day. I then critique the legacy of the "Jābir problem", showing that the problem itself was constructed through scholarly dialogue in the early-mid 20th century around questions of the origins of alchemical knowledge and the path of its transmission. These questions and how scholars sought to answer them housed triumphalist and teleological narratives of the history of science.

Questions of Jābirian historicity first opened up within the European academy in the 19th century when, in explorations of a major Latin alchemical text, the *Summa perfectionis magisterii*, the question of its author Geber's relationship to a historical Jābir ibn Ḥayyān was initially raised. "Geber Arabus" is the author to whom medieval witnesses attribute the *Summa perfectionis magisterii*; the *Summa* being "...perhaps the most important 'text-book' of alchemy in the late medieval West."[7] The issue in question was whether the *Summa* was a Latin translation from an Arabic original, a question complicated by the lack of authorial citations

[6] See, for example, the introduction to *Islamicate Occult Sciences in Theory and Practice* by Liana Saif and Francesca Leoni, "De-orienting the Study of Islamicate Occultism" by Matthew Melvin-Koushki, and "The past and future of the study of Islamic esoterism" by Liana Saif, to provide a non-exhaustive list.
[7] Geber and William R. Newman, *The Summa Perfectionis of Pseudo-Geber: A Critical Edition, Translation, and Study* (Leiden; New York: E.J. Brill, 1991), 57.

given by the author of the *Summa* as well as the degree to which the author rewrote their sources. Early developments of the "Jābir problem" centered on the relationship between Jābir and Geber, or, phrased differently, on the relationship between the Latin alchemical texts of great importance and their attribution to an original, Arab author.[8] The notice of an alchemist Jābir ibn Ḥayyān in the Arabic bio-bibliographic tradition led to comparisons between the Latin works of Geber and the Arabic works of Jābir, in an attempt to establish a direct line of transmission and translation between the two. The work prior to 1920 on the subject largely established skepticism around the possibility of the Latin *corpus geberianum* being a translation from an Arabic original.

At stake in this Jābir-Geber relationship was a narrative of the development of scientific progress: whence did the Latin alchemists to whom the original germs of the modern science of chemistry are attributed receive their knowledge? A disjuncture between the traditional account and the textual evidence complicates this narrative and also adds specific values to its consideration, such as authenticity, authorship, and historicity, which are themselves products of particular epistemologies (in the sense of both scholarship and worldview). This narrative is also most interested in European scientific contributions and the transformation of alchemy into chemistry.

From 1919 to 1930, the chemists and Arabists Julius Ruska and E.J. Holmyard–though starting from nearly opposite presuppositions–constructed the "Jābir problem" as we know it around attempts to prove the existence of a historical Jābir through relationships to other known historical figures and bio-bibliographic records. Holmyard wanted to rehabilitate the traditional narrative and prove a historical Jābir was also indeed Geber, giving the *Summa magisteri* an unbroken genealogy of knowledge from Hellenic Egypt through Jābir and into the Latin Geber

[8]See the works of Karl Christoph Schmieder, F. Hoefer, Herman Kopp, Gustav Weil, Marcellin Berthelot, Edmund O. von Lippmann, and Ernest Darmstaedter.

tradition. Ruska did not think Geber and Jābir were the same, but he did know that al-Rāzī cited Jābir as a source; he was therefore committed to determining the sources of Jābir's knowledge and separating out legend from fact in this transmission of knowledge. This mode of inquiry therefore had the origins of alchemical knowledge and the path of its transmission as stakes; new manuscript data that surfaced in the later 1920s thus exploded the ramifications of the problem as it had been set up.

Between 1919 and 1922, the "Jābir problem" seemed less a problem of authorial authenticity or even the Jābir-Geber relationship, and more an issue of "...to what extent the author of the Geber writings had drawn directly or indirectly from Arabic sources, a question that included nothing less than the clarification of the source and the course of development of Latin alchemy."[9] Holmyard's work pushed back against the separation of Jābir and Geber while simultaneously critiquing methods and assumptions found in Marcellin Berthelot's major work on the topic; this brought the question of the veracity of a historical Jābir to the forefront of the discussion.[10] He redefined specific aspects of the "Jābir problem" and forced a serious consideration of what the Arabic sources themselves actually said about the existence and historicity of Jābir ibn Ḥayyān. Even as Holmyard wanted to show that the *Summa* of Geber relied on other texts of Jābir, his insistence on a historical and early Jābir made it imperative that his interlocutors engage with the Arabic sources themselves and directed the collective gaze of the field to the question of the historical personage of Jābir.

German philologist Julius Ruska respected Holmyard's critique of Berthelot, but raised a crucial follow-up question: "But another question was whether one could place such

[9] Julius Ruska, "Die bisherigen Versuche, das Dschâbirproblem zu lösen," in *Chemistry and Alchemy: Texts and Studies, Collected and Reprinted*, vol. 2, ed. Fuat Sezgin (Frankfurt: Institute for the History of Arabic-Islamic Science at the Johann Wolfgang Goethe University Frankfurt am Main, 2002), 94.
[10] See E.J. Holmyard, "A critical examination of Berthelot's work upon Arabic chemistry," *Chemistry and Industry Review* 42 (1923), 489.

unconditional trust in the Arabic tradition."[11] Ruska gloms particularly to the question of Jābir and Jaʿfar al-Ṣadiq's relationship, as he feels it is an especially suspicious part of the traditional narrative, given his disbelief that the sixth Shīʿi imam could have been a chemist, and thus establishing its veracity is a means towards assessing the overall authenticity of the traditional Jābir narrative. He examines the Jābirian books published by Berthelot and concludes that caution is needed in abundance, for all scientific texts by authors writing before 800 CE may be forged. The authenticity of all the manuscripts published by Berthelot is also therefore in doubt, and the same goes for works attributed to Khālid ibn Yazid–who is traditionally described as the first Arab alchemist, learning from the monk Morienus–and Jaʿfar al-Ṣadiq: until they are published and translated and critically examined no judgment on older Arabic chemistry is possible. All that being said, while Ruska is certain that Ibn al-Nadīm's list of Jābirian writings contains some apocryphal texts, he is also certain that nothing it presents suggests the impossibility of a historical figure Jābir living and experimenting under the Barmakids.

Holmyard and Ruska batted the "Jābir problem" back and forth between them, Ruska working to unbind Jābir from legends surrounding alchemical transmission and discipleship and Holmyard working to discern the presence of a historical Jābir through bio-bibliographical research.[12] They had reached a standstill when, in 1925, Ruska received hitherto unknown manuscripts of Jābirian writings from Max Meyerhof in Cairo and learned of the discovery of an Arabic version of the *70 Books* and the *K. al-sumūm*. Ruska demanded a complete re-evaluation of the Jābirian corpus; these texts fell to Ruska's assistant and student, Paul Kraus. At the same time, Holmyard also received a manuscript from H.E. Stapleton, an English chemist, historian of chemistry, and Arabist, of al-Dīnawarī's *Kitab al-Akhbar al-Ṭiwāl*. On its basis, Holmyard

[11] Ruska, "Die bisherigen Versuche," 96.
[12] Ibid, 99.

posited that Jābir could have been the son of a druggist Ḥayyān who was executed for participating in the *daʿwa* of the Abbasids.[13] While still unwilling to admit a relationship based specifically around scientific or chemical teachings between Jābir and Jaʿfar, Ruska had to acknowledge the possibility of the reality of Jābir and Jaʿfar having known one another, undermining Ruska's earlier undermining of the traditional Jābir narrative and dating. Ruska was, in fact, exuberant. By 1929, Ruska declared that "...nothing is impossible with Jaber", and noted that, "although the writer [himself] is not inclined to accept Holmyard's thesis that Jaber and Geber were identical, he does agree with the findings as to Jabir's origin."[14]

However, in 1930, Paul Kraus, the aforementioned student of Ruska, published "Der Zusammenbruch der Dschabir-Legende". This publication marks a tremendous shift in Jābirian studies: from this point forward, Kraus' work and perspective defines the field. The article presents the first published evidence for the late composition of individual Jābirian writings. Kraus arrived at this conclusion on the basis of similarity to Fatimid/Ismāʿīlī writings and the technical vocabulary utilized, which Kraus argued was reliant upon Hunayn ibn Ishaq's translation work.[15] In 1943, Kraus published *Jabir ibn Hayyan: Essai sur l'histoire des idees scientifiques dan l'Islam* I and II, *Le corpus des Ecrits Jabiriens* and *Jabir et la science grecque*,

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[13] "...the Shʿites sent deputations to the imam Muḥammad ibn ʿAlī ibn ʿAbdullah ibn ʿAbbās ibn ʿAbdu'l-Muṭṭalib ibn Hāshim, whose abode was in the land of Syria, at a place called Al-Ḥumayma. The first of the Shiʿites who thus came forward were Maysara al-ʿAbdī, Abū ʿIkrima the saddler, Muḥammad ib Khunays, and Ḥayyān the druggist." in Eric John Holmyard, "An Essay on Jābir ibn Ḥayyān," in *Studien Zur Geschichte Der Chemie: Festgabe Edmund O. V. Lippmann Zum Siebzigsten Geburtstage Dargebracht Aus Nah Und Fern Und Im Auftrage Der Deutschen Gesellschaft Für Geschichte Der Medizin Und Der Naturwissenschaften*, ed. Julius Ruska (Berlin: J. Springer, 1927), 30.

[14] Julius Ruska, "History and Present Status of the Jabir Problem," *Journal of Chemical Education* 6, no. 7 and 8 (July-August 1929), 1274-75.

[15] For the curious reader, Kraus offers two arguments in relation to three texts in "Der Zusammenbruch der Dschabir-Legende". First, he argues that a careful study of Jābirian scientific terminology–specifically the number of ocular membranes which he knows–and his use of Hunayn ibn Ishaq's terminology (done between 860 and 870 CE) in the *K. ikhrāj mā quwwa ilā fiʿl* necessitates the text's date as later than 860 (see pg. 109). Second, he argues that the *K al-bayān* and the *K al-aḥjār* are clearly Ismāʿīlī texts, whether based on the word of scholar Schaeder, his (Kraus') own study of terminology, or due to religious analogies with explanations found in the word of al-Kirmānī (see pg 113-115).

respectively, before his death. This was a major study on Jābirian cosmology and its Greek sources which elaborated upon and expanded Kraus' theory of a late Jābirian dating (9th and 10th centuries), the notion of multiplicity of Jābirian authors, and the Ismaʿili focus of the writings.

Despite the proclamation that Kraus "solved" the "Jābir problem", neither his work nor his death ended that line of inquiry. Indeed, the "Jābir problem" has grown and taken on new contours in the eighty years since *Jabir ibn Hayyan: Essai sur l'histoire des idees scientifiques dan l'Islam*. In response to Kraus' thesis about dating and historicity, two schools of Jābirian studies developed and crystallized over the course of the 20th century.

First, there is the school that maintains and defends the traditional account, championed by the Turkish scholar of Islamic science Fuat Sezgin and S. N. Haq, a scholar most known for his work on the Jābirian corpus. Sezgin argued in the fourth volume of his *Geschichte des Arabischen Schrifttums* (1967) for a single author and early composition of the corpus. Sezgin felt in particular that Kraus underestimated the degree of circulation of Greek philosophy in the Arab world prior to the translation movement of the caliph al-Maʾmūn and overstated the Ismaʿīlī influence in the corpus. In 1994, Haq published *Names, Natures, and Things*, on the Jābirian *Kitāb al-Aḥjār* (*Book of Stones*), arguing also for an early and single Jābir on the basis of what he sees as an overstatement of the size of the corpus and the presence of archaic translations of Greek texts within the Jābirian corpus that could make an early dating possible.

Second, there is the school following Kraus, the generally dominant approach to Jābirian writings and the one most regularly cited by scholars of medieval alchemy outside of Islamic studies generally or Jābirian studies specifically. The thrust of its argumentation follows from Kraus directly, demanding a reconsideration of the traditional account's dating and authorship.

Included in this is usually a designation of Jābirian writings as Ismāʿīlī or Ismāʿīlī-inflected. Representatives include Martin Plessner, Peter Zirnis, Manfred Ullmann, Donald R. Hill, and Kathleen Malone O'Connor.[16]

A third school of Jābirian studies grew out of a different intellectual tradition independent of Kraus, emerging not from the "Jābir problem" but instead out of a particular branch of studies of Islamic esotericism and Sufism, defined by the legacy of the Traditionalists and the Jungians. This school includes figures such as philosopher and theologian Henry Corbin and the Perennialist writer Titus Burckthart, whose methods have included overlaying universalist ideas and a concept of sacred history onto medieval ideas. As scholar of Arabic occult scientific texts Liana Saif writes, "Guénon and Schuon thus cemented a Traditionalist and perennialist view of Sufism under the term 'Islamic esotericism.' This view has become influential to such a degree that many non-Traditionalist scholars who became key authorities on Islamic esotericism and 'spirituality' wrote in similar terms. This is especially true of Henry Corbin, who is often described as a Traditionalist, despite his rejection of it."[17] Corbin's student, Pierre Lory, a very prolific scholar of Jābirian alchemy, holds a unique position amidst this discussion of schools: while deeply invested in the interpretation of alchemy as a spiritual enterprise, Lory also offers a highly sophisticated take on the "Jābir problem", arguing for a historical Jābir as well as a reworking and continual development of the corpus over time.[18]

Nonetheless, Kraus remains the authority within the field of Jābirian studies even today, and his work certainly established the parameters of scholastic conversation, intervention, and

[16] It is worth noting variations within the positions of these authors, e.g. O'Connor utilizes an oral history paradigm to consider the Jābirian legend in her work, even though she tends to agree with the general thrust of Kraus' thesis on whole.
[17] Liana Saif, "What is Islamic Esotericism?," *Correspondances* 7, 1 (2019): 29.
[18] A study of Jābirian (and Arabic alchemical) historiography could be the subject of a separate monograph, broken into chapters such as early sources, Kraus and his archives, schools responding to Kraus' work, and the Traditionalists.

exploration into Jābirian writings. Ironically, despite Kraus' influence and effect, Jābirian studies has remained defined by the "Jābir problem" regardless of whether Kraus "solved" it or not.

Furthermore, regardless of which school of thought one may follow, the "Jābir problem" extends into the very fundamentals of the subfield. One example of this is our ability to catalog the Jābirian corpus itself. To introduce a new reader to the corpus proves challenging because of its size, complexity, scope, and the contentious nature of just what should be included within the corpus and therefore delimit all of these definitional categories. The medieval bibliographer and bookseller Ibn al-Nadīm has been the starting point and principle guide for all other attempts at cataloguing the Jābirian corpus, having catalogued the works which he knew to make up the Jābirian corpus in the 10th book of his *Fihrist*, proclaiming, "We shall mention all of his [Jābir's] books which we ourselves have seen, or which reliable persons have witnessed and reported to us."[19] He suggests there are about 4200 Jābirian treatises. Contemporary scholars rely upon Jābirian treatises that are extant today, quotations found in later authors, and Ibn al-Nadīm's list to outline the edges of the Jābirian corpus.[20] The manuscript record we have today was assembled primarily by Kraus, whose first volume included a critical bibliography of Jābirian works and their chronological ordering. Sezgin consults Kraus' bibliography extensively in order to list and cite Jābir's works in his *Geschichte des arabischen Schrifttums* (*History of Arabic Literature*) volume IV (on alchemy and chemistry), published in 1996, and provides additional information on manuscripts discovered after Kraus' death. The majority of Jābirian treatises

[19] Ibn al-Nadīm, *The Fihrist of al-Nadīm*, volume II, ed. and trans. Bayard Dodge (New York and London: Columbia University Press, 1970), 856.
[20] Paul Kraus, *Jābir ibn Ḥayyān, Contribution à l'histoire des idées scientifiques dans l'Islam* (Cairo, Imprimerie d l'Institut français d'archéologie orientale, 1942-43), vol 1: xviii.

remain in manuscript form.[21] About 50 treatises have been published as critical editions, with some translations found in English, French, and German.[22]

Though the number of treatises listed by Ibn al-Nadīm may stretch credulity, Kraus believed that the scope of the Jābirian corpus that Ibn al-Nadīm tendered was not incorrect. "The fact is," Kraus wrote, "that the Jābirian Corpus included, besides alchemical works, a considerable number of treatises and entire collections on philosophy and logic, on astrology and astronomy, on magic, on medicine, on occult properties, etc."[23] Kraus identified fourteen collections of Jābirian works: the Jābirian catalogs, the Book of Mercy (*k. al-raḥmah*), the CXII Books, the LXX Books, minor collections, the Books of Balance (*kutub al-mawāzīn*), the 500 Books, the Books of Seven Metals, various alchemical treatises, works on theurgy/magic/etc, medical and pharmacological writings, philosophical writings, mathematical/astronomical/astrological writings, and religious writings. These total 2982 titles. "Almost every collection of Arabic manuscripts contains some treatises by Jābir and much

[21] Syed Nomanul Haq, *Names, Natures and Things: The Alchemist Jābir ibn Ḥayyān and His Kitāb Al-Aḥjār (Book of Stones)* (Kluwer Academic Publishers, 1994): 31.

[22] Critical editions of Jābirian texts include the 1892 edition by Steele of the *k. hatk al-asrār* (Discovery of Secrets); Berthelot and Houdas' 1893 editions of the books *al-mulk* (Dominion), *al-raḥma al-ṣaghīr* (Small Book of Mercy), *al-raḥma al-kabīr* (Great Book of Mercy), *al-tajmīʿ* (Gathering), *al-zībaq al-sharqī* (Eastern Mercury), *al-zībaq al-gharbī* (Western Mercury), *al-nār al-hajar* (Fire of the Stone), *arḍ al-ḥajar* (Earth of the Stone), *al-mawāzīn al-ṣaghīr* (Small Book of Balances); Holmyard's 1920 editions from an 1891 Indian lithograph of the books *al-bayān* (Elucidation), *al-ḥajar* (the Stone), *al-nūr* (Light), *al-īḍāḥ* (Explication), *usṭuquss al-uss* (the Element of Foundation), *tafsīr k. usṭuquss al-uss* (Commetnary on the Book of the Element of Foundation), *al-tajrīd* (Abstraction), *al-manfaʿa* (Utility), *al-raḥma al-ṣaghīr* (Small Book of Mercy), *al-malik* (the King); Kraus' *Textes choisis/Mukhtār al-rasā'il* (1935, 559 pages), which includes selections from the treatises *ikhrāj mā fi'l-quwwa ila'l-fiʿl* (The Passage of Potentiality into Actuality), *al-ḥudūd* (Definitions), *al-mājid* (the Glorious), *al-aḥjār ʿalā ra'y balīnās* (The Book of Stones according to the Opinion of Balīnās), *al-khawāṣṣ al-kabīr* (Great Book of Properties), *al-sirr al-maknūn* (The Hidden Secret), *al-tajmīʿ* (Gathering), *al-taṣrīf* (Morphology), *al-mīzān al-ṣaghīr* (The Small Book of Balance), *al-sabʿīn* (The LXX Books), *al-khamsīn* (Fifty Books), *al-baḥth* (Research), *al-rāhib* (The Monk), *al-ḥāṣil* (The Result), *al-qadīm* (The Eternal), and *al-ishtimāl* (Comprehensive Understanding); Peter Zirnis' 1979 unpublished edition of the *Usṭuquss al-Uss* (the Element of Foundation) and its *tafsīr* (commentary); Pierre Lory's 1988 editions of the books *al-sabʿīn* (LXX Books), *al-lāhūt* (Divinity), *al-bāb* (Operation), *al-thalāthīn kalima* (Thirty Words), *al-munā* (Desire), *al-hudā* (Guidance), *al-ṣifāt* (Attributes), *ʿashara* (the Ten), *al-nuʿūt* (Epithets), *al-ʿahd* (The Pact), *al-sabʿa* (the Seven), *tadbīr al-arkān wa'l-uṣūl* (the Treatment of Elements and Principles), *hatk al-asrār* (Discovery of Secrets), and *al-ṣāfī* (the Pure). Masayo Watanabe's 2023 dissertation also includes unpublished editions of excerpts of the *Books of the Seven Metals* (*al-dhahab, al-fiḍḍa, al-nuḥās, al-ḥadīd, al-raṣāṣ al-qalʿā, al-usrub)* and the complete *k. al-khārṣīnī* (the Seventh Metal). For translations, see Haq's Appendix II, 255-259.

[23] Kraus, vol 1, xxi.

remains to be done before the most important among them are made accessible to readers,"[24] said Kraus, and his catalog indeed cites manuscripts from Cairo, Paris, London, Hyderabad, and more.

However, writing in 1994, scholar of Islamic science Syed Nomanul Haq critiqued Kraus' counting, effectively. Haq noted that Kraus' enumeration does not run continuously, thus leaving large, unaccounted-for gaps; that treatises are tallied by section instead of by treatise, thus leading to single works being counted as many more; and that many independent treatises are not more than a manuscript folio in length. In other words, the corpus according to Haq is not nearly so large as Kraus makes it seem. This critique is given among a number of others in order to challenge Kraus' solution to the "Jābir problem".[25]

Old Problems, New Methods

This dissertation takes a methodological stance quite distinct from other works of Jābirian studies. As I have just discussed above, Jābirian studies as a field tends to prioritize questions of Jābirian historicity, authenticity, and chronologically-vertical relationality (i.e. the transmission of knowledge across cultures from antiquity through the medieval). In contrast to this, however, my methodological approach applies disciplinary lenses from religious studies, literary studies, deconstructionist history, and decolonial approaches to the history of science to focus on what the Jābirian corpus can offer in the absence of concrete dating and authorship. These interdisciplinary lenses are helpful because they offer alternative means and methods of interpreting texts that enable meaningful engagement with the Jābirian corpus regardless of the tenuousness of its historicity, and that challenge paradigms that misread, oversimplify, and

[24] Ibid, xviii.
[25] Haq: 10-13. It is also worth noting that Haq's critique is not itself devoid of criticism, as Emma Gennagé (1998) and Thijs Delva (2017) both question aspects of Haq's evidence.

reduce what Jābirian texts have to offer to readers. I distill the insights of these lenses into three methodological principles that I follow in my own readings of Jābirian texts, as well as make use of their overall perspectives in my considerations and theorizations of the Jābirian corpus more broadly. These three principles are the conceptual frameworks of medieval Muslim agents, the situation of Jābirian texts within a cross-genre context, and the intratextuality of the Jābirian corpus. I discuss these in greater detail after detailing the core problems inherent in the "Jābir problem".

There is nothing wrong, of course, with trying to establish a text's historical context or its more ancient interlocutors. Rather, the issue is the hegemony of this method of study within the field, and the consequent misreading of key terms like *takwīn*. Primarily, I take umbrage with the narrativization necessarily presented in the set-up of the "Jābir problem". To ask of texts only where they fit into a preset narrative is to read with tunnel vision; it is to neglect the theoretical and philosophical insights of the last hundred years in the disciplines of history, literary criticism, and philosophy that encourage historians to, as much as possible, let texts speak for themselves. The totality and totalization of fixation on the "Jābir problem" is my foremost methodological concern. The field of Jābirian studies has ossified around the specific issue of Jābirian historicity: instead of more and further works reading and translating Jābirian manuscripts and considering the content of these texts, the trend has been to either write towards a resolution of the "Jābir problem" or to simply not study Jābir.

The fundamental construction of the "Jābir problem" itself also does much to deny richer and more capacious reading practices and interpretations of Jābirian material. While this critique may be readily anticipatable after years of navigating orientalism and its numerous bedfellows, it should still be said: the way the "Jābir problem" is set up and executed by scholars means that it

contains a paradigm of the history of alchemy that fixates on origins, both in terms of the inception of an idea in history and in terms of the national, ethnic, and/or racial origins of the authors involved; a positivistic teleology (and maybe even theology) of science that necessarily places the culmination of scientific development and thus scientific superiority exclusively in the hands of Europe (and underlying this, as well, is a particular structure of relations and relationality between Greek sources, Arabic sources, and Latin sources); and a purging of occult scientific theories, philosophies, and practices from the histories of science and religion.

At core, these three problems rely upon a triumphalist narrative, wherein the scientific production of knowledge in the Islamic world is only valued for its contributions to European science, that subsists in the "Jābir problem" and its construction.[26] Entrenched within that narrative is the idea that alchemy—a discipline with a particular origin—must necessarily become chemistry once it arrives into the hands of Europeans: this is what I understand to be the "teleological narrative" at play. Together, this amounts to a paradigm that encourages an understanding of medieval Muslims as intermediaries between an ancient Hellenistic and later Latinate/European scientific tradition, which reaches its highest form–chemistry–in the hands of 20th century Europeans and which cannot include occult, esoteric, mystical, or even religious aspects. This necessarily forecloses interpretive and narrative possibilities of the Jābirian corpus within history and constrains our (scholars') engagements with Jābirian texts; the "Jābir

[26] To define and contextualize the term 'triumphalist narrative', I turn to the scholar of Ottoman Tuna Artun. He writes, "In an article written in 1936, Rudolf Winderlich, a chemist-cum-historian like many early historians of chemistry, introduced the German orientalist Julius Ruska's decade of research on Muḥammad Zakariyā ar-Rāzī (d. 925) to an English-speaking audience. Winderlich begins his article with a sentence that succinctly explains what has until recently been the driving force behind the investigation of "Arab alchemy" by Western scholars: "The revival of scientific thought in the Occident did not emanate directly from the study of the Greek writers; on the contrary, the Arabs played an important intermediary rôle." The triumphalist narrative of the rise of modern science in Europe valued the production of scientific knowledge in the Islamic world only so far as the latter's contributions to the former. This narrative held that by the late medieval period, the transmission of Arab scientific knowledge (and thereby the Greek scientific traditions) to Europe had already taken place, whether via Muslim Iberia and Sicily or the Byzantine Empire. Whatever came after was irrelevant, for the medieval West had by then taken over the mantle of scientific inquiry." Tuna Artun, "Hearts of gold and silver: The production of alchemical knowledge in the early modern Ottoman world" (PhD diss., Princeton University, 2013), 1.

problem" limits our studies in a way that is at worst both ethically troubling and scholastically short-sighted.

In their work on the "Jabir problem", scholars of the early-mid 20th century reiterated and reinscribed the triumphalist narrative over and over again, setting up a reified relationship between particular civilizations and types of scientific knowledge, while simultaneously concretizing a teleological narrative whereby alchemy was viewed as a discipline that does and must necessarily become European chemistry. Take the following example from Holmyard's work:

> "We may be quite certain that, in the main, Muslim alchemy was derived from the Greek. The frequency with which Greek authors are quoted, the numerous theories that are common to both Greek and Arabic alchemy, and the large number of Arab technical terms clearly taken over from Hellenic treatises…prove beyond doubt the affiliation of Muslim and Greek alchemy…Arabic alchemy is for the most part a direct legacy from the Greek, and to a lesser extent from Persian, Chaldean and other sources."[27]

Ruska was most excited about Jābir for the way in which he contributes to the history of science and the history of chemistry more specifically. Ruska lauded Berthelot's work about Jābir on the basis that "…a new age in the History of Chemistry began with [him]; that through him and his co-workers Duval, Houdas, and Ruelle, the foundations of a History based on sources, especially of Greek and Arabic alchemy, were at last laid…."[28] Holmyard also echoed these sentiments, stating that, "The origin of Chemistry is obscure, but much of the obscurity will be removed when the rise and development of the science in early Islam have been more fully investigated."[29] Indeed, Holmyard so doggedly pursued research on Jābir because, "The progress of research continually emphasizes the overwhelming importance of the influence of Jabir ibn

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[27] Eric John Holmyard, *Makers of Chemistry* (Oxford: The Clarendon Press, 1931), 46-47.
[28] Julius Ruska, "Methods of Research in the History of Chemistry," in *Ambix* 1 (1937), 26. Reprinted in *Alchemy and Early Modern Chemistry: Papers from Ambix*, ed. Allen G. Debus (Jeremy Mills Publishing for The Society for the History of Alchemy and Chemistry, 2004), 6.
[29] Jābir ibn Ḥayyān and Eric John Holmyard, *The Arabic Works of Jābir ibn Ḥayyān* (Paris: P. Geuthner, 1928), 113.

Hayyan upon the early development of chemistry,"[30] and "What Aristotle was for philosophers, Jabir was for chemists, and a full investigation of his life and writings would unquestionably be of the utmost value for the history of chemistry."[31]

This is an instance where the triumphalist narrative shifts to a teleological one: importance and prestige is ascribed to the early age of Islam and to Muslim practitioners, Jabir chief amongst them, because "…**it was in Islam that chemistry first became a true science** [emphasis mine]."[32] Jabir is incorporated into the history of chemistry. This move simultaneously (and somewhat discordantly) necessitates a greater value be given to Islamic alchemical works than the triumphalist narrative might otherwise grant, while also conveniently merging the triumphalist narrative with the teleological one, such that ancient Greek and Persian knowledge becomes the true parent of contemporary European chemistry.

Jābir as an alchemist can be a part of the history of science, then, so long as his work fits the standard of scientific rationality prescribed by 20th century standards. This seems to be part of Ruska's approach to both Jābir and al-Razi. However, Ruska also seems interested in rescuing the history of alchemy from its denigrated status, insofar as he thinks the "true" history of alchemy is one separate from legend and mysticism. He writes the following:

> "...I am convinced that only by following this path of patient and detailed research will it be possible gradually to set up a **true history of alchemy** in place of a tissue of legends. We continually need new texts, we need summaries of contents, translations and commentaries, and we cannot be grateful enough for the new material which is contributed to the history of alchemy by such publications. But in order to achieve a **real history of alchemy** we also need the application of the keenest critical methods. We need researches which will bring to us, so to speak, legally documented data about the influence of **the great alchemists**. Herein I ask nothing which is not also required by

[30] E.J. Holmyard, "An Essay on Jābir ibn Ḥayyān," in *Studien Zur Geschichte Der Chemie: Festgabe Edmund O. V. Lippmann Zum Siebzigsten Geburtstage Dargebracht Aus Nah Und Fern Und Im Auftrage Der Deutschen Gesellschaft Für Geschichte Der Medizin Und Der Naturwissenschaften*, ed. Julius Ruska (Berlin: J. Springer, 1927), 28.
[31] Ibid.
[32] Holmyard, "A critical examination," 498.

> other historical sciences in their own special spheres. The inevitable consequence of critical philological work is the destruction of illusions, but there remains no other way of clearing the undergrowth of legends and of **approaching historical truth** [emphases mine]."[33]

According to Ruska, a real history of alchemy is, in fact, a history of chemistry, excised of legends and studied with specific methods, including a focus on key individual figures[34]. This attitude necessarily strips the occult scientific elements of alchemy out of the subject's study, thus furthering the teleological narrative of Jābirian alchemy as becoming chemistry.

In recent years, the field of the history of science has become much more open to thorough considerations and appreciations of the relationship between the occult sciences and the category of natural and material studies we today term "hard" or "physical" sciences. This attitude has made its way to the places where the history of science and Islamic studies overlap, but this is a newer development of the past decade. Previously and generally, histories of Islamic science worked to eradicate occult or magical elements from much of Islamic thought and history more broadly. Scholar of Islamicate occult sciences Matthew Melvin-Koushki theorizes one reason for this disregard:

> "Reacting to the depredations of European colonialism, orientalism's wellspring, the well-intentioned scholarly compulsion has been to exorcize Islamicate history and culture of "superstition" and "magic" in an effort to banish orientalist stereotypes of cultural and scientific stagnation. This otherwise laudable impulse has resulted in an invasive scientistic pruning of Islamicate intellectual history: we are presented with an approved canon of Muslim thinkers whose contributions to Science can be universally appreciated."[35]

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[33] Julius Ruska, "Methods of Research in the History of Chemistry," in *Ambix* 1 (1937): 28-29. Reprinted in *Alchemy and Early Modern Chemistry: Papers from Ambix*, ed. Allen G. Debus (Jeremy Mills Publishing for The Society for the History of Alchemy and Chemistry, 2004): 8-9.
[34] This is interestingly at odds with George Sarton's insistence that the history of science is not about kings.
[35] Matthew Melvin-Koushki, "Introduction: De-orienting the Study of Islamicate Occultism," *Arabica* 64, no. 3-4 (2017): 288.

The construction of science here occurs as a means of establishing legitimacy for Islamic science according to a European paradigm of scholasticism (one which claimed the absence of occult sciences). In the narratives of 20th century scholars, Jābirian texts carefully rescue nuggets of scientific truth otherwise occluded by the superstitious, the magical, and the occult. Jābir is able to cleanse experimental chemistry from its corroding occult heritage; it is this true chemistry that is borne from the Jābirian tradition into Latinate texts and then the history of European scientific development. Thus, this attitude is both symptomatic and constructive of the teleological ideation of the history of chemistry that I have been describing.

Poor theoretical engagement with the occult sciences in Jābirian material–which is to say, a complete absence of positive or constructive theorizing around magic, mysticism, and the occult–has led to problems baked into one of the most influential theses in the field. This is Paul Kraus' answer to the "Jābir problem". Even as Kraus, too, dismissed much of the occultism within the Jābirian corpus, he nonetheless declared that what is esoteric in Jābirian writings is, in fact, clear indication of an Ismāʿīlī provenance to Jābirian texts, and specifically an Ismāʿīlī set of references that require the dating of Jābirian works to the 10th century.

Declaring everything that is esoteric to be Ismaʿilī is lacking as a methodology for Jābirian studies. At worst, it is a by-product of poor understandings of what 'esoteric' actually is or means[36], and equally poor considerations of what work magic and occult sciences do in texts we deem 'scientific'. We need to assess not just what kinds of esoterica are found in Jābirian writings, but consider more broadly what esotericism means in this context, as well as consider how we are defining the edges of Ismaʿilīsm and Shiʿism and (again) esoteric Islamic religious traditions themselves. A lack of rigorous engagement with the occult sciences, both theoretically

[36] I point the curious reader to Liana Saif's article, "What is Islamic Esotericism," for further discussion.

and practically, is the inheritance of Jābirian studies from the occult-dismissive attitude of the likes of Holmyard and Ruska, and it does not serve the continuation of our work well.

Emerging in response to the problems that inhere within the "Jābir problem" itself, my goal, methodologically speaking, is to escape the "Jābir problem". To do so, I adopt three major methodological principles that are based on key methods of reading. First, if I am engaging questions of authenticity and historicity, I read and rely upon the conceptual frameworks of medieval Muslim agents. Second, I read and situate Jābirian texts within a cross-genre context: I never read a Jābirian text in isolation from non-alchemical sources. Third, I take the corpus' own injunctions of intratextuality seriously and therefore take seriously that these texts are a corpus and a corpus in conversation with itself; as such, I never read a Jābirian text in isolation from other Jābirian texts.

In what follows, I elucidate the thinking and research which undergirds these principles, and how they shape the subsequent work of this dissertation.

The conceptual frameworks of medieval Muslim agents

As the previous section demonstrated, the "Jābir problem" emerges in no small part out of the belief that the Arabic bio-bibliographical accounts of Jābirian historicity are inherently "suspicious". In response to this attitude, I turn to how medieval Muslim agents–my interlocutors in all other things Jābirian–understood Jābirian authorship, and how they understood the Jābir legend to be or not be significant in relation to the construction of the Jābirian corpus.

Many medieval and early-modern Arabo-Islamic sources cite Jābir as the author of numerous alchemical texts and name him as a student of the imām Jaʿfar al-Ṣādiq (d. 148/765),

living between c. 107/725 and c. 193/812.[37] These authors references Jābir with no questions raised regarding the veracity of the historicity of a single figure Jābir ibn Ḥayyān and no doubt surrounding this figure's sole authorship of texts bearing his name.[38] However, there are medieval Arabic texts which raise doubts or express skepticism of Jābir's historical or authorial veracity.[39] The *Fihrist* of the bibliographer Ibn al-Nādīm (d. 344/955) offers the most readily-referenced and therefore perhaps important debate on Jābir's precise historical provenance from within the medieval tradition. Most interestingly, the *Fihrist* genuinely offers a debate: while Ibn al-Nādīm expresses his personal opinion on the matter, he does recount two sides of the argument.[40] After providing Jābir's location, profession, political and religious associations, relationships to two differing Jaʿfars, and record of historical doubt, Ibn al-Nadīm goes on to provide an extensive list of titles attributed to Jābir. He quotes Jābir himself as saying that he wrote on philosophy, devices, the arts of war, medicine, logic, asceticism, charms, incantations, specific and special properties of objects, and alchemy.

Commenting upon this bibliographic notice of Ibn al-Nadīm's, scholar of Jābirian alchemy Kathleen Malone O'Connor encourages an expanded consideration of authorial conventions. She writes,

> "Modern written authorship does not permit the performance of pseudepigraphic writing to be anything but an anomalous exception to the notion of 'original' and individual authorship of discrete texts. Yet the fact of on-going medieval pseudepigraphy was known to Ibn Nadīm and his contemporaries just as it is to modern scholars of medieval

[37] E.g. the Nabatean toxicologist, alchemist, and agriculturalist Ibn Waḥshiyya (b. second half third/ninth century), the alchemists al-Rāzī (d. 313/960), al-Majrīṭī (fl. mid 4th/10th c.), Ibn Umayl (d.c. 349/960), the author Abū Ḥanīfa al-Dīnawarī (d.c. 282/895), and the historians Ibn Ṭāhir al-Maqdisī (fl. mid 4th/10th c.), and Ṣāʿid al-Andalusī (d. 462/1070). Additionally, as Tuna Artun writes, "Ottomans scholars were certainly aware of the debates about the historical Jābir, thanks to the Arabic bio-bibliographical tradition…It is also clear, however, that his existence was generally accepted—if there was a dissenting opinion in the Ottoman world, it has left no textual evidence." See Artun, 64.
[38] Haq, 4.
[39] Claims of the apocryphal nature of works attributed to Jābir exist in Abū Sulaymān al-Manṭiqī's *Taʿālīq* (360/970) and persist into the 14th century (e.g. Jamāl al-Dīn ibn Nubāta al-Miṣrī), for example (Haq, 4).
[40] Ibn al-Nadīm, 853-855.

> textuality…it might be more fruitful to regard it as an established authorial convention along with others which we now identify as more 'truly' authorial. The corpus wielded considerable intellectual influence…as a group, not as a series of 'true' Jābir texts perceived to be accompanied by an accretion of 'false' Jābir texts. This aggregate textual awareness does not imply that medieval Muslim or Christian thinkers were less sophisticated or critical in their historical or linguistic awareness, but perhaps that their criteria of authorship existed in a different cultural and linguistic nexus."[41]

O'Connor shifts her attention away from Kraus' pseudepigraphic focus of Jābirian texts onto an alternative approach drawn from Islamic Hermetica and other Arabo-Islamic oral-to-written traditions. This is similar to Kevin van Bladel's approach twenty-five years later in "al-Birūnī on Hermetic Forgery", where he explores how the medieval Iranian scholar and polymath al-Birūnī made sense in the 11th century of the notion of forgery and historicity with regards to the Arabic Hermetica tradition. Van Bladel demonstrates that a) al-Birūnī believes that the name Hermes was used as an eponym in order to promote the fame of new works, b) the presence of numerous forgeries did not negate, for al-Birūnī, the historicity of Hermes, and c) the reception history of this criticism was minimal, especially in comparison to the widespread reading of Hermetic texts, inclusive of what al-Birūnī deemed forgeries.[42] Holding these points in mind, I would turn us back to O'Connor. She writes,

> "What can be observed concerning the Jābirian corpus is that there is an element of certainty about the historicity of the mid-eighth-century to early ninth-century alchemist, Jābir ibn Ḥayyān. Upon this original foundation of alchemical authority the corpus grew…the original Jābirian corpus generated pseudepigraphic texts in the way the seed of an historical person or event generated oral legend. The corpus, in effect, became Jābir's 'legend'. The corpus both formed his legendary repute by establishing him as an authorial model, and stemmed from his legendary authority by means of which more texts were created. Thus, when I viewed the genre of medieval Islamic pseudepigraphy as in some way analogous in this case to legend, then the ongoing nature of the Jābirian corpus began to come into focus as a process rather than an anomaly."[43]

[41] Kathleen Malone O'Connor, "The alchemical creation of life (takwīn) and other concepts of Genesis in medieval Islam" (PhD diss., University of Pennsylvania, 1994), 4.
[42] Kevin van Bladel, "al-Birūnī on Hermetic Forgery," *Gnosis* 3, no. 1 (2018): 63 and 64.
[43] O'Connor, 6.

Taken together, the linguistic and cultural nexus surrounding authorship for the medieval Muslim reader of potentially pseudepigraphic texts is one that recognizes the concept of original authorship without prioritizing it.[44] As such regarding Muslim accounts of Jābirian historicity as "suspicious" or "incorrect" because they allow pseudepigraphic texts to refer back to a legend and a historical figure with a degree of simultaneity misunderstands the interpretive framework and priorities of these texts' medieval reading communities. For my work, then, I adopt as best I can the frameworks of these medieval reading communities. I comfortably recognize that the texts I read may not share an author, but, like their medieval readers, I am not terribly concerned about it, as they all participate in a broader Jābirian legend (to borrow O'Connor's terminology).

Of course, as van Bladel says elsewhere, "...it matters whether a book was written in the eight or the tenth or the twelfth century, or in Toledo, Cairo, or Baghdad. Finding the source often means finding the context, and the context provides a basis for interpretation."[45] To account for this, I locate Jābirian writings within what I term the "Jābirian milieu". The texts I work with can generally be dated somewhere within the 8th to 10th centuries, and so when I read Jābirian texts with other sources–as the next section discusses–I read across the 8th to 10th centuries. This time frame is both the formative context of the Jābir legend and the formative context of Jābirian historicity, as well–it bridges two traditions and two concerns of Jābirian scholarship.

[44] O'Connor further expands on this point, discussing how other genres display similar paradigms when navigating complex relationships between authorship and legend, making use of theories of orality to undergird her interpretations. See O'Connor (chapter one, section one) for more and richer examples of medieval Muslim frameworks of authorship across genres.
[45] Kevin van Bladel, *The Arabic Hermes: From Pagan Sage to Prophet of Science* (Oxford UP: 2009), 238.

Reading Jābir in a Cross-Genre Context

Jābirian thinking on artificiality, even as it was expressed initially and primarily within the Jābirian corpus[46], was not thought exclusively within the Jābirian corpus. As historian of science and technology Chakanetsa Mavhunga writes,

> "The things that words denote never start as universal or available everywhere, their meanings already stabilized; they originate from a particular place, community, society, culture, and nation and then, through travel or mobility, become universal, global. The issue to address is why specific words get to be used when, how, and where they are."[47]

Furthermore, a study of these concepts must be a study of Jābirian thinking and theorizing at its core. Jābirian artifice, artificiality, and technology are found not only in materially measurable or laboratory components, but also the ways of thinking which underlie those material technological components and in which those procedures are gestated and saturated. As Mavhunga aptly continues, "The arbitrary restriction of what constitutes technology to measurable things and experiments in the built laboratory performed only by those with mastery over them constitutes not just an epistemological exclusion, but also an ontological and sociological one."[48] Jābirian theorizations also joined a broader conversation about the meaning of artifice and artificiality that took place across a number of genres and sources within the Jābirian milieu.

Despite this, however, Jābirian works have not been routinely read alongside a number of genres wherein this theorizing also took place: material cultural/craft discourse, *adab*/literature and its associated critical theory, or theological texts.[49] I find two immediately likely reasons for

[46] Though it is worth noting that Jābirian thinking has a reach far beyond the corpus as well, ranging from the Ikhwān al-Ṣafā' to Ibn al-ʿArabī.
[47] Clapperton Chakanetsa Mavhunga, "Introduction" in *What Do Science, Technology, and Innovation Mean from Africa?*, ed. Clapperton Chakanetsa Mavhunga (Cambridge: The MIT Press, 2017), 1.
[48] Ibid, 4-5.
[49] Manfred Ullmann suggests that some of this is due to how alchemy is itself defined in and by medieval Islamic sources. He writes, "The theme of alchemy is therefore the transmutation of base metals into precious ones. And thus certain limitations are given: retrology and mineralogy do not belong to alchemy in the strict sense, although

this. First, the Islamicate occult sciences have been marginalized or ghettoized within Islamic historiography more broadly[50], as have been works attributed to Shīʿī and/or Ismāʿīlī thinkers. The Jābirian corpus is, in these ways, doubly neglected as an interlocutor for the disciplines mentioned above. Second, the Jābirian corpus has been read consistently as a corpus primarily about alchemy, and alchemy was given value in earlier and more Orientalist scholarship because of the perceived lineage between alchemy and modern chemistry. In other words, the Jābirian corpus has primarily been valued not as an early example of systematic theorization of human agency on or in nature, but as a specifically alchemical work enriched due to its relationship to chemistry.[51]

Studies of Jābirian texts engaged in comparative analysis have instead primarily focused on natural-philosophical systems and logic underlying alchemical theorizations of materia.[52] This makes good sense as, within the Jābirian corpus, alchemy is never presented as separate from natural philosophy. The entire corpus itself is best viewed as a tremendous collection of

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the alchemist must of course have an exact knowledge of minerals (as well as of animal and vegetable substances). In the same way, fabrication of glass and falsification of precious stones (see the Papyrus Graecus Holmiensis , ed. O. Lagercrantz, Uppsala 1913) belong no more to alchemy than metallurgical activities like extracting iron, gold and silver from their ores, so precisely and impressively described by al-Hamdānī (K. al-Djawharatayn , ed. C. Toll, Uppsala 1968). Nor does the technical chemistry of the craftsman, namely the manufacture of tints, colours and perfumes, come within the field of alchemy. The title Kīmiyāʾ al-ʿiṭr (ed. K. Garbers, Leipzig 1948) which al-Kindī gives to his book on the falsification of perfumes is as metaphorical as the Kīmiyāʾ al-saʿāda with which the mystics entitled their writings (see WKAS, i, 515b). Finally, it should be mentioned that the notion of "pharmaceutical chemistry" did not exist in the Islamic Middle Ages. The often very complicated "compound medicines" (al-adwiya al-murakkaba) are prepared by the physician or the apothecary according to Galen's work De compositione medicamentorum or to the many Aḳrābādhīnāt [q.v.] composed by the Arabs. There were of course points of contact between the various professions: the metallurgists and perfumers worked with the same instruments and appliances as the alchemists. Some of the latter also excelled in the related sciences, like Muḥammad b. Zakariyyāʾ al-Rāzī, who classified the minerals. Alchemy, however, the art of transmuting metals, has to be singled out from the other more technically orientated professions because of its theoretical foundations." See the entry "Alchemy" in the The Encyclopedia of Islam II. While I respect the bounds of the definition alchemists provide for alchemy, I don't actually think removing alchemy from comparative conversations around its "sister disciplines" is sensible for scholastic and historical work in the 21st century.

[50] See Melvin-Koushki, "Deorienting," for a richer discussion of this.

[51] Ironically, though, even while suffering from "alchemical exceptionalism", the Jābirian corpus has still not been examined along the lines of interpretive tropes found in studies of medieval and early-modern European alchemical texts and traditions, i.e. "alchemy as material culture" and "alchemy as literature". The ERC study of Ibn Arfa Ra's is, however, a good example of initial forays into questions of the relationship between alchemy and literature.

[52] See Kraus, O'Connor, Haq.

natural-philosophical theorizations centering around the relationship of human agency to nature, presenting a coherent cosmology, including explanations of how individual aspects that sustain the cosmological order function; the workings of alchemy are situated within that larger order.[53] It also makes sense in the context of the desire of 20th century scholars to link Jābirian alchemy to ancient Greek philosophy on the one hand and European chemistry on the other: if ancient Hellenistic natural philosophical texts are presented as the main interlocutors of the Jābirian corpus, then studying Jābir essentially becomes an enterprise in the field of Classics, and it becomes part of European history and the history of European science.

Natural philosophy, however, is not the only discipline with which Jābirian theories and texts are in conversation, even as they themselves are natural-philosophical in character. This is particularly the case when we consider that Jābirian enterprises (alchemical and otherwise) partake in aspects of numerous disciplines beyond natural philosophy. For example, crafted components are required for the success of experiments and procedures, and alchemy, pharmacology, and talismanery (all aspects of the Jābirian corpus) are associated with related processes of material culture production, such as glassmaking, ceramics, and metallurgy.[54]

The narrative of the Jābirian corpus in history as established within the paradigm of the "Jābir problem" has limited scholars in how they have laterally contextualized Jābirian texts, what works they have seen and placed Jābir in conversation with, and therefore how they interpret and understand Jābirian thinking. Thus, to escape the "Jābir problem", I read the Jābirian corpus in conversation with material cultural/craft discourse[55], *adab*/literature and its

[53] The Jābirian classification of sciences, found in the *K. al-ḥudūd*, demonstrates this well; see chapter 3 for a more in-depth analysis of how alchemy fits into the larger natural-philosophical system.
[54] See Ullmann, "Alchemy", in *EI2*.
[55] e.g. *On the Practical Crafts* (*al-risāla al-thāmina min al-qism al-'awwal fi-l-ʿulūm al-riyāḍiyya al-taʿlīmiyya fi-l-ṣanā'iʿ al-ʿamaliyya*) of the Ikhwān al-Ṣafa', the *Keys of the Sciences* (*Mafātīḥ al-ʿulūm*) by al-Khwārazmī, *Kitāb al-ḥiyal* (*Book of Ingenious Devices*) by the Banū Mūsā b. Shākir, and Ibn al-Zubayr's *Kitāb al-hadāyā wa-l-tuḥaf*

associated critical theory[56], or theological texts[57], as well as natural philosophical texts[58] that share a unifying theme of creation. I do not limit the scope of Jābirian conversation on the basis of a narrative of scientific development that only includes certain texts, registers, and ideations. When, in later chapters, my focus moves to *takwīn* and its theorization as an artificed (as opposed to artificial) making, I focus upon primary source texts that make specific reference to *takwīn*[59], in order to compare uses of the word as a technical term, and texts that discuss the *k-w-n* root and its association with creation beyond *takwīn* specifically.[60] Taken together, these sources show that a theory of human making or artifice (*ṣanʿa*) existed in 8th-10th century thinking about creation and creativity across disciplines with shared features, including cosmological scalability, and a shared aesthetic of *ʿajab*, and that *takwīn* was theorized within it.

The Jābirian Corpus as an Intratextual Corpus

A major epistemological framework (i.e. what readers are expected to know and do while reading) of the Jābirian corpus is intra-corpus knowledge. Simply put: the Jābirian corpus instructs its interlocutor to read and place other Jābirian texts in conversation with the text currently being read. These injunctions do not challenge the potentiality of the Jābirian corpus having been written across a lengthier period of time or by a number of Jābir ibn Ḥayyāns. What

[56] e.g texts by al-Āmidi, al-ʿAskarī, and ʿAbd al-Qāhir al-Jurjānī
[57] e.g. the Qur'ān, *Nahj al-balagha* of Alī ibn Abī Ṭālib
[58] e.g. Abu Bakr al-Rāzī's *Philosophical treatises* (*rasā'il falsifiyya)* and specifically the section on what is beyond nature (*maqālat fīmā baʿd al-ṭabīʿa*)
[59] e.g. the pseudo-Platonic *k. al-nawāmīs*, al-Qurṭubī's *Ghayat al-Ḥakīm*, Ibn Waḥshīyah's *filāḥa al-nabaṭiyya* and *k. al-sumūm*
[60] e.g. the Qur'ān, texts of *kalam* (scholastic theology), texts of *falsafa* (philosophical responses to *kalam*), Shīʿī and Ismaʿīlī theological works, the *Ishārāt* of Ibn Sīnā, and Aristotelian, Galenic, Neoplatonic natural-philosophical works

they do, however, is necessitate the consideration of what it means for the Jābirian corpus to be a *corpus*, especially vis-a-vis scholarly reading practices and study.

While I will never argue against the importance of deep studies on individual Jābirian texts, there is a strong tendency to read Jābirian works in silos. Few studies of themes or concepts across the Jābirian corpus exist. In their absence, the field implicitly signs onto the idea that Jābirian texts from one century or written by a pseudepigraphic Jābir (regardless of how we define the "original") cannot contribute to or our understanding of or be in conversation with Jābirian texts outside of those chronological or authorial bounds, unless it is to make further statements about Jābirian timeline and historicity.

The Jābirian corpus itself fundamentally challenges this notion: *regardless* of chronology or authorship, Jābirian texts are in conversation with other Jābirian texts. This is brought to the fore not only by the conceptual frameworks of medieval Muslim agents and by cross-genre readings, but also by the corpus' own intratextuality and awareness of itself methodologically.

Intratextuality is a critical term I am borrowing from the study of Latin literature, defined by scholar Alison Sharrock as

> "...a critical term used to explore the relationship between the parts and the whole in texts, including issues of unity (and disunity), the relationship between digressions and their surroundings, interactions between disparate parts of texts (such as ring composition), juxtapositions that may reflect surprisingly on their neighbours, or any structural issue within a single work of literature. Intratextual approaches may also be interested in ways in which the activity of a reader affects response to the text, for example by dividing it into mental "paragraphs." Crucial to intratextual reading is that all these relationships be interpretable."[61]

It is strongly related to the notion of the dissimulation of knowledge, which refers to the intentional distribution of fragments of information across a variety of sources, making it

[61] Alison Sharrock, "intratextuality," in *Oxford Classical Dictionary.* 26 Mar. 2019; Accessed 12 May. 2025. https://oxfordre.com/classics/view/10.1093/acrefore/9780199381135.001.0001/acrefore-9780199381135-e-8281.

impossible to attain certain understandings or complete certain instructional courses without reading a number of texts and/or being guided by an expert. This is a well-known feature of the Jābirian corpus, with roots as a practice in antiquity and high medieval usage.[62]

In Jābirian *k. al-mīzān*, an epistemological base is presented for its reader, which is the corpus (or smaller doctrinal units within the corpus) as a collected whole. The text reads:

> "So know also that, in this book of mine, there are two injunctions. The first injunction is regarding the teaching of the reading of the *Books of Balance*, and the second injunction is that by which the completion of your knowledge of balance and other things exists, if God, may He be exalted, wills it. So as for the first injunction, gather all of the books first…and then select a teacher whom you respect and whose knowledge of logic and geometry and philosophy and the science of nature you trust. Begin reading the books from the first of them to the last, and indeed the truth will become clear to you, if God wills it."

Further instructions on how to engage that base of knowledge are given by way of addressing alchemical literary tropes, such as the dissimulation of knowledge across a corpus, the purity or worth of the initiate, and the need for a teacher (see Appendix A for the text of the *k. al-mīzān* and my full discussion of these tropes).

This epistemological base modeled in the *k. al-mīzān* is exemplary for the larger Jābirian corpus. It serves as one instance among many where the concept of the corpus' intratextuality is established. Jābirian texts, *by their own account*, are not meant to be read without reference to other Jābirian works. Every text labeled "Jābirian" opts into the intratextual system of the corpus; the idea or label of "Jābirian" means that the corpus is in self-conversation. Thus, studies that read for themes across numerous texts of the corpus are participating in the corpus as it itself instructs them.

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[62] Kraus comments: "Jābir is therefore not the only one to use the method of dispersing science. But never elsewhere has it been raised in principle governing the literary structure of a multitude of treaties, never before has it taken on such disturbing proportions." in Paul Kraus, *Jābir ibn Ḥayyān, Contribution à l'histoire des idées scientifiques dans l'Islam* (Cairo, Imprimerie d l'Institut français d'archéologie orientale, 1942-43), vol 1: xxxiii.

It is appropriate here to call back to O'Connor's discussion of Jābirian authorship. To restate, she says, "...it is the entire corpus that becomes the 'legend' of Jābir, with...the original Jābirian corpus generat[ing] pseudepigraphic texts in the way the seed of an historical person or event generated oral legend."[63] I will go a step farther than O'Connor and also suggest that there is, really, no "original" Jābirian corpus. There are early texts, but we, as readers in the 21st century, are always working out of a nested and entangled collection that forms a capacious corpus. This resonates with the development of *Alf Layla wa Layla, The One Thousand and One Nights,* and *The Arabian Nights*, which may be an illustrative example here.[64] Even as we can distinguish some of what is earliest or even 'original' of *Alf Layla wa Layla*, in the present day, we do not consider only the earliest manuscript fragments "authentic". To do so would not only fly in the face of the tradition of medieval Arabic pseudepigraphy, but would also leave us without much of what has *become* iconically the textual tradition of *The One Thousand and One Nights*. What is valuable about *The Thousand and One Nights* is not a single moment or text bound in time and space. The same is true for the Jābirian corpus. The *becoming* has as much value as the *being*, and I believe the alchemists would agree with me.

This is the third way in which new scholarship (mine included) can escape the Jābir problem: instead of siloing Jābirian texts, especially according to a dating scheme, I read the corpus as a whole entity, reading for themes, methods, and theorizations. In this dissertation, I choose to place Jābirian treatises that either a) discuss foundational aspects of Jābirian discourse

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[63] Ibid, 6.

[64] *Alf Layla wa Layla* as a medieval Arabic text developed over the course of the 9th-14th centuries, across different urban centers of the Arabic-speaking world, and then continued to grow and change following the Ottoman conquest of Syria and Egypt in the hands of professional storytellers. Antoine Galland, an accomplished classicist in 18th century France, then added some of the most recognizable tales of *The Arabian Nights* (Aladdin, Ali Baba), many of which were told to him by Hanna Diyab, a Maronite Christian from Aleppo, because Galland's publisher felt it necessary for marketing even though these tales did not appear in the manuscripts off of which Galland was translating from Arabic. See Paulo Lemos Horta, "Introduction," in ed. Horta, Paulo Lemos, and tr. Yasmine Seale, *The Annotated Arabian Nights* (WW Norton & Company: 2021), xxv and xxxiii-iv.

and thus explicitly and implicitly theorize major structuring concepts such as artifice and human making within the corpus[65] or b) specifically reference *takwīn* or are referenced as texts containing necessary information for the successful reproduction of the process of *takwīn*.[66] I can also do so without relying on the historical ordering of individual Jābirian texts to make these themes meaningful. By taking seriously the unit of "corpus" for the Jābirian corpus and listening to the instructions of the corpus itself, the field of Jābirian studies is opened for new possibilities.

Theoretical Resources of Secondary Scholarship

This dissertation is fundamentally focused on how broad and structural concepts like artifice and artificiality are theorized within premodern Arabic alchemical/occult scientific material. Studies of artifice and artificiality exist, of course, especially within the history of science. However, these works do not focus upon medieval Islamic context or history of science, being situated primarily in relation to the European Enlightenment period, the Industrial Revolution, the modern, and the contemporary.[67] Studies of the alchemical generation of life in an antique Mediterranean or European context exist, and sometimes mention Jābir or Islamic alchemy, but by and large, they do so as a means to talk about links between European alchemy across time.[68] There are also works on medieval robots, but these approach 'medieval' as a primarily western European category, as even the edges of these works expand into the

[65] e.g. the *k. al-ḥudūd, k. al-ikhrāj mā fi-l-qūwa ilā al-fiʿl,* and *k. al-khawāṣṣ al-kabīr*
[66] e.g. the *k. al-tajmīʿ, k. ikhrāj, k. al-saʿbīn, k. al-ḥajar*, and *k. al-mīzān al-ṣaghīr*
[67] See, for example, the works of Warwick Anderson, John Hedley Brooke's "Religion and Science", Simon Herbert's "The Sciences as Artificial", Syed Ali's "Discourse on Artificiality: A Unifying Framework for the Artificial Sciences", Lorraine Daston's "The Nature of Nature in Early Modern Europe", Pamela H. Smith's "Science on the Move: Recent Trends in the History of Early Modern Science", Steven Shapin's *The Scientific Revolution*, Jessica Riskin's *The Restless Clock*, or Sven Dupré's oeuvre, for a non-exhaustive list.
[68] Perhaps most famously is William Newman's *Promethean Ambitions*, but there are also works addressing homunculi, golem, and more in Ancient Greece, Alexandria, and a broader European context.

Byzantine and the ʿAbbāsid.[69] Islamic philosophy and literary theory have inquired into the distinctions between different ontological levels of being and thus the meaning of terms like 'natural' and 'artificial'.[70] These works do not include texts typically labeled as 'alchemical'; they are firmly situated within metaphysics or poetic theory, and they stay within rather strict genre categories. Studies of *takwīn* and related processes of generation have been written, including a few that address the Jābirian corpus specifically, as have studies of medieval Islamic mechanisms, machines, and technology.[71] These do not, however, by and large, theorize what artificiality or artifice means. Even as they detail details and principles of these processes, they don't "zoom out" to ask about the conceptual work being done at the level of these broad, structural terms on the part of the medieval authors they read.

My dissertation therefore specifically asks how artifice and artificiality are theorized in the context of the Jābirian corpus, not assuming a static or particular set of meanings behind the theorization of these terms in its interpretation of processes translated with them. This work, then, is more spiritually akin to Francesca Rochberg's work *Before Nature*.[72] My work takes inspiration from the way in which Rochberg asks how contemporary readers can make sense of Assyro-Babylonian texts and culture when we find within the cultural artifacts that remain no evidence for a concept (nature) that fundamentally structures how we relate to our world. Rochberg does not assume that the idea of 'nature' is stable in meaning or even existent as a category of analysis or interpretation for a culture of the past. I have taken up a similar

[69] My favorite of which is Elly Truitt's *Medieval Robots: Mechanism, Magic, Nature, and Art*
[70] See chapters 2 and 4 for works of this variety.
[71] E.g. Paul Kraus' *Jābir ib Ḥayyān: Contribution à l'histoire des idées scientifiques dans l'Islam* and *Jābir et la science grecque*, Kathleen Malone O'Connor's "The alchemical creation of life (*takwīn*) and other concepts of Genesis in medieval Islam", Remke Kruk's "A frothy bubble: spontaneous generation in the medieval Islamic tradition", Jaakko Hämeen-Anntila's "Artificial man and spontaneous generation in Ibn Waḥshiyya's *al-Filāḥa an-Nabaṭiyya*", and the works of both Donald Hill and Ahmad Y. al-Hassan on medieval Islamic technologies.
[72] *Before Nature* explores the development of inquiries into the so-called natural world within an Assyro-Babylonian knowledge tradition where no word, reference, or sense for the concept of 'nature' existed.

perspective with the idea of artificiality, doing my best to not presuppose that the very idea of artificiality operated in medieval Islamic sources in ways I might intuitively assume it did.

The matter of Jābirian artificiality and with it, the matter of the category of artificiality itself across time, are not matters without large implications or stakes. First, there is the issue of historical accuracy. Though it may seem initially innocuous, something like the translation of *takwīn* as 'artificial generation' necessarily imposes a modern ideation upon a medieval concept. Second, there are a collection of issues raised vis-a-vis Jābirian scholarship, about methods of studying a unique corpus, the scope of scholarly inquiry in the absence of firm dating, and implicit narratives within a field's historiography, which shape the field's futurity. Finally, the stakes of any discourse of artificiality are high: ethics, the limits of human capacity, the appropriateness of human ambition, and the relationship of humans to a sense of the divine are all captured in discussions of the artificial. To fail to address artificiality thoroughly wherever we find it is to foreclose the possibility of addressing these matters in new ways that might shift our perspectives and inform our understandings of the past.

Argument and Chapters

This dissertation makes six interlocked arguments over this introduction and four chapters. It begins and is suffused with a meta-argument born of a suspicion of the common translation of *takwīn* as "artificial generation". My broadest and largest scale argument is that the translation of *takwīn* as "artificial generation" obscures the actual theorization of notions of artifice, artificiality, and technology that the Jābirian corpus undertakes. Furthermore, a by-product of this problem of translation is the removal of the Jābirian corpus from a cross-generic conversation about the theorization of these concepts of which it is a part. This

meta-argument is bound to a methodological argument. Throughout this introduction, I have shown how the paradigm of Jābirian studies set in the 20th century—the aforementioned "Jābir problem"—has become hegemonic, locking engagement with the Jābirian corpus into particular modes and considerations that are laden with problems of interpretation and bias. These problems include a triumphalist narrative and positivistic teleology of science that establishes Europe as the pinnacle of scientific superiority and defines relationality between Greek, Arabic, and Latin sources, as well as a purging of occult scientific theories, philosophies, and practices from histories of both science and religion. I argue that it is necessary to apply new methodological principles to the study of the Jābirian corpus to escape these problematic holdovers of 20th century scholarship and to move the (sub)field of Jābirian studies forward.

Using these new methodological principles to examine notions of artifice, artificiality, and technology within the Jābirian corpus, I make four historical arguments, organized into two parts: 'Artifice' comprises Chapters One and Two and seeks to establish a theory of artifice in Arabo-Islamic 8th-10th century texts. 'Artificiality' comprises Chapters Three and Four and questions if a paradigm and translation of 'artificiality' is appropriate for the idea of *takwīn*.

In Chapter One, "Artifice Across Genres: an Intellectual History of *ṣanʿa* in non-Jābirian Sources of the Jābirian Milieu", I situate Jābirian writings within a broader intellectual environment by constructing an intellectual history of the concept of 'artifice' as it is found in cross-generic sources within the 8th-10th century "Jābirian milieu" and ambient to Jābirian writings. I explore the meanings, uses, and resonances of the term *ṣanʿa*, which translates to artifice, making, or crafting, in a variety of religious and theological texts, philosophical discourse, literary criticism, treatises on crafts and trades, and encyclopedias of sciences that are temporally and culturally contiguous with Jābirian writings, to establish a theory of artifice

centered around the term. From my research, I argue for the existence of a cross-generic 8th-10th century theorization of artifice around the following key features: artifice is a particular kind of making that invokes certain qualities (fineness, well-wroughtedness, intellection) and that consistently invokes an aesthetics of *ʿajab* (wonder), which together make artifice both cosmologically scalable and a positively imitative, devotional action in its reference back to divine wonders of creation. This both challenges the application of a contemporary notion of artificiality onto 8th-10th century thinking about human making and identifies a conversation about the meaning of artifice contemporaneous to the Jābirian corpus.

In Chapter Two, "Art/ifice, Craft, and Wonder in Jābirian *ṣanʿa,*" I turn to *ṣanʿa* in three Jābirian treatises: the *k. al-ḥudūd,* the *k. ikhrāj mā fī quwwa ilā fiʿl,* and the *k. al-khawāṣṣ al-kabīr*. I argue that, while there are unique aspects to Jābirian theorizations of *ṣanʿa*, Jābirian texts nonetheless participate in the broader cultural theorization of artifice argued for in Chapter One. Jābirian theories are clearly informed by and in dialogue with texts outside of the alchemical and natural-philosophical genres, as Jābirian *ṣanʿa* shares the same features of fineness, cosmological scalability, and an aesthetics of *ʿajab* with *ṣanʿa* in other works. I argue this not only on the basis of explicit and implicit definitions of *ṣanʿa* presented within these texts, but also through a literary analysis of these texts' use of rhetoric and structure.

In Chapter Three, "'Artificial' Life?: Theorizing *Takwīn* as a Category of Making," I shift my focus from *ṣanʿa* to *takwīn*. I examine *takwīn* in texts of the Jābirian milieu but outside of the Jābirian corpus, asking if and how the making of life involved in *takwīn* relates to ideas of artificiality and/or artifice. I examine different theories and varieties of generation across medieval Islamic thought, which are brought to mind by the *k-w-n* root from which *takwīn* is derived, to explore resonances between *takwīn* and categories of the divine, the natural, the

cosmological, and the human. I then turn to a set of texts in the Jābirian milieu that discuss *takwīn* to establish how the idea is broadly but explicitly theorized, including a discussion of the relationship between talisman-making and *takwīn*. Finally, I consider how *takwīn* in cross-generic, contemporaneous sources of the Jābirian milieu relates to craft, artifice, and wonder, complicating the theorization of the term as 'artificial generation' even before turning to its usage in the Jābirian corpus. I argue that *takwīn* is a type of making that is associated with the crafting of talismans and with certain modes of production (*sanʿa*), invoking the same senses of complexity, forethought, and careful making as craft in other Jābirian-milieu sources, and explicitly linking craft and *takwīn* through terms such as *sanʿa*. *Takwīn* also participates in the same aesthetics of *ʿajab* (wonder), wherein the things crafted produce a sense of wonderment.

In Chapter Four, "The *Takwīn*-Machine: Artifice, Artificiality, Imitation, and Wonder in Jābirian Instructions for the Alchemical Creation of New Life", I look to Jābirian *takwīn* directly to consider how the concept is theorized in the Jābirian corpus, and compare those readings with previous secondary scholarship on Jābirian *takwīn*. I summarize previous theorizations of *takwīn* in Jābirian studies as a field, then turn to the Jābirian corpus and examine how both the *k. al-tajmīʿ* and the *k. ikhrāj* theorize *takwīn* as one of their central topics of discussion. In particular, I closely examine the description of the *takwīn*-machine, often termed an "artificial womb", found in the *k al-tajmīʿ*. I argue that *takwīn* in the Jābirian corpus should be read with the same sense of artifice found in other cosmologically-scalable, well-wrought crafts that invoke an aesthetics of *ʿajab*, drawing in relevant intratextual material from the Jābirian *k al-saʿbīn* and the *k al-ḥajar* where appropriate. This complicates readings of the alchemists' experiments as irreligious or outside of a paradigm of Islam; it relocates Jābirian alchemical practice more squarely within the frame of positive, devotional imitation and forces scholarship

to a less anachronistic understanding of what human creation meant in relation to the natural world or divinity. It also highlights the value of a de-ghettoization of alchemical, magical and/or occult-scientific texts in comparative and cultural studies, and challenges what we understand to be meant by terms and ideas such as 'artificial', 'natural', 'divine', and even 'making'. Building upon my intertextual examination of the *takwīn*-machine, I discuss the value of intratextuality when reading *takwīn* in a paradigm of artifice more broadly, showing how an intratextual reading of the *k al-tajmīʿ* alongside the Jābirian *k al-sifwa* provides even greater insight into questions and theorizations of both technology and virtue within the Jābirian corpus. In so doing, I emphasize the importance of engaging the Jābirian corpus with the methodological principles I have established throughout this dissertation, which include intertextual and comparative readings of Jābirian treatises, as well as the application of contemporaneous frames of interpretation.

Finally, in an epilogue, I discuss some of the contemporary stakes of understanding and translating Jābirian *takwīn* as a matter of artifice and not artificiality. Reading Jābirian *takwīn* as artifice challenges a commonplace contemporary coupling of notions of the 'natural' with the 'unmodified'. It also challenges a contemporary decoupling of scientific pursuit from wonder, as well as the idea that scientific and natural-philosophical works do not make use of literary, rhetorical, or aesthetic strategies. Lastly, reading *takwīn* in this way continues to push the boundaries of the discipline of the history of science. Including both Islamic texts and occult-scientific materials not only makes the discipline more capacious, but also opens us to new understandings and nuances in how we understand the category of the 'natural' itself.

Part One

Artifice

Chapter One

Artifice Across Genres: an Intellectual History of *ṣanʿa* in non-Jābirian Sources of the Jābirian Milieu

Introduction

How does the Jābirian corpus theorize artifice? In pursuing an answer to this question, I begin by following my own methodological principles of Jābirian engagement. Instead of beginning with the establishment of genealogical and chronological links between Hellenic natural philosophical concepts and Jābirian writings[1], I opt instead to first situate Jābirian writings within a broader intellectual environment. Jābirian theorizations of artifice are necessarily in dialogue with a larger cultural discourse about these concepts; as such, this chapter provides an intellectual history of the concept of 'artifice' as it is found within the 8th-10th century "Jābirian milieu". I establish a conceptualization of artifice ambient to Jābirian writings and identify a contemporaneous conversation about the meaning of artifice in which Jābirian writings likely partook.

Artifice is found not only in materially measurable or laboratory components, but also the ways of thinking which underlie those material technological components and in which those procedures are gestated and saturated. Thus the historian of science and technology Chakanetsa Mavhunga writes, "The arbitrary restriction of what constitutes technology to measurable things and experiments in the built laboratory performed only by those with mastery over them

[1] As discussed in the introduction, this serves as the initial step in constructing the narrative wherein these Hellenic (or sometimes Persian) concepts are held within Arabic texts until their transmission into European alchemical tradition, leading eventually to their apotheosis into modern chemistry.

constitutes not just an epistemological exclusion, but also an ontological and sociological one (Shiva 1988; Stengers 2008)."[2]

As such, to explore how artifice was theorized, I track the usage and meaning of a single word in 8th-10th century Arabic sources: *ṣanʿa*. I translate *ṣanʿa* primarily with the English term 'artifice'; however, I note the polyvalence of the term throughout and therefore its potential for multiple translations. The root ṣ-n-ʿ refers to handiwork, craft, manufacture, creation, and art. *Ṣanʿa* is also used in texts on alchemy (both within and without the Jābirian corpus) to refer to the entire alchemical enterprise.[3] Though we take the English term 'alchemy' from the Arabic *al-kīmīyā'*, as scholar of alchemy Regula Forster notes, it is much more regular in Arabic sources that the entire practice or science be termed *al-ṣanʿa* ("the art"), *al-ṣanʿa al-ilāhiyya* ("the divine art"), *ʿilm al-ṣināʿa* ("the science of the art"), *al-ḥikma* ("the wisdom"), *al-ʿamal al-aʿẓam* ("the biggest work") and so forth. I therefore argue that a theory of Jābirian artifice should take *ṣanʿa* as both its starting point and its focus.

Ṣanʿa is often interpreted as the Arabic translation of the Greek (and specifically Aristotelian) term *technē*. As scholar of Islamic science and philosophy Nader El-Bizri discusses, Aristotle articulates the distinction between domains of scientific knowledge and skilled technical craftsmanship on the basis of the terms *epistēmē* and *technē*. In the sixth book of the *Nicomachean Ethics*, five virtues in thinking are highlighted, included the aforementioned *epistēmē* and *technē*, which, according to El-Bizri, correlate:

> "...with theoretical thinking (θεωρητική διάνοια) that is guided by σοφία, and with practical thinking (πρακτική διάνοια) as oriented by φρόνησις. This establishes a distinction between knowledge/science from one side and the skilled arts of making in craftsmanship on the other. The τέχναι are technical crafts of the *artes mechanicae* varieties, such as tailoring, weaving, cooking, blacksmithing, building, farming,

[2] Ibid, 4-5.
[3] Regula Forster, "Alchemy" in *Encyclopaedia of Islam Three Online*, eds. K. Fleet, G. Krämer, D. Matringe, J. Nawas and D. J. Stewart (Brill, 2016) doi: https://doi-org.proxy.uchicago.edu/10.1163/1573-3912_ei3_COM_23831.

> carpentry, shoemaking horsemanship, pottery, navigation, and it may also include engineering/architecture, medicine, and pharmacology. Each of these has a goal in its designated sphere of workmanship. A further distinction can be established, between making something (ποιητών) and an action in practice (πρακτικών), as the basis for the difference between a craft (τέχνη) and a virtue of excellence (άρετή). What pertains to technicity and equipment in a craft can be beneficial or harmful…To have the benefits manifest and clear, there must be a measured virtue of excellence that underpins the skilful execution (τέχνάομαι)."[4]

However, the term *ṣanʿa* has a distinct Arabic and Islamic history: it is not used solely in reference to the Greek. Thus, theorizing on the basis of definitions of *ṣanʿa* in both Jābirian texts and on cross-generic definitions of *ṣanʿa* that are ambient to Jābirian discourse in an early-medieval Arabo-Islamic context provides a more indigenous model.[5]

A skeptical reader will ask if we can really escape placing the past in modern categories completely. I chafe against the reliance upon contemporary categories in theorizing artifice for the Jābirian corpus, but do those categories not necessarily structure my own interpretations of historical texts? This is a fair critique–and surely these categories do contribute to the underlying structures of my own thinking. However, to earnestly and uncritically reproduce these categories (to keep, as the Introduction of this dissertation discusses, the translation of *takwīn* as 'artificial generation' without an interrogation of what artificial is and how its meaning could change over time, people, and place) is to hold implicitly to a kind of structural functionalism (à la the 20th anthropologist Radcliffe Brown, one that does not account for change within cultures). While I do not want to seek recourse in historicism nor in the production of historical knowledge that assumes a semiotic epistemology–one which sees the presence of the past in the present as a sign

[4] Nader El-Bizri, "Introduction to Epistle 8," in *Epistles of the Brethren of Purity: On Composition and the Arts*, ed. Ikhwān al-Ṣafā', Nader El-Bizri, Godefroid de Callataÿ, Institute of Ismaili Studies, and Ikhwān al-Ṣafā'. 6-8 (Oxford: Oxford University Press, in association with the Institute of Ismaili Studies, 2018), 121-122.
[5] An additional comparative angle that would enrich this project is an exploration of Byzantium concepts of artifice and therefore also dialogues between 8th-10th century Arabic sources and contemporaneous Greek texts (as opposed to more ancient or antique Greek sources). This would be an exciting development in a later iteration of this project.

calling for explanation, one wherein historical knowledge is causal explanations of past eventuation–I am interested in more recent methods from the history of anthropology that produce historical knowledge in part through the work of imagination.[6] As my colleague Kellan Klaus aptly describes,

> "This epistemic position abandons the linear temporality of successive eventuation for the latency of potentiality…this position renders the constitutive resonance of aesthetic experiences as the actualization of latent potentialities. These actualizations temporalize the present and extend the potentialities archived in the imagination. Historical knowledge here is the latent content of the imagination and historical experience, their present and embodied actualization."[7]

I cannot completely escape modern categories, but I can both temporalize the present and combine resonances, aesthetic experiences, and imagination to produce a form of historical knowledge that is distinct from historicism and its pitfalls.

This chapter therefore offers an exploration of meanings, uses, and resonances of *ṣanʿa* in disciplines and texts that are temporally and culturally contiguous with Jābirian writings. 8th-10th century Arabic sources that readily engage *ṣanʿa* are those that deal in some manner with craftsmanship and creation, including not only texts on artisanry, but also texts on poetic composition, on the workings of nature, and on divine creation. Interestingly, despite the importance of *ṣanʿa* to these texts and the high place *ṣanʿa* is accorded in Jābirian writings as the reference term for the enterprise of alchemy as a whole, Jābirian works have not been routinely read alongside material cultural/craft discourse, *adab*/literature and its associated critical theory, or theological texts.[8]

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[6] For example: Taussig 1984, Comaroff and Comaroff 1992, Sutton 1998, Stewart 2012, Mazzarella 2017, Vanessa 2019.

[7] Kellan Klaus, email correspondence to author, May 9th 2024.

[8] Manfred Ullmann suggests that some of this is due to how alchemy is itself defined in and by medieval Islamic sources. He writes, "The theme of alchemy is therefore the transmutation of base metals into precious ones. And thus certain limitations are given: retrology and mineralogy do not belong to alchemy in the strict sense, although the alchemist must of course have an exact knowledge of minerals (as well as of animal and vegetable substances). In the same way, fabrication of glass and falsification of precious stones (see the *Papyrus Graecus Holmiensis* , ed.

I find two immediately likely reasons for this. First, the Islamicate occult sciences have been marginalized or ghettoized within Islamic historiography more broadly[9], as have been works attributed to Shīʿī and/or Ismāʿīlī thinkers. The Jābirian corpus is, in these ways, doubly neglected as an interlocutor for the disciplines mentioned above. Second, the Jābirian corpus has been read consistently as a corpus primarily about alchemy, and alchemy was given value in earlier and more Orientalist scholarship because of the perceived lineage between alchemy and modern chemistry. In other words, the Jābirian corpus has primarily been valued not as an early example of systematic theorization of human agency on or in nature, but as a specifically alchemical work enriched due to its relationship to chemistry.[10] Ironically, though, even while suffering from "alchemical exceptionalism", the Jābirian corpus has still not been examined along the lines of interpretive tropes found in studies of medieval and early-modern European alchemical texts and traditions, i.e. "alchemy as material culture" and "alchemy as literature".[11] Studies of Jābirian texts engaged in comparative analysis have instead primarily focused on

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O. Lagercrantz, Uppsala 1913) belong no more to alchemy than metallurgical activities like extracting iron, gold and silver from their ores, so precisely and impressively described by al-Hamdānī (*K. al-Djawharatayn* , ed. C. Toll, Uppsala 1968). Nor does the technical chemistry of the craftsman, namely the manufacture of tints, colours and perfumes, come within the field of alchemy. The title *Kīmiyāʾ al-ʿiṭr* (ed. K. Garbers, Leipzig 1948) which al-Kindī gives to his book on the falsification of perfumes is as metaphorical as the *Kīmiyāʾ al-saʿāda* with which the mystics entitled their writings (see *WKAS*, i, 515b). Finally, it should be mentioned that the notion of "pharmaceutical chemistry" did not exist in the Islamic Middle Ages. The often very complicated "compound medicines" (*al-adwiya al-murakkaba*) are prepared by the physician or the apothecary according to Galen's work *De compositione medicamentorum* or to the many *Aḳrābādhīnāt* [*q.v.*] composed by the Arabs. There were of course points of contact between the various professions: the metallurgists and perfumers worked with the same instruments and appliances as the alchemists. Some of the latter also excelled in the related sciences, like Muḥammad b. Zakariyyāʾ al-Rāzī, who classified the minerals. Alchemy, however, the art of transmuting metals, has to be singled out from the other more technically orientated professions because of its theoretical foundations (Encyclopedia of Islam Second Edition, "al-kīmiya'" by Manfred Ullmann)." While I respect the bounds of the definition alchemists provide for alchemy, I don't actually think removing alchemy from comparative conversations around its "sister disciplines" is sensible for scholastic and historical work in the 21st century.

[9] For an expanded discussion of this idea, see not only the introduction of this dissertation, but also Matthew Melvin-Koushki, "Introduction: De-orienting the Study of Islamicate Occultism," in *Arabica* 64, no. 3-4 (2017).

[10] I again point the reader to my introduction for a more detailed discussion of Orientalism, occult sciences, and the Jābirian corpus.

[11] The European Research Council project "Between Religion and Alchemy. The scholar Ibn Arfa' Ra's (d. 1197) as a modell for an integrative Arabic literary and cultural history of Ibn Arfa Ra's" is a good example of initial forays into questions of the relationship between alchemy and literature.

natural-philosophical systems and logic underlying alchemical theorizations of materia.[12] This makes good sense as, within the Jābirian corpus, alchemy is never presented as separate from natural philosophy. The entire corpus itself is best viewed as a tremendous collection of natural-philosophical theorizations centering around the relationship of human agency to nature, presenting a coherent cosmology, including explanations of how individual aspects that sustain the cosmological order function; the workings of alchemy are situated within that larger order.[13]

That being the case, and as I will argue in greater detail in the following chapter, natural philosophy is not the only discipline with which Jābirian theories and texts are in conversation, even as they themselves are natural-philosophical in character. Phrased somewhat differently, to understand how artifice is theorized within the Jābirian corpus, we need to compare and contrast its theorizations to those beyond the natural-philosophical, as well. This is particularly the case when we consider that Jābirian enterprises (alchemical and otherwise) partake in aspects of numerous disciplines beyond natural philosophy. For example, crafted components are required for the success of experiments and procedures, and alchemy, pharmacology, and talismanery (all aspects of the Jābirian corpus) are associated with related processes of material culture production, such as glassmaking, ceramics, and metallurgy.[14]

I therefore discuss *ṣanʿa* in lexical texts, in craft discourse and material culture, in literary and poetic criticism, and in literary-religious texts, reading a variety of religious and theological texts, philosophical discourse, literary criticism, treatises on crafts and trades, and encyclopedias of sciences, in order to establish a theory of artifice centered around *ṣanʿa*. I argue that the invocation of *ṣanʿa* in craft and literary genres presents artifice as cosmologically-scalable,

[12] See the work of Kraus, O'Connor, and Haq, for example.
[13] The Jābirian classification of sciences, found in the *K. al-ḥudūd*, demonstrates this well; see chapter 2 for a more in-depth analysis of how alchemy fits into the larger natural-philosophical system.
[14] Manfred Ullmann, "al-Kīmiyāʾ," in *Encyclopaedia of Islam New Edition Online (EI-2 English)*, ed. P. Bearman (Brill, 2012) doi: https://doi-org.proxy.uchicago.edu/10.1163/1573-3912_islam_SIM_4374.

planned, fine making or crafting. It is different from instantaneous creation, but it is not the exclusive province of either the divine or the human; instead, there are distinct modes and methods of artifice based on the actor, but it is a category of action that operates on human, natural, and divine levels. The invocation of *ṣanʿa* in these genres also perpetually makes reference to an aesthetic of wonder (*ʿajab*). Within this aesthetic, artifice is modeled as a devotional imitative process that harkens back to the wonders of divine creation. That artifice is presented in these ways (as scalable and as wondrous) suggests that man-made creations are not to be understood as outside of either divine or natural workings. In other words, it challenges the application of a contemporary notion of artificiality onto 8th-10th century thinking about human making.

I am borrowing the phrase "aesthetics of *ʿajab*" from scholar and librarian of Islamic art history Matthew Saba, who developed this notion in regards to lusterware in Abbasid Iraq. In considering *abu qalamūn*-like surfaces (iridescent and perpetually changing color), Saba argues for the participation of lusterware in a broader "'aesthetics of *ʿajab*'--a set of expectations, informed by contemporary interest, to which Abbasid lusterware could be held."[15] He defines *ʿajab* as "a desirable feeling that stems from one's own inability to fully comprehend an event, object, or phenomenon because it is perceived as too strange, too great, or too complicated."[16] Importantly, Saba suggests that, "while lusterware has been particularly germane to this discussion, the 'aesthetics of *ʿajab*,' if fleshed out further, could be a productive framework for understanding broader developments in the material culture of Abbasid Iraq that are not limited to one medium or type of object."[17] Here, then, my task is twofold: first, I attempt to add some flesh to Saba's framework by tracing and collating meanings of *ṣanʿa* across genres ambient to

[15] Matthew D. Saba, "Abbasid Lusterware and the Aesthetics of ʿAjab," *Muqarnas* 29 (2012): 203.
[16] Ibid, 198.
[17] Ibid, 207.

my main object of study (the Jābirian corpus). I ask what ideas are drawn into relationship continually with *ṣanʿa* and what concepts imbue the notion. I synthesize from this collection a broader sense of how ideas of artifice were modeled in/across the 8th-10th centuries, noting the consistent relationship between a notion of *ʿajab* and *ṣanʿa*.

Ambient *Ṣanʿa*: Establishing an 8th-10th Century Theorization of Artifice

In developing a theory of *ṣanʿa*, I want to begin by providing grounding in contemporaneous source's lexical analyses of the term. For this, I turn to two dictionaries situated at either end of the 8th-10th century period (which I term here the "Jābirian milieu"). The *Kitāb al-ʿAyn* is the first Arabic dictionary. It is often attributed to al-Khalīl b. Aḥmad (d. 791, or 786, or 776 CE), considered the founder of Arabic philology due to his numerous studies, intensive teachings, and storied pupils. It was, however, his student al-Layth b. al-Muẓaffar who finalized and published the *Kitāb al-ʿAyn*.[18] The *al-Muḥīṭ fi-l-lugha* is the work of Ibn ʿAbbad (d. 995 CE), often known as al-Sāḥib ibn ʿAbbad (Abu 'l-Ḳāsim Ismāʿīl b. *ʿAbbād* b. *al-*ʿAbbās b. *ʿAbbād* b. Aḥmad b. Idrīs), a vizier and *kātib* of the Buyids. *Al-Muḥīṭ fi-l-lugha* is an Arabic dictionary in ten volumes. Both dictionaries are arranged phonetically.

Full translations of each dictionary's entry for *ṣ-n-ʿ* can be found in the appendix to this chapter. In summary, *ṣanʿa* and the root *ṣ-n-ʿ* are tied, first, to delicate or fine crafting and the use of one's hands. Both dexterity or deftness of the hands and a broader sense of expertise are invoked in this usage. Second, the idea of crafting is extended to include shaping and taking care of those under your authority or within your household. The training of horses, the care of maids, and even general behavior or etiquette (good works or the aid of another) are some of the

[18] R. Sellheim, "al-Ḵẖalīl b. Aḥmad," in *Encyclopaedia of Islam New Edition Online (EI-2 English)*, ed. P. Bearman (Brill, 2012).

examples provided. Finally, there is the relationship of *ṣanʿa* to an establishment of physical control: the building of edifices and structures, the control and management of water, and cultivation are all invoked in relationship to the root. From the dictionaries, then, there emerges a sense of *ṣanʿa* as careful shaping or molding, be that of material, of action, or of the environment.

Ṣanʿa *in Craft Discourse and Material Culture*

8th-10th century Arabic texts focused on artisans and handicrafts built upon the previously-discussed dictionary definitions and the sensibilities of *ṣanʿa* that they provide. Appearing even more frequently in these texts than the term *ṣanʿa* is its related term *ṣināʿa*. The two words derive from the same *ṣ-n-ʿ* root, and *ṣināʿa* has a similar meaning, defined as some combination of 'craft', 'art', 'trade', or 'work', especially habitual work based on hand-skill. Both the relationship of meaning and the tension in the difference of *ṣanʿa* and *ṣināʿa* merits investigation to better sketch understandings of what artifice was and how it was theorized in early-medieval Islamic writings. I therefore examine five 8th-10th century Arabic texts, each of which has a different relationship to and understanding of craftsmanship.

I read the 8th *risāla* of the Ikhwān al-Ṣafa', *On the Practical Crafts* (*al-risāla al-thāmina min al-qism al-'awwal fi-l-ʿulūm al-riyāḍiyya al-taʿlīmiyya fi-l-ṣanā'iʿ al-ʿamaliyya*), and the *Keys of the Sciences* (*Mafātīḥ al-ʿulūm*) by al-Khwārazmī to trace how *ṣanʿa* and *ṣināʿa* are discussed and defined in texts with different relationships to religious and cultural orthodoxy, and in texts which explicitly work to delineate the boundaries and contents of disciplines. I then turn to Abu Bakr al-Rāzī's *Philosophical treatises* (*rasā'il falsifiyya)* and specifically the section on what is beyond nature (*maqālat fīmā baʿd al-ṭabīʿa*) to look to distinctions between naturality

and artificiality at the intersection of natural philosophical discourse with ideas of craftsmanship and making. Following that, I consider the meaning of *ṣanʿa* and *ṣināʿa* in the *Kitāb al-ḥiyal* (*Book of Ingenious Devices*) by the Banū Mūsā b. Shākir, which, as the title indicates, specifically details constructions of machines that, while different in function from the Jābirian *takwīn*-machine, may not be so different in the sciences used in their constructions or in the sense of wonder they provoke. Lastly, I ask how the idea of *ṣanʿa* is portrayed in Ibn al-Zubayr's *Kitāb al-hadāyā wa-l-tuḥaf*, which catalogs the beautiful pieces of material culture given as gifts and noted amongst treasuries for their value.

Risāla 8 of the Ikhwān al-Ṣafa': On the Practical Crafts

The eighth epistle of the Ikhwān al-Ṣafa'[19] deals with practical crafts, arts, and their purposes. The introduction to its most recent translation by Nader El-Bizri, notes that, first, the epistle establishes and maintains the Aristotelian distinction between *techne* and *episteme*, or skilled, technical craftsmanship and scientific knowledge, as well as between theory and practice,[20] and second, that the epistle "... seems to be guided by an ontology of production and a metaphysics of making, and these would be akin to thinking about the Deity as an Artisan rather than a radically Neoplatonic one…."[21] In considering how artifice is theorized, as well as notions of divine imitation, the eighth epistle is useful for the insight it provides on craft as both part of an Aristotelian worldview and craft as a religious action. This is particularly so given that the Jābirian corpus shares these features. Relevant for our purposes, as well, the eighth epistle not

[19] The Ikhwān al-Ṣafā' were an anonymous, underground philosophical fraternity operating in Iraq in the 10th century. They authored the *Rasā'il Ikhwān al-Ṣafā' (Treatises of the Brethren of Purity)*, a 52-treatise (and one comprehensive treatise additional, the *risālat al-jāmiʿa*) encyclopedia of philosophical sciences. I would refer the curious reader to the Ismāʿīlī Institute's translation series, beginning with the Introductory volume.
[20] al-Bizri, 121-22.
[21] al-Bizri 122.

only discusses *ṣanʿa*, but also defines what is something *maṣnūʿ* (the passive participle of ṣ-n-ʿ, meaning 'produced', 'made', or 'artefacted'), delineates different varieties of artifacts (literally 'made or artefacted things', *maṣnūʿāt*) according to who made them, and explicates the relationship between the human and the divine in crafting.

Furthermore, the eighth epistle discusses metallurgy, blacksmithing, pharmacology, and other disciplines which are needed or cited in varying degrees throughout different Jābirian enterprises, including the alchemical. While the practitioners described in Jābirian writings are not metallurgists nor physicians nor pharmacologists, they still require knowledge of these crafts to conduct their experiments and to come to their theories of the world. It is reasonable to expect that theories of artifice in these related disciplines, or in texts discussing them together such as the eighth epistle, would be in conversation with the broader Jābirian conceptualization of the term. Additionally, while the Ikhwān are unique in their precise understandings of the cosmos, Yves Marquet, a notable 20th century scholar of the Ikhwān, has argued for the minimum of an awareness of each other's work and theories on the part of Jābirian authors and the Ikhwān.[22] This, too, is a justification for considering the Ikhwānian discourse on craft in conversation with Jābirian theorizations of artifice.

Before discussing the specific meanings of *ṣanʿa* in the eighth epistle, however, I want to note that a link between *ʿajab* and craft is introduced at the close of the first section of the text. It reads, "We needed to mention the practical crafts with regards to…the wonders (*ʿajā'ib*) in their powers, and the oddities of their sciences, the admirable novelties (*badā'iʿ*) of their makings, and the differences in their actions."[23] Not only is a relationship between craft and wonders

[22] Yves Marquet, "Quelles Furent Les Relations Entre 'Jâbir Ibn Ḥayyân' et Les Iḫwân Aṣ-Ṣafâ'?". *Studia Islamica*, no. 64 (1986): 39–51. https://doi.org/10.2307/1596045.

[23] Ikhwān al-Ṣafā' and Nader El-Bizri, "*al-risāla al-thāmina min al-qism al-'awwal fi-l-ʿulūm al-riyāḍiyya al-taʿlīmiyya fi-l-ṣanā'iʿ al-ʿamaliyya,*" in *Epistles of the Brethren of Purity: On Composition and the Arts*, ed. El-Bizri and de Callataÿ (Oxford: Oxford University Press, in association with the Institute of Ismaili Studies, 2018): 100-01. Translation mine.

immediately established, but crafts are bound to curiosity and pleasure, as well. I highlight this because there is an aesthetic element at play here: discourse on craft and making is not separate from questions of beauty; rather, it is linked in part through the wondrous and curious elements of craft.

Ṣanʿa is first defined as, "the knowledgeable maker's production of the image (*ṣūra*) which is in his mind, and its placement in matter."[24] Things which are made, *maṣnūʿāt*, are "...a collected whole of matter and image together,"[25] and they are of four genera: human (*bashriyya*), natural (*tabīʿiyya*), psychical (*ruḥāniyya*), and divine (*ilāhiyya*). The epistle explains,

> "The human artifacts are like the shapes, engravings, and dyes in natural bodies which the craftspeople make, in the markets of cities and other places. The natural artifacts are the forms of the skeletons of animals and the diversity of their shapes, and the species of plants, and the types of remedies and minerals. The psychical artifacts are like the order of the stations of the four elements which are beneath the orbit of the Moon, which are fire, air, water, and earth, and like the fixing of the celestial spheres, and the system of the image of the world in entirety. The divine artifacts are the forms <divested from> matter, the inventions of the Creator of creators, brought from nothingness into existence, into being from non-being, as a thing not from a thing, in one instance, with neither time, nor place, nor matter of a specific entity, nor a form, nor motion, because all of them are the creations and the inventions and the artifacts of the Maker (*al-bārī*), praised and exalted."[26]

El-Bizri mentions in a footnote that 'minerals' in the above section indicates "types of preparations (such as drugs, ointments, and powders) that are extracted or compounded from organic oils and minerals."[27] Thus natural artifacts are not necessarily devoid of the presence or influence of human hands. Rather, the genera refers to the place from where the underlying form and matter of a made artifact comes in the order of things. In other words, it is a cosmological distinction about which layer of creation something is generated at.

[24] Ibid, 102. Translation mine.
[25] Ibid. Translation mine.
[26] Ibid, 103-104. Translation mine.
[27] El-Bizri, 141. El-Bizri does not provide justification for this claim aside from the fact that minerals are mentioned in the same breath as remedies.

While there are key distinctions between these genera, all artifacts in each category are still *masnūʿ*. In other words, here we see the cosmological scalability of artifice (*ṣanʿa*). Artifice does not refer to things that are only man-made. Rather, productions of natural, human, and divine actors are all just that: productions. The artifice is the same action or category of action, even as there are qualitative distinctions according to the actor making the artifact. These distinctions are human, natural, psychical, or divine. El-Bizri elaborates upon the details of their differences as follows:

> "When dealing with the human crafts, every maker is in need of matter, time, place, a tool, instrument, and movement, besides their own self as agent. They also require seven motions: generation, corruption, augmentation, diminution, alteration, translation (linear, circular, and a composite of both), and spiritual movement...Unlike the things that are needed by humans to fulfill their respective trades, a natural agent of making only requires matter, place, time, and motion. As for the psychical agency of making, it is in need only of matter and motion, while the intellective one involves the form only, since the First Intellect is influenced directly by the sublime Divine Maker who does not need anything, with all existents being His own inventions and creations."[28]

Even further qualification for *maṣnūʿ* is given in the fourth section of the epistle. A single body (*al-jism al-wāḥid*) is termed *maṣnūʿ,* or an artifact, if it is receptive to the workings of the "craftsperson who makes his making (*ṣanʿataha*) from it and through it with regards to shapes and engravings,"[29] which is different from matter, subject matter, and an instrument. The Ikhwān provide the example of a piece of iron:

> "An example of this is a piece of iron, for it is said that it is 'matter' for every form that receives it, and it is said that it is also the 'subject matter' of the blacksmith who works his making (*ṣanʿataha*) from it and through it. If the blacksmith makes a knife from it, or an axe, or a saw, or a file, or something else, it is termed the artifact (*maṣnūʿan*) en-mattered by the blacksmith. And if the butcher used the knife, or something else, it would be called a 'tool', and thus the hatchet and the saw and the file."[30]

[28] El-Bizri, 125.
[29] Ikhwān al-Ṣafā', 106. Translation mine
[30] Ibid, 106. Translation mine.

Humans, who, as previously described, need a number of additional components besides their own agency to craft, are able to take only simple or composite 'subject matters' up for their making. The simple are the four elements (fire, air, water, earth) and the composite are mineral, vegetative, and animal bodies.[31] The Ikhwān then add, "And all of these are artifacts of nature, just as all artifacts of nature are psychical artifacts, and indeed all psychical artifacts are divine artifacts."[32] This is an explicit statement of the cosmological scalability of artifice. Something being defined with the quality of *maṣnūʿ* relates to the purposeful shaping of material; artifice (*ṣanʿa*) takes place across the (volitional) cosmos, from the top of the chain of being (the Divine) to the human level. Indeed, the Ikhwān suggest that everything, fundamentally, is divine artifice, and divine creation is unique in that the Divine Maker does not need anything, including time or matter, to forge creation.

The Ikhwān explicitly understand the making of the craftsman as divine imitation. They write:

> "Know, my brother, that the skill in every making (*ṣanʿa*) is an imitation of the Wise Maker who is the Bārī, exalted be His Glory. It is said that God loves the nimble, skillful maker. It is reported regarding the Prophet, may God grant him blessings and peace, that he said, 'Indeed God loves the maker exact in his making (*ṣanʿatihi*).' On account of this, it has been said in a definition of philosophy that it is the imitation of the divine according to the power of the person. However, we intend by 'imitation' the imitation in the sciences and crafts and the effusion of the good, because the Bārī, exalted be His Glory, is the most knowledgeable of the learned and the wisest of the wise and the finest maker of the makers and the best of the best, so all who increase in these things even a degree, increases his proximity to God…the means do not exist except by work or knowledge or worship…"[33]

[31] Ibid, 107. Translation mine.
[32] Ibid. Translation mine.
[33] Ibid, 131-32. Translation mine.

Thus, for the Ikhwān, to imitate the divine in the making of craft is not to overstep the limits of human possibility or to make oneself a partner to divinity, but instead a practice of devotion, a replica of artifice at the highest order of being appropriately scaled.

The Keys of the Sciences

al-Khwārazmī (Abū ʿAbd Allāh Muḥammad b. Aḥmad b. Yūsuf al-Kātib), polymath and head librarian of the ʿAbbasid intellectual center known as the *Bayt al-Ḥikma*, composed the *Mafātiḥ al-ʿulūm* (*Keys of the Sciences*)[34], dedicated to Abu 'l-Ḥasan ʿUbayd Allāh b. Aḥmad al-ʿUtbī, vizier to the Sāmānid Nūḥ II b. Manṣūr (366/976-387/997), in Bukhara in the 10th century[35]. The *Mafātiḥ* is an introductory handbook for court secretaries (*kuttāb*), of whom a fairly encyclopedic knowledge base was required, inclusive of theology, law, philosophy, music, medicine, and natural and mathematical sciences.[36] In the introduction, al-Khwārazmī states that his goal is to attend specifically to branches of learning that are neither too well-known nor too obscure.[37] The book is divided into two parts, the first covering indigenous Muslim branches of learning (Islamic law, theology, grammar, the secretary's art, poetry and prosody, and history), the second covering the *ʿajamī* (non-Arab or foreign-born) sciences (philosophy, logic, medicine, arithmetic, geometry, astronomy, music, mechanical contrivances, and alchemy). Each individual

[34] That the title is translated as *Keys of the Sciences* should not stop us from understanding it as a text discussing both technical craft and theoretical "scientific" knowledge (re techne/episteme); *ʿulūm* carries the meaning of disciplinary boundaries or fields and shouldn't be limited on the basis of our contemporary definition of 'science' as a discreet entity.
[35] Bosworth dates the composition to shortly after 977 CE on the basis of its dedication and other internal evidence (see page 100).
[36] C.E. Bosworth, "A Pioneer Arabic Encyclopedia of the Sciences: Al Khwarizmi's Keys of the Sciences," *Isis* 54, no. 1 (1963): 98.
[37] Sabra notes in his Encyclopedia of Islam article that Khwārazmī "explains the key terms used by the various groups of scholars, artisans and government officials, *in particular those terms which were left out of current lexica* (emphasis mine)." In: A.I. Sabra, "al-Khwārazmī" in *Encyclopaedia of Islam New Edition Online (EI-2 English)*, ed. P. Bearman (Brill, 2012). doi: https://doi-org.proxy.uchicago.edu/10.1163/1573-3912_islam_SIM_4207.

branch then receives a chapter which provides technical terms and explicates the basics of the subject.[38]

The *Mafātiḥ* delineates the boundaries and contents of disciplines, a number of which themselves are at times considered crafts (such as poetry, music, and engineering), and it is a practical introduction to the key features of those trades. Furthermore, al-Khwārazmī introduces *awāʾil al-ṣināʿāt*, or elements of the crafts, to his readers. Thus while the *Mafātiḥ* does not seem to concern itself with a distinction between *techne* and *episteme*, spanning disciplines that elsewhere (e.g. the Rasā'il Ikhwān al-Ṣafa') might be categorized as either "skilled technical knowledge" or as "theoretical scientific knowledge", I suggest that it can still be read as a work about craftsmanship, broadly defined as is appropriate for an introduction received by the aforementioned secretarial audience.

Moving beyond al-Khwārazmī's general use of *ṣināʿa* as science or craft, the term *ṣanʿa* makes an appearance in two places. The first is in the section on mechanical devices and contrivances; the second is in the section on alchemy. These are the last two sections in the *Mafātiḥ* and they follow one after another, in the order just given.

Mechanical devices

In the pithy section on mechanical devices and contrivances, *ṣanʿa* is only used three times, two of which are in the title and subtitle, and one of which repeats a phrase used in the title later. The active participle *ṣāniʿ* is also used once. The title of the section is *ḥīl ḥarakāt al-mā' wa-ṣanʿa al-'awānī al-ʿajība wa mā yattaṣilu bi-hā min ṣanʿa al-ālāt al-mutaḥarrika bi-dhātihā*: "devices of the movements of water and the making of wondrous vessels, and what is

[38] See Bosworth or Sabra (above) for a more thorough exploration of this.

connected/related to them from the making of vessels which move of their own accord."[39] The section that follows describes different kinds of devices that move water and other liquids, as well as their associated tools, including some which are explicitly for the use of *ṣanʿa al-'awāni al-ʿajība*. Some examples of these are the *saḥāra*, "which the general populace calls the 'thief of water'; I mean the bent pipe made of glass or something else. One of its ends is put in water or another watery liquid, and the other end sucks, so that the water arrives to it, and pours/rises from it"[40] or the *al-may dazd*, "the stealer of beverages, and it is a vessel made in order that is is filled with a beverage, then inverted, and not a dirham of it pours out, so the drinker is deluded/deceived that he received in full what was in it."[41] The active participle form of *ṣanʿa* is used once in one of these examples. The section reads: "The *naḍāḥat* [an instrument made of copper or brass commonly used for shooting out naphtha]: the instrument is used for sprinkling/spraying onto the faces of people, in the direction which the maker (*ṣāniʿ*) wants."[42]

In its brief usage of the term, this section charts a relationship between *ṣanʿa*, design, and *ʿajā'ib* (wonders). The wonder produced by these devices is emplotted; it is the direct result of the way in which these machines and tools are designed, which seems to be a feature they have (the tools being designed things) because they are the result of the *ṣanʿa* of either *'awānī* or *ālāt*. al-Khwārazmī even notes that, "The wondrous movement is prepared, therefore, according to different forms."[43] This is to say, the wonder is not inexplicable, the result of natural properties, or hierophanic, but rather the product of carefully considered and shaped materiality. There is will to this shaping, that which the maker (*ṣāniʿ*) desires.

[39] Khwārizmī, *Mafātīḥ Al-ʿulūm* (S.l.: s.n., Maṭbaʿat al-Sharq, 1970): 143. Translation mine.
[40] Ibid, 144. Translation mine.
[41] Ibid, 144. Translation mine.
[42] Ibid, 145. Translation mine.
[43] Ibid, 143. Translation mine.

Alchemy

From the outset, al-Khwārazmī draws a connection between *ṣanʿa* and alchemy, writing, "And the experts of this craft (*ṣināʿa*) call it wisdom *par excellence* (*hikma ʿalā 'l-iṭlāq*), and some of them call it the Art (*ṣanʿa*)."[44] In this sentence, then, he also presents a difference between the meanings of *ṣināʿa* and *ṣanʿa*, with *ṣināʿa* designating a trade, craft, work, or even art--something one does for money that requires specialized skills and results in a material product--and *ṣanʿa* as the capitalized version of those nouns (the Craft, the Work, Art/ifice). Writing to a broad secretarial audience, al-Khwārazmī recognizes not only a relationship between the nexus of meaning surrounding *ṣanʿa* and alchemy, but notes that for some practitioners, these two concepts are one and the same. He then proceeds to give a chapter (*faṣl*) each on the tools, substances and compounds, and processes (*tadābir*) involved with alchemy.

As is seen below, al-Khwārazmī discusses made, produced, and manufactured substances and compounds in the context of alchemy. I want to take a moment to think about made things, or artifacts (à la the Aristotelian definition of an object made for a specific purpose[45]), especially in the context of distinctions between things made 'naturally' and 'artificially', as this categorical or ontological distinction is one around which numerous medieval Islamic critiques or attacks of alchemy hinge. As scholar of alchemy Takatome Inoue discusses in his article "al-Kindī's attack on Alchemy and his Perfume-Making", the argument of al-Kindī reproduced in Hajji Khalifa's entry on alchemy in *Kashf al-Ẓunūn ʿan 'Asāmī al-Kutub wa-l-Funūn* (*The Removal of Doubt from the Names of Books and the Arts*) emphasizes distinctions between naturally made things

[44] Ibid, 147. Translation mine.
[45] Takatomo Inoue and Yaʿqūb b. Isḥāq al- Kindī, "Al-Kindī's Attack on Alchemy and His Perfume Making," in *Orient (Society for Near Eastern Studies in Japan)* 52 (January 2017): 83. https://research-ebsco-com.proxy.uchicago.edu/linkprocessor/plink?id=e6b6d28f-b072-3955-b8cb-fe3e57943efc.

and artificially made things. Relying on Peripatetic natural philosophical theory, al-Kindī challenges the possibility of reproducing natural objects artificially:

> "Yaʿqūb al-Kindī mentioned in his epistle the impossibility of men's work because nature is independent of their work, cheating of the people of this craft and their ignorance. He invalidates the claim of those who claim tincturing gold and silver. The deniers (of al-Kindī) said that if artificial gold was the same as natural gold, then what was made through the craft is the same as what is made through nature. If one permitted the possibility that what was made naturally is the same as what was made artificially, we would find a naturally made sword, throne, or ring. That is not true. They also said of tincturing (*ṣābigh*) gem: either that it is more enduring against fire than the tinctured (*maṣbūgh*), or that the tinctured is more enduring, or that both are equal. If the tincturing is more enduring, the tinctured has to perish before the tincturing. If the tinctured is more enduring, the tincturing has to perish, and the tinctured remains in its first state free from the color (*ṣibgh*). If they are equal in endurance against fire, they are made from the same one genus in order for them to be equal in the endurance against fire. Thus, each of them is not the tincturing nor the tinctured."[46]

al-Kindī takes alchemy to be invalid or impossible because it is impossible to to reproduce natural objects artificially; however, he does not have a problem with a discipline like perfume-making, where one manufactures practical products with the intention of making something fundamentally artificial. Inoue smartly notes that differences in the role of Peripatetic theory for alchemists and non-alchemists may be crucial in understanding how different communities using the same philosophical bases come to differing conclusions about a discipline's validity.[47] As he concludes, "…we have to determine the view of Muslim alchemists on whether they distinguish nature and artifact and on how they relate their theory and Peripatetic natural science…We should take into account the possibility that they had a completely different paradigm for the issue of natural philosophy from that of the philosophers and intellectuals, even though they both applied the Peripatetic theory."[48]

[46] Ibid, 82.
[47] Ibid, 83.
[48] Ibid, 91.

How, then, is the question of manufacture taken up in al-Khwārazmī's writing on alchemy? While not an alchemist himself, al-Khwārazmī's writing can still point us towards some understandings of the relationship between nature and artifice that were circulating throughout the Jabirian milieu. al-Khwārazmī uses the term *maʿmūl* to mean something in the nexus of 'made', 'produced', or even 'manufactured'. He does not use *maṣnūʿ*, the passive participle form of *ṣanʿa*. This raises a question as to if al-Khwārazmī is presenting a distinction between things which are produced or manufactured (*maʿmūl*) and things which are made by design (*maṣnūʿ*), or if these words are operating as synonyms. For example:

Table 1: *maʿmūl* and *maṣnūʿ* in al-Khwārazmī

"Sal ammoniac, of which there are two types, a mineral type and another produced (*maʿmūl*) type formed/made (*yaṣnʿu*) from hair."[49]	النوشاذر وهو ضربان معدني واخر معمول يصنع من الشعر
"And from their medicaments is zinc, of which there is green [zinc] and yellow [zinc] which resembles shells, and which also has varieties, among which are white, which is Indian and precious, and yellow, which is treacherous, and green, which is from Kirman, and a type which is called "*al-muhawwas*" (shaped like a date-palm) and other types, and the Indian type is produced/manufactured (*maʿmūl*)."[50]	ومن عقاقيرهم التوتيا فمنها اخضر ومنها اصفر وشبيه بالقشور وهي ايضا ضروب فمنه ابيض وهو هندي وهو عزيز واصفر وهو خوزي واخضر وهو كرماني ونوع يقال له المخوص وأنواع أخر والهندي معمول
"Among them is ratsbane (a type of arsenic), of which there are two types, a yellow and a white. It is mineral/metallic (*maʿadanī*) and made/produced (*maʿmūl*) from the smoke of silver and is called "the poison of the rat"."[51]	ومنها الشكّ وهو ضربان اصفر وابيض وهو معدني/ى ومعمول من دخان الفضة ويسمي سم الفار

[49] Khwārizmī, 147-48. Translation mine.
[50] Ibid, 148. Translation mine.
[51] Ibid, 148-49. Translation mine.

Regardless, it is worth noting that al-Khwārazmī charts a difference between what is mineral (*maʿadanī*) and what is produced (*maʿmūl*), even as mineral and *maʿmūl* varieties of a substance are still described as that same substance. This resonates with the Ikhwānian sense of an artifact being classified as 'human' or 'natural' based on how its making (*sanʿa*) occurs, but that classification not ordering a fundamental distinction between what itself is made. In other words, zinc is still zinc whether it is *maʿadanī* or *maʿmūl*. This contributes to the argument that, in the broader Jābirian milieu, something being made by human hands does not remove it from the natural or even divine order of the universe. In other words, al-Khwārazmī's implicit theorizing also suggests the cosmological scalability of artifice.

Ṣanʿa appears thrice more, two times in the section on substances and compounds, and once in the section on processes (*tadābir*). In substances and compounds, al-Khwārazmī writes: "Distillation is like the making (*ṣanʿa*) of rose water…"[52] and "The oxidation from rust is like what is made in the making (*ṣanʿa*) of verdigris."[53] al-Khwārazmī does describe how verdigris comes about; it is included in a section in which he does not explicitly use the term *ṣanʿa* but does seem to address concepts of artifice and making more broadly. He describes a category of *ʿaqāqīr* (medicaments) as "*al-muwallada al-latī laysat biʾaṣlīah* (those generated things which are not in their original forms)".[54] The list of these *ʿaqāqīr* and how they are produced follows:

> "Verdigris: which is taken from copper, sheets of which are placed in an amount of vinegar, so it becomes green. It [the vinegar] corrodes it [the copper], and it comes to this condition in order that all of it becomes verdigris; cinnabar, which is taken from quicksilver/mercury and sulfur, which are put into vials and ignited, so it becomes cinnabar. The fire is of an amount which the experiment issued, one time after another, and the amount [of cinnabar] being taken one part from mercury and one part from

[52] Ibid, 149. Translation mine.
[53] Ibid, 150. Translation mine.
[54] Ibid, 149. Translation mine.

> sulfur; red lead, which is lead that is burned and fire is kindled upon it so that it reddens; litharge, which is when one places lead in a hollow ditch/cavity/well and cooks crushed, baked bricks and ashes and intensifies the blowing/bellowing of air upon it, in order that it hardens so that it becomes litharge; *al-qalīmīā*, which is iron-dross/allay of each metallic body (*jasad*) which is refined/purified; ceruse/white lead, which is taken from plates of lead (*raṣṣaṣ*) in vinegar in the manner which verdigris is made; and likewise the saffron of iron, which is from iron; and zinc, [which is from] the smoke of copper and the smoke of kohl/antimony."[55]

These *muwallada* result from processes which require intervention. The use of *muwallada* to classify and describe these entities is interesting, given that things which are "spontaneously generated" are *tawallud* (this is the verbal noun of the same root in the same form as *muwallada*, which is a passive participle).[56] These entities are also explicitly *laysat bi'aṣlīah*, not original. In other words, al-Khwārazmī recognizes that some entities can only exist through intervention or human artifice.

The final use of *ṣanʿa* comes in the section on alchemical processes. It reads: "*al-ḥajar ʿinda-hum huwwa al-shay' al-ladhī yakūnu min-hu al-ṣanʿa 'aʿnī al-ladhī yuʿmalu min-hā al-iksīr*…"[57] I read al-Khwārazmī here as using *ṣanʿa* as he describes some practitioners using it, i.e. to mean alchemy itself. Thus he says, "The stone, in their opinion, is the thing by which alchemy exists, that is, that from which the elixir is made."[58] al-Khwārazmī seems to understand alchemy to "really be about" the production of the elixir.

[55] Ibid, 149. Translation mine.
[56] See Chapter 3 of this dissertation for an extended discussion of the meaning of 'generation'.
[57] Ibid, 150. Translation mine.
[58] Ibid, 150. Translation mine.

al-Rāzī's *maqālat fīmā baʿd al-ṭabīʿa* (*Discourse on metaphysics*)

Abī Bakr Muḥammad ibn Zakariyyā' al-Rāzī (865-925 CE) was a highly influential and controversial philosopher and physician reported to have run hospitals in Rayy and Baghdad.[59] He was also an alchemist: Julius Ruska worked heavily on al-Rāzī (see Introduction) and Paul Kraus edited the *Rasā'il falsafiyyia* (*Philosophical works)*, one of two complete works of philosophy by al-Rāzī that survive to the present day, in 1939. Within the *Rasā'il falsafiyya* is a section titled *maqāla fīmā mā baʿd al-ṭabīʿa* (*Discourse on metaphysics*), which is pertinent to our purposes as al-Rāzī discusses the distinction between what is made by nature and what is made by human hands, making use of the terms *ṣanʿa* and *ṣanā'iʿ*. His discourse offers us his perspective on what he considered to be the bounds or the realm of the natural and, in so doing, the boundaries and relationships of other domains of generation and creation, such as the human and divine. In other words, what is left for artifice when nature is defined?

In the *Discourse on metaphysics*, al-Rāzī is criticizing the way Aristotelian doctrines of nature, especially those within Aristotle's *Physics* and commentaries thereafter, had been adopted within an Arabic philosophical tradition. Definitions of nature in the Arabic philosophical tradition stuck closely to the Aristotelian ("a certain principle and cause of being moved and being at rest, belonging primarily to that in which it is essentially, not accidentally"[60]). The Arabic translation of Aristotle's *Physics* reads, "Nature [*ṭabīʿa*] is a certain principle and cause on account of which the thing in which it is is primarily is essentially, not accidentally, moved and at rest."[61] The translator and philosopher al-Kindī (ca. 800-870 CE) defined nature in *The*

[59] Peter Adamson, "Abu Bakr al-Razi," in *The Stanford Encyclopedia of Philosophy* (Summer 2021 Edition), ed. Edward N. Zalta. <https://plato.stanford.edu/archives/sum2021/entries/abu-bakr-al-razi/>.
[60] Jon McGinnis, "Natural Knowledge in the Arabic Middle Ages," in *Wrestling with Nature: From Omens to Science,* ed. Peter Harrison, Ronald L. Numbers and Michael H. Shank, 61.
[61] Ibid.

Definition and Description of Things as "a starting point [*ibtidā'*] of motion and resting from motion, where the most important [starting point] is the powers of the soul."[62] The influential Muslim philosopher al-Fārābī (ca. 870-950 CE) identified something's nature with its essence (*māhīya*) and defined essence as "that on account of which that species does the activity generated from it as well as the cause of the rest of the essential accidents belonging to it, whether motion, quantity, quality, position, or the like," while his pseudepigrapher defined it as "the principle of motion and rest, when [that motion or rest] is neither from something external nor a result of volition."[63] The influential physician and philosopher Ibn Sīnā also made use of the Aristotelian definition, and added that nature is "a power that brings about motion and change and from which the action proceeds according to a single course without volition."[64]

According to the scholar of Greek and Arabic philosophy Peter Adamson, al-Rāzī was likely targeting in his *Discourse on metaphysics* specifically the conversations and conclusions of the Baghdad Peripatetics on *Physics* Book II .[65] This circle of philosophers, which included al-Fārābī, the Syrian Christian Yaḥyā ibn ʿAdī (893-974 CE) who became the head of the school, and his famous student Ibn al-Samḥ (d. 1027 CE), operated from approximately 870 CE to 1023 CE and focused their efforts largely on aspects of Aristotelian logic.[66] As for the second book of *Physics*, this is where Aristotle makes an analogy between nature and art, arguing that both are teleological (acting for the sake of something), but noting that, "...whereas an artefact is the outcome of the deliberation, rationality, and choice of the artisan or craftsman, nature does not seem to exhibit any of those features."[67] Alexander of Aphrodisias, the 3rd century Peripatetic

[62] Ibid.
[63] Ibid.
[64] Ibid, 62.
[65] Peter Adamson, "'PORPHYRIUS ARABUS' ON NATURE AND ART: 463F SMITH IN CONTEXT," *Bulletin of the Institute of Classical Studies. Supplement*, no. 98 (2007): 149. http://www.jstor.org/stable/43767977.
[66] McGinnis, 61-62.
[67] Adamson, "Porphyrius," 143.

philosopher, emphasized in his commentary on Aristotle that nature "does not *think* or *deliberate*"[68]; later Neoplatonic commentators such as Simplicius and John Philoponus respond with contrasting ideas, working to reconcile Plato and Aristotle through differentiating between the active principle of nature and the activity of nature exercised in specific bodies. The Baghdad Peripatetics had their own responses to this commentarial chain on the issue of nature in/and *Physics* II, recognizing the metaphysical stakes attached to the issue of whether nature can or does deliberate or make choices. There is an edition of the *Physics* known as the Baghdad *Physics* made by a third generation student of Yaḥya ibn ʿAdī, Abū al-Ḥusayn al-Baṣrī, which collates the comments of numerous members of the Baghdad Peripatetics on Aristotle's text, including its second book, as well as Arabic versions of comments by Philoponus and Alexander.[69] Thus, in the Baghdad *Physics*, attributed to Alexander in Arabic is the following:

> "Nature is not an efficient cause of what comes to be by chance, but rather deliberation and will are. For chance comes about through acts of will resulting from deliberation. Will is acquired and not natural, even if it is by his nature that man wills the goal of will, while art is external to the things; but as for the goal of nature and form, it is the same thing. Will may not come to be with[out] complete deliberation, while chance is what comes to be willingly out of deliberation."[70]

The Arabic commentators, Adamson explains, were obviously aware of Alexander's view of nature, but held views closer to those of Philoponus.[71] In the Arabic commentarial tradition, the view attributed to Philoponus was that "nature descended from separate, immaterial causes, even though he rejected the idea that nature looks to paradigms."[72] So, for example, Abū Bishr Mattā ibn Yūnus, a Christian member of the Baghdad Peripatetics under whom Yaḥyā ibn ʿAdī also studied, writes, "By 'active nature' (*al-ṭabīʿa al-faʿʿāla*) I mean neither the matter nor the form,

[68] Ibid, 144.
[69] Ibid, 149.
[70] Ibid, 150.
[71] Ibid.
[72] Ibid, 145.

but rather the nature that is disseminated (*mabthūth*) into all generated things that makes them come-to-be."[73]

Now, as said, the discussion of al-Rāzī's *Discourse on metaphysics* centers around the issues al-Rāzī takes with the way other philosophers define nature, and specifically with what kind of will or intention nature does or does not have. He takes up a polemic against what he finds to be a contradiction in Aristotelian understandings of nature that subsists in the Arabic tradition. Adamson writes, "What we have here, then, is a text focused on the dilemma confronted by Alexander: how far can we push the analogy between nature and a rational agent such as an artisan?"[74] I will not explicate al-Rāzī's entire line of argumentation fully, but rather focus on key passages that reveal theories and underlying conceptualizations about the relationships between nature, artifice, and the divine held within his refutation of others' points. All translations are my own.

Al-Rāzī notes early on in the section that, "The philosophers we saw claimed that the evidence of its [nature's] existence is its actions and faculties (*quwwā*) permeating through the world that make its acts (*afʿāl*) necessary."[75] Here we are given our first definition of nature: actions and powers emanating in the world that cause actions. To this al-Rāzī responds, however, "As for their reasoning/inference about the power/potential that they claimed, it will be said to them: you do not deny that God is the Reason/Necessary by Himself for the power/potential of all actions and the natures of things?"[76] From the start, this is an interesting statement of worldview, reminiscent of the Ikhwān al-Ṣafā' describing each class of artifacts (*maṣnūʿāt*) as *maṣnūʿāt* of the class above it. Where does nature fit into a cosmology headed by God? al-Rāzī

[73] Ibid, 150.
[74] Ibid, 147.
[75] وزعم مَن شاهدنا من الفلاسفة أنّ الدليل على وجودها أفعالُها وقواها المنبثَّة في العالم الموجِبة للأفعال
[76] وأمّا استدلالهم بالقُوى التي ادّعوها فيُقال لهم ما أنكرتم أن يكون الله جلّ وعزّ هو الموجِب بذاته لقوى سائر الأفعال ولطبائع الأشياء

hints here at a sense of the cosmological scalability discussed throughout this chapter in locating nature itself as a 'sub-section' of the divine.

al-Rāzī then refutes another claim:

> "As for their claim that nature is an essence except that it does not subsist by itself, it is said to them, why don't you instead claim that accidents are essences and they do not subsist on their own. As for the opinion of Yahya al-Nahwi that nature is a force/potential that is operative in bodies and arranges/governs them, it is said to him: is nature, if it is a substance, devoid of being a force that is operative in the entire body, so that the essence circulates/is propagated throughout the entire body?...We found you describing nature in the way you describe the living, the chosen, the knowledgeable, the wise–so you say that it [nature] does not act expect with wisdom and with good sense, and that it intends a purpose and does something for something that will be, just as its action for the fetus, the eye for looking, the hand for striking, and the molars for grinding, and that it places all things in their places and arranges them according to how it must arrange them, and that it gives form to the fetus in the womb and arranges it in the most delicate way until it is complete, then it arranges/manages the human being and brings him health and rejects diseases from him–until Hippocrates said natures are doctors of diseases. Then with that, you claimed that it [nature] is dead, not living, not sensitive, nor capable, nor chosen, nor knowing."[77]

Here, we are given three definitions of nature: it is 1) a force that is operative in bodies and arranges or manages them, 2) it does only what is wise and in good sense while intending a purpose for something that will be, and 3) it is dead, not living, sensitive, capable, chosen, or knowing. al-Rāzī has issues with all of these definition aspects, calling out the ascription by philosophers of qualities of the divine (the living, the knowledgeable, the wise) to nature itself, but most of all, he chafes at the third aspect, where nature is taken to be dead. To this, al-Rāzī replies,

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[77] فأما زعمهم أن الطبيعة جوهر إلا أنها غير قائمة بنفسها، فيقال لهم لِمَ لا زعمتم أن الأعراض جواهر وهي لا تقوم بأنفسها ? فأما قول يحيى النحوي أن الطبيعة قوة تنفذ في الأجسام وتدبرها، فيقال له هل تخلو الطبيعية إذا كانت جوهرا من أن تكون تنفذ في كل الجسم فيشيع جوهر في كل الجسم...إنا وجدناكم تصفون الطبيعة بما تصفون به الحي المختار العالم الحكيم فتقولون إنها لا تفعل إلا حكمة وصوابا وإنها تقصد غرضا وتفعل شيئا لشيء يكون، كفعلها للجنين العين للنظر واليد للبطش والأضراس للطحن وإنها تضع جميع الأشياء مواضعها وترتبها على ما يجب أن ترتبها عليه وإنها تصور الجنين في الرحم وتدبِّره ألطف تدبير حتى يكمل ثم تدبر الإنسان وتجلب له الصحة وتنفي عنه الأسقام حتى قال بقراط الطبائع أطباء الأمراض. ثم زعمتم مع ذلك أنها موات غير حية ولا حساسة ولا قادرة ولا مختارة ولا عالمة

> "How can the dead be wise and not be discerning, speaking, and sensitive, and how can order and consideration come from something not discerning and alive? It is said to them, 'Tell us about anger, contentment, dislike, will, love, and hatred. Do you say that these are from actions of the soul?' No, they made it for nature, so certainly they invalidated the actions of the soul and made nature the cause of actions that do not take place except from the living, chosen one, just as they made it [the soul] the cause of that which nature places upon it. And if they say yes, it will be said to them: and likewise, what you have described of actions is not permitted to be due to nature, and it will be said to them: What did you deny regarding the accidents acting with wisdom and with good sense and being a storyteller for a purpose? If they continue according to that, they will increase in ignorance/disregard, and if they abstain from it, it will be said, "For what cause did you refrain from that?" We find something similar in the composition that does not do that, and it is said to them: "Is it permissible for the building of a house and the formation of a city to be by nature and not from a living, capable person?" If they say no, it will be said to them that likewise, the structure of the human body does not exist except by a living, capable person."[78]

Essentially, al-Rāzī says that there is confusion here between what is the prerogative of nature and what is the prerogative of the soul. Nature is said to be the cause of things that are actually actions of the soul, and vice-versa.

al-Rāzī also uses a very interesting example at the end of this paragraph, where he asks if the building of a house or the design of a city is something from nature and not from a person. Most importantly, if the response is that, indeed, the building of a house is not permitted to be from nature, then al-Rāzī says, in that case, the same must also be true of a human body–it is not the creation of nature but the creation of a living, capable person. This is crucial to thinking about artifice as its broader theorization, I believe, because al-Rāzī delineates what is human creative action (conceptually, artifice) not on the basis of materials used but on where will and

[78] كيف يكون الموات حكيما ولا يكون مميزا وناطقا ومحسا، وكيف يأتي الترتيب والنظر من غير المميز الحي؟ ويقال لهم أخبرونا عن الغضب والرضى والكراهية والإرادة والحب والبغض هل تقولون إنها من أفعال النفس. لا وجعلوها للطبيعة فقد أبطلوا أفعال النفس وجعلوا الطبيعة علة الأفعال التي لا تقع إلا من الحي المختار كما جعلوها علة ما يقع عليه الطبع. وإن قالوا نعم قيل لهم وكذلك ما وصفتم من الأفعال لا يجوز أن يكون للطبيعة ويقال لهم ما أنكرتم من أن تكون الأعراض تفعل حكمة وصوابا وتكون قاصة لغرض ؟ فإن مضوا على ذلك ازدادوا تجاهلا، وإن امتنعوا منه قيل لأي علة امتنعتم من ذلك فإنا نجد مثلها في المؤلف لا يفعل ذلك ويقال لهم أيجوز أن يكون بناء دار وتأليف مدينة بطبيعة لا من حي قادر ؟ فإن قالوا لا قيل لهم وكذلك تركيب بدن الإنسان لا يكون إلا من حي قادر.

intent are located vis-a-vis that action. It isn't nature that makes the body, despite the perhaps intuitive sense that bodies are 'natural' things, but the will of the person.

al-Razi then discusses Galen, Alexander, and Porphyry's definitions of nature. As in the above example, al-Razi challenges distinctions between art, human intervention, and nature, suggesting that these seemingly intuitive separation of categories obscure incorrect understandings of nature itself. Of Galen, al-Razi writes,

> "...it is said from Galen that you described nature with two opposite descriptions, so you said, "Rather, nature did that - meaning the teeth and the mouth - intentionally." Then you said that intentional movement is one of the actions of the soul, and intentionality does not subsist except for the soul, just as the will does not subsist except for the soul. I said that nature manages the animal, and this is the opposite, but the living person is the one who manages nature, so he has a fever sometimes and takes what he sees of medicines at times."[79]

In other words, intentionality and will cannot be exclusively for the soul if nature does things, like design teeth and mouths, intentionally. Furthermore, as al-Razi points out, humans direct their agency upon nature regularly to manage it, such as in the case of taking medicine.

As for Alexander, says al-Razi,

> "…As for the claim of Alexander that the actions of nature are above the actions that exist by crafts, then it is said to him: How are the wondrous and high actions the prerogative of the helpless dead and the actions that are beneath them are for the living, capable, and chosen?"[80]

This passage is exciting not only because it is an instance where wonder and human creation (art) are cited in the same breath, but also because it points to a contradiction in logic of other authors of the milieu. To restate al-Razi, if nature is dead, how can its actions be more wondrous and

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[79] ويقال لجالينوس إنك وصفت الطبيعة بوصفين متضادين فقلت وإنما فعلت الطبيعة ذلك - يعني الأسنان والفم - تعمدا، ثم قلت إن الحركة الإرادية من أعمال النفس، والعمد لا يكون إلا للنفس كما أن الإرادة لا تكون إلا للنفس. وقلت إن الطبيعة تدبِّر الحيوان، وهذا معكوس وإنما الحي هو الذي يدبر الطبيعة فيحمى مرة ويأخذ ما يراه من الأدوية مرة.

[80] وأما زعم الاسكندر أن أفعال الطبيعة فوق الأفعال التي تكون بالصناعات، فيقال له وكيف تكون الأفعال العجيبة العالية الشأن للموات العاجز وتكون الأفعال التي هي دونها للحي القادر المختار

higher status than the actions undertaken by humans, who are living, capable, and choosing? This implies that the actions of nature are generally taken to be of a higher order than those of humans, and it challenges that hierarchy. Either one must understand nature differently to maintain said hierarchy, or one must challenge the idea that nature is fundamentally above the human creative action of people.

Finally, on Porphyry, al-Razi writes,

> "Porphyry contradicts [this] in his statement that nature acts without intellect, thought, or will, and it does not act by agreement, and it may do something for the sake of something. Because this can only be done by the wise, discerning and willing person…If he (Porphyry) said that nature is greater than the craft/the skill in work and greater in value/capacity, just as a living human being who is natural is greater than a pictured person, he said, and if that is so and the master of the craft does what he does for the sake of something, then likewise nature only does what it does for the sake of something and does not bring a work to perfection or agreement. It is said to him: Is not the master of the craft acting for the sake of something, while he is alive, capable, willing, thinking, and aware of the benefit of the thing which he intends and does on its account? It must be yes, it is said to him: is it likewise with nature?"[81]

Here, Porphyry's definition of nature is challenged by the use of analogy around professional work: can nature be said to do something for the sake of something, if a craftsperson does something for the sake of something while also being alive, capable, willing, etc, which Porphyry has stated nature cannot be? Al-Razi continues:

> "If he says yes, he contradicts his position, and if he says no, then he contradicts his subject like it. It is said to him: what do you deny regarding the existence of the craft doing what it does by it for some purpose and for the sake of something, and that nature is not like that? It is said to them that the craft we have does not do anything, but the one who does the craft is the one who does it, because the doer is the carpenter and the builder, not the builder and the carpentry, and the carpenter and the builder are alive and

[81] وناقض فرفوريوس في قوله أن الطبيعة تفعل بغير عقل ولا فكر ولا إرادة وليس تفعل بالاتفاق وقد تفعل شيئا من أجل شيء. لأن هذا لا يكون إلا من العاقل المميز المريد. فإن قال إن الطبيعة أجل من المهنة وأعظم قدراً كما أن الإنسان الحي الذي هو طبيعي أجل قدراً من الإنسان المصور، قال وإذا كان كذلك وكان صاحب المهنة يفعل ما يفعل من أجل شيء ما فكذلك الطبيعة إنما تفعل ما تفعل من أجل شيء ما لا تجئ بالحبط والاتفاق، فيقال له أليس صاحب المهنة إنما يفعل من أجل شيء ما وهو حي قادر مريد مفكر عالم لما في الشيء الذي يقصده ويفعل من أجله من المنفعة؟ فلا بد من نعم، يقال له أفكذلك الطبيعة

are higher than the dead nature. If the living human being is the actor, then he is the natural one according to you."[82]

Agency, including human agency, is here defined as natural. The flip side of this, as al-Razi goes on to say, must be that nature is alive, and nature must have intention. He writes,

"This is alive, so it makes nature alive, otherwise you have surely violated the ruling of what you cited. Show us in nature and its intention an example of dead things, such as the heat of fire and the falling of stone, otherwise stop your deception. If they say that nature arranges a natural plan and has intentions and enacts intention and action naturally, it is said to them to separate themselves from those who claim that it chooses naturally and influences one thing over another in a natural way, and that fire burns by choice. This is done, and it is not permissible that anyone do, intend, want, or influence except the living, chosen one, and the imprinted dead are not described in that way. As for the claim of those who claim that nature does not act or intend, and that it is the beginning of movement, then it is said to him, what do you mean by the beginning of movement and rest? Do you mean that if movement, stillness, growth, and nourishment had occurred, and things were arranged and put in their places, and a thing happened for a thing by it and for it?…Yahya al-Nahwi said in the second article of his commentary on the Sama al-Kyan that these matters are natural and not outside of nature, because that which universal nature, which generation and corruption necessitated by the movements of the planets and the change of elements, necessitated are from what is necessitated by the structure of the world. The individual nature that is in each one of these types did not err, but rather its position is the position of the craftsman who, since the things he makes become corrupt, makes them as wisely as he can, and there is corruption in them that is not attributed to a lack of wisdom, like a piece of wood with knots and corruption that does not enable a skillful carpenter to make it into a good chair or a flat bed. We said that that will not be free of there being an error of the universal nature, or it may not be an error. If it was because of an error on her [nature's] part, then the universal nature has begun to err and cause corruption due to one of the causes, and this is contrary to what they say."[83]

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فإن قال نعم نقض قوله، وإن قال لا فقد خالف موضوعه مثله. وقيل له ما تنكر من أن تكون المهنة يفعل ما يفعل بها لغرض ما ومن أجل شيءٍ ما ولا تكون الطبيعة كذلك ؟ ويقال لهم إن المهنة عندنا لا تفعل شيئا ولكن ذا المهنة هو الذي يفعل لأن الفاعل هو النجار والبناء لا البناء والنجارة، والنجار والبناء حيّان وهما أعلى من الطبيعة الموات. وإذا كان الإنسان الحي هو الفاعل فهو الطبيعي عندكم

83 فهذه حية فاجعل الطبيعة حية وإلا فقد خالفت حكم ما استشهدت به، فأرنا في الطبيعة وقصدها مثالا من الأشياء الموات كحرارة النار وهوى الحجر وإلا فدع التلبيس. فإن قالوا إن الطبيعة تدبر تدبيرا طبيعيا وتقصد وتفعل قصدا وفعلا طبيعيا، قيل لهم انفصلوا ممن زعم أنها تختار اختيارا طبيعيا وتؤثر شيئا على شئ إيثارا طبيعيا وأن النار تحرق إحراقا اختياريا. وهذا يتم وليس يجوز أن يفعل ويقصد ويريد ويؤثر إلا المختار الحي، والمطبوع الموات لا يوصف بذلك وأما زعم من زعم أن الطبيعة لا تفعل ولا تقصد وأنها ابتداء حركةٍ فيقال له ما تريد بابتداء حركةٍ وسكون ? أتريدُ أنها إذا كانت حدثت الحركة والسكون والنمو والغذاء وترتبت الأشياء ووضعتها مواضعها ووضع شيء لشيء بها ومن أجلها…قال يحيى النحوي في المقالة الثانية من تفسيره لسمع الكيان ان هذه الأمور طبيعية وليست بخارجةٍ عن الطبيعة، لأن الذي أوجبته الطبيعة الكلية التي أوجبت الكون والفساد بحركات

In sum, these passages from al-Razi imply that plenty of his interlocutors think nature has a will, which complicates the idea of human making as being a type of making uniquely tied to will or intent. In other words, human creation is often distinguished from natural creation by virtue of intention and will, and al-Razi challenges the logic of this paradigm. It is also noted that the divine has will, and so present in al-Razi's writing, too, is a sense of scalability of action. This is to say, the idea of artifice as cosmologically scalable is present in al-Razi's conception of creative action. Finally, al-Razi routinely makes use of craft and craftsmanship as a metaphor, relying on artifice to describe a paradigm of action that scales from the human through the natural and to the divine.

Kitab al-ḥiyal

The ninth century *Kitāb al-ḥiyal* (*The Book of Ingenious Devices*) contains a remarkable array of drawings and descriptions for ingenious devices, such as fountains, constantly refilling vessels, jars which dispense multiple liquids from one tap, and so forth. The text was composed by the Banū Mūsā, the sons of Mūsā bin Shākir and members of the ʿAbbasid *Bayt al-Hikma*, well-regarded as scientists and also as patrons of scientists and translators. The *Kitāb al-ḥiyal* is primarily the intellectual work of Aḥmad bin Mūsā, the second of the three sons, who specialized in engineering.[84]

الكواكب وتغيير العناصر مما توجبه بنية العالم. ولم تغلط الطبيعة الشخصية التي هي لكل واحد من هذه الأنواع، وإنما منزلتها منزلة الصانع الذي إذا فسدت عليه الأشياء التي يعملها فصنعها على أحكم ما يمكنه ووقع فيها فساد لم ينسب إلى غير الحكمة، كالخشبة ذات العقد والفساد الذي لا يمكن النجار الحاذق من صنعتها كرسياً جيداً وسريراً مستوياً. قلنا فلن يخلو ذلك من أن يكون بغلط من الطبيعة الكلية أو ليس بغلط. فإن كان بالغلط منها فقد صارت الطبيعة الكلية تغلط وتفعل الفساد لعلةٍ من العلل وهذا خلاف قولهم

[84] Ibn Shākir, Muḥammad ibn Mūsá, Aḥmad ibn Mūsá Ibn Shākir, Ḥasan ibn Mūsá Ibn Shākir, and Donald R. Hill, *The Book of Ingenious Devices (Kitāb Al-ḥiyal)* (Dordrecht ; Boston: D. Reidel Pub. Co., 1979), 19. For an excellent overview of the Banū Mūsā and the *Kitāb al-ḥiyal*, see the introductions to Donald R. Hill's translation of the *Book of Ingenious Devices*.

Ḥiyal as a term generally refers to automatic devices; scholar Constantin Canavas defines *ḥiyal* as "...[a technological term] used primarily for artificial mechanisms that are actuated mechanically, pneumatically, or hydraulically, or by some combination of these means."[85] The *Kitāb al-ḥiyal* is primarily concerned with pneumatics and hydraulics. As scholar of Islamic technology Donald Hill notes, unlike the work of al-Jazarī--author of what is perhaps the most popular *ḥiyal* text, *al-Jāmiʿ bayn al-ʿilm wa-l-ʿamal al-nāfiʿ fī ṣināʿat al-ḥiyal* (*The Book of knowledge of ingenious mechanical devices*, 1206 CE)--the Banū Mūsā are only moving fluids, and, "The figures of animals, birds and humans are static, and there is no astronomical content. This approach differentiates the Banū Mūsā's work sharply from the other Arabic writers known to us...all these writers were concerned with the application of hydraulic power to activate the biological and cosmographical automata on monumental clocks…."[86]

The *Kitāb al-ḥiyal* does not have an edited or printed edition; three manuscript copies exist (in the Vatican, Topkapı, and Berlin). I have not extensively combed through these manuscripts as I do not have access to them; I have relied instead on images of the manuscripts which Hill has reproduced in his work. These photographs, in fact, confirm the routine use of the word *ṣanʿa* and its verb *ṣanaʿa* throughout descriptions of the ingenious devices and their workings. It typically introduces a device and its basic properties or desired effects. A few examples will suffice to demonstrate the use of the term:

[85] Constantin Canavas, "Automata," in K. Fleet, G. Krämer, D. Matringe, J. Nawas and D. J. Stewart (eds.), *Encyclopaedia of Islam Three Online*, (Brill, 2009) doi: https://doi-org.proxy.uchicago.edu/10.1163/1573-3912_ei3_COM_23013
[86] Banū Mūsa and Hill, 22.

Table 2: *ṣanʿa* in the *Kitāb al-ḥiyal*

Model 10: the making/crafting of another pitcher in the form of the pitcher which operated first by air[87]	صنعة إبريق آخر على مثال الإبريق الذي عمل أولا بالهوا
Model 40: this jar has also another way of making/method which works like this…[88]	لجرة أيضا صنعة أخرى يعمل مثل هذا
Model 89: making/crafting of a fountain which water shoots up from it sometimes in the shape of a lily-of-the-valley and sometimes like a lance[89]	صنعة فوّارة لفوّر منها الماء مرة على مثال شكل السوسنة ومرة مثل القنات
Model 96: the making of a lamp whose wick comes out by itself[90]	صنعة سراج تخرج الفتيلة لنفسه

Hill's translation suggests that, in instances where the manuscript photos are not provided, he is translating *ṣanʿa* and *ṣanaʿa* as 'construction' or 'to make', respectively. It appears to be used synonymously at times with *ʿamala*, as in the *Mafātiḥ*.

The devices of the *Kitāb al-ḥiyal* are of careful, skilled design and make (*ṣanʿa*), requiring tremendous craftsmanship. As in both the *Mafātiḥ* and the Ikhwān's epistle, this type of *ṣanʿa* is linked with a sense of wonder: this is evident in the Topkapı manuscript which gives the title, "Book of Ingenious devices and wonderful (*ʿajība*) matters concerning the construction of pneumatic machines."[91] The *Book of Ingenious Devices*, while fairly standard and repetitive in its

[87] Ibid, 61.
[88] Ibid, 116.
[89] Ibid, 220.
[90] Ibid, 234.
[91] Ibid, 45.

use of *ṣanʿa*, emphasizes key qualities of the word: careful design and wroughting, which are bound to a sense of wonder.

Gifts and Rarities

The *Kitāb al-hadāyā wa-l-tuḥaf* (*Gifts and Rarities*) is a Fatimid text dating to the 11th century. Authorship is often attributed to one Qāḍī ibn al-Zubayr; however, scholar Ghāda al Ḥijjāwī al-Qaddūmī's study indicates that this is not certain. Rather, what is known is that the author was an employee of the Fatimid state during the reign of al-Mustanṣir, living in Egypt between 1052-53 and 1071.[92] The text describes gifts exchanged, especially in diplomatic and political relations, and rarities included among those gifts across a five century period (early 7th century CE through the 11th century CE).[93] The material is divided into thematic chapters, with the information in them arranged in approximate chronologically.

While this text is an 11th century work, al-Qaddūmī believes the author drew from a tenth century work by the title *al-Tuḥaf wa-l-Hadāyā*, written by al-Khālidiyyān, or the two Khālidī brothers. This is the only other published work on gifts and rarities; however, I have chosen not to draw upon it because its focus is on literature surrounding gifts and rarities as opposed to the material objects themselves.[94] Furthermore, a number of sections of the 10th and 11th century texts share enough material that al-Qaddūmī writes, "Since the sections in our text are so similar, it seems likely that our author used *Kitāb al-Tuḥaf*, or another text based on it, as the source for his information."[95] I am comfortable, therefore, in collating information on the use

[92]Aḥmad ibn al-Rashīd Ibn al-Zubayr, *Book of Gifts and Rarities*, ed. and trans. Ghāda al Ḥijjāwī al-Qaddūmī (Cambridge, MA: Harvard University Press, 1996): 13.
[93] Ibid, 25.
[94] "...the authors mention that their book was specifically commissioned to document the poetry and correspondence connected with rarities and gifts...The focus is on the related literature rather than on the gifts themselves (Ibid, 24)."
[95] Ibid, 25.

of the term *ṣanʿa* from the 11th century *al-Hadāyā wa-l-Tuḥaf*; while necessarily a representation of 11th century thinking, it is likely that the text also represents ideas and valuations of an earlier period, as well.

The word *ṣanʿa* appears three times in the *al-Hadāyā al-l-Tuḥaf*. It is found specifically in the second half of the eighth chapter, "Expenditures and [Items] Which Were Brought out of the Palace Treasuries of al-Imam al-Mustanṣir bi-Allāh During the Days of Sedition in the Years 460 and 461 (*al-nafaqāt wa mā ukhrija min khazā'in qaṣr al-imām al-mustanṣir bi-allāh fi ayyām al-fitnah fī sanat 460 wa 461*).[96] The second half of the chapter details the contents of Fatimid treasuries. The three passages in which *ṣanʿa* appears are as follows:

> "389: In the silverware treasuries was found an innumerable quantity of articles (*ālāt*), a million dirhams [in weight] or more, all fashioned (*maṣughah*) from silver inlaid with (*mujrā*) gold. They were of all types, either commonly or rarely used. The [weight (*zinah*) of] silver in each was five thousand dirhams more or less, with unusual designs (*naqsh*) and craftsmanship (*ṣanʿah*)..."[97]

> "392: There were also found gold and silver articles (*ālāt*) in great quantity, including trays of gold inlaid with (*mujrā*) enamel (mīnā) [champlevé] and of other material. The trays were decorated (*manqūshah*) with unusual designs (*nuqūsh*) and craftsmanship (*ṣanʿa*); all were full of splendid precious stones of various kinds, colors, and beauty…"[98]

> "404: A large box (*majmaʿ*) for [keeping] appetizer saucers (*sakārij*) [was found] with its cover (*ghiṭā'*) cut with a lathe (*makhrūṭ*) from a [single] block of rock crystal. It contained appetizer saucers of rock crystal, which could be removed and put back into it. It was four spans by four of beautiful workmanship (*al-ṣanʿa*)..."[99]

In each of these examples, *ṣanʿa* is translated as craftsmanship or workmanship, specifically in the context of beautifully wrought, and presumably thoughtfully designed and executed, objects.

[96] Ibid, 33.
[97] Ibid, 235.
[98] Ibid, 236.
[99] Ibid, 238.

The *Kitāb al-hadāyā wa-l-tuḥaf* shows that, even beyond highly technical works and surveys of the disciplines in which those highly technical works subsist, in the broader discourse of the Jābirian milieu or, better, in hindsight of works of that period, *ṣanʿa* is connected with a particular kind of fine and thoughtful making. To make with *ṣanʿa*–there is no good way in English to state that, but in Arabic one could simply say *ṣanaʿa yaṣnaʿu*–is always to make carefully and with consideration.

Craft and Material Culture Discourse, Broadly

An investigation of the meaning and usage of *ṣanʿa* across craft discourse and material culture texts reveals a few key nuances of the term. *Ṣanʿa* indicates a thoughtful or designed making. What is made (*maṣnūʿ*) is purposefully shaped, worked (*maʿmūl*) or wrought. It is also regularly connected to the wondrous *(ʿajīb/'aʿjā'ib*): many of the crafts discussed above are designed explicitly to produce wonder, or generate wonder and pleasure due to the fineness of their making. Indeed, craft or craftsmanship on the whole seem connected to the aesthetic by the way of the wonder and pleasure generated from well-made, carefully designed artifacts.

Craft discourse, and specifically the texts which deal with what is craftsmanship in particular disciplines (*Risāla*, *Mafātiḥ*), offer their own theorizations of artifice. Some entities require the artifice of human hands to come into being; this is made explicit in the *Mafātiḥ*'s discourse on generated bodies which are "non-original". These made or produced entities, as they are discussed in both the *Mafātiḥ* and the *Risāla*, are recognized as originating differently from their mineral (*maʿadanī*, from the *Mafātiḥ*) or natural, psychical, and divine counterparts (*Risāla*). However, in the *Mafātiḥ*, these entities seem to have no practical distinction from their

mineral counterparts (i.e. zinc is still zinc). In the *Risāla*, all levels of making (*ṣanʿa*) exist under the larger heading or concept of divine artifice, offering the most explicit example of the cosmological scalability of artifice as a concept wherein the differentiation between human, natural, and psychical levels of artifice is a means of making a qualitative distinction based on *how* the making occurs and from where its material comes.

Ṣanʿa *in Literary Discourse*

Literary discourse is another rich site of exploration for the meanings of *ṣanʿa* and theorizations of artifice and artificiality. Of course, "literary discourse" is a huge category; here, I have imposed the limits of texts within a very broadly defined frame of literature and/or *adab* which discuss or invoke *ṣanʿa*. I therefore discuss poetic and literary-critical discourse and what I will here term "literary-religious" texts, by which I mean texts with tremendous or even primary religious value that are also recognized as exemplars of Arabic eloquence.

Poetry and Literary Criticism

Before delving into the intricacies of the use of *ṣanʿa* in a poetic and literary-critical context, a few words justifying the inclusion of this genre of the term are in order. I advocate for a consideration of *ṣanʿa* in this context alongside philosophical, alchemical, craft-work, and theological meanings because poetry--its production, crafting, and meaning--intersect with each of the aforementioned-listed discourses. While the 21st century approach may intuitively locate

poetry within a separate discipline, for example as an aspect of literature, that sentiment should not be transferred onto the "Jābirian milieu".

Poetry is located among the propaedeutical arts (*al-ʿulūm al-riyāḍiyya*) of the Ikhwān al-Ṣafa', which they define in their 7th Epistle ("On The Scientific Arts" or *fī al-ṣanā'iʿ al-ʿilmiyya*) as "sciences that have been established, for the most part, for the pursuit of livelihoods and the improvement of life in this world', and which they also sometimes term the 'science of education' (*ʿilm al-adab*).[100] The list given of propaedeutical arts names the following disciplines, subdivided into nine categories: writing and reading; language and grammar; calculation and operations; poetry and prosody; auguries, auspices; magic, talismans, alchemy, mechanical devices; professions and crafts; sale and purchase, trades, cultivation, and breeding; and the study of campaigns and history.[101] In other words, poetry is therefore categorized alongside crafts and technologies including alchemy. Poetry is described by Muḥammad b. Sallām al-Jumaḥi (d. 845) as "a craft (*ṣināʿa*) and a skill (*thaqāfah*) known to scholars (*ahl al-ʿilm*) as is the case of other types of knowledge and craft"[102]. It is associated with magic and auguries through pre-Islamic *kāhin*s;[103] questions of poetry and its ability to create images are taken up by members of the Islamicate philosophical canon (e.g. al-Farābī, ibn Sīna). Poetry is bound, too, to questions of truth and religiosity: take the 26th Qur'ānic sura, which distinguishes poets and prophets following accusations calling Muḥammad a poet and false prophet, and commentaries upon this.[104] In other words, poetry is not unrelated to the nexus of disciplines that

[100] Godefroid de Callataÿ, "Introduction to Epistle 7," in *Epistles of the Brethren of Purity: On Composition and the Arts*, ed. Ikhwān al-Ṣafā', Nader El-Bizri, Godefroid de Callataÿ, Institute of Ismaili Studies, and Ikhwān al-Ṣafā'. 6-8 (Oxford: Oxford University Press, in association with the Institute of Ismaili Studies, 2018): 78.
[101] Ibid, 78-79.
[102] Jūrj Qanāzi', *Studies in the Kitāb Aṣ-Ṣinā'atayn of Abū Hilāl Al-'Askari* (Leiden; New York: E.J. Brill, 1989): 25.
[103] Michael Sells, *Approaching the Qur'án: The Early Revelations* (Ashland, Or.: White Cloud Press, 2007), 7.
[104] Some context, in brief: "When a listener challenged Muhammad to prove he was a prophet by performing a miracle, the Qur'anic answer was that the Qur'an itself was a miracle. If anyone could produce anything like it, then the Qur'an was a human creation and Muhammad a false prophet. If, however, no one else could produce anything like it, then the Qur'an was clearly beyond the capacity of a human being, and Muhammad was not its author but

immediately abutt alchemy; it is one of them. Thus the way in which terms such as *ṣanʿa* and its related passive participle *maṣnūʿ* are finessed in the poetic context can be a helpful valence through which to consider *ṣanʿa* and concepts of artificiality and artifice both more broadly and from the alchemical perspective.

The focus here, then, is on the distinctions drawn between so-called "artificial" (*maṣnūʿ*) and "natural" (*maṭbūʿ*) poetry, and on the myriad and developing meanings of the term *ṣanʿa* in relation to these distinctions. The context of these terms is the early literary-critical discourse of the "Old School of literary criticism"[105] in the 9th and especially 10th centuries, which defended the old style of the ancient poets (*mutaqaddimūn*) over the new and emerging *badīʿ* style of poetry and the modern (*muḥdath*) poets who produced it. These debates harnessed the binaries most typically translated as naturalness and artificiality, as well as truthfulness and falsehood, as means of critiquing, defending, and discussing a stylistic development in the poetic and literary-critical landscape.

These diptychs were used to evaluate poetic excellence, with the poetic style of the ancients (*mutaqaddimūn*) correlated with truthfulness and naturalness, and the "modern" style (*muḥdathūn*) with artificiality and falsehood. According to scholar of Arabic poetics Lara Harb, prior to the early 10th century, chronology had been the major distinguishing factor between ancient and modern poets. In the 10th century, the rise of the use of *badīʿ* (literally 'innovated', but denotes a variety of literary figures, such as paronomasia, metaphor, simile, and more) in poetry led to literary-critical debates focused more on style than chronology. As pre-Islamic poets and poetry typically were taken to represent the most pure and authentic Arabic language

simply its messenger. Although poets and others have taken up the Qur'anic challenge, including the famous and beloved poet nicknamed al-Mutannabi (the 'Would-Be Prophet'), within Islam the Qur'an has generally been recognized as inimitable (Ibid, 2)."

[105] Lara Harb, "*Poetic Marvels: Wonder and Aesthetic Experience in Medieval Arabic Literary Theory*," (PhD diss., New York University, 2013), 143.

and style, some critics held that poetry in the "old style", which lacked an "increased and conscious employment of literary figures"[106], was the best of the day's poetry. Others, of course, preferred the embellished and intellected "new style". This debate is exemplified by critiques and defenses of the poet Abu Tammān (d. 846), representative of the new style, in comparison and contrast with the poet al-Buḥturī (d. 897), who stood for the old style.

Of course, my summary presents a very cut-and-dry picture of the literary-critical landscape, and one polarized over a harsh dichotomy at that; the reality of these critics was more nuanced and their approach to questions of naturalness and artificiality belies a more complex means of evaluating these terms as poetic qualities. A number of scholars have taken up the questions of the meaning of these terms in the poetic context; as such, here I provide a literature review centered around what scholars have identified as the deeper and more exact meanings that terms like *ṣanʿa*, *maṣnūʿ*, *ṭabʿ* (nature, naturalness, aptitude), and *maṭbūʿ* (natural) designate in the poetic and literary-critical context. I then consider what their meanings and uses indicate about notions of artificiality and artifice in the 8th-10th centuries more broadly.

Harb gives a summary of the so-called artificial/natural divide: "In sum, the new style was characterized as "artificial" for the attention it gave to and its delving into strange, obscure, and farfetched meanings that are difficult to understand. The old style, on the other hand, was "natural", straightforward, simple, uncomplicated, familiar and effortlessly graspable."[107] The academic, translator, and scholar of Arabic Mansour Ajami explores this division in greater depth in his 1984 monograph, *The Neckveins of Winter: The Controversy over Natural and Artificial Poetry in Medieval Islamic Literary Criticism*. *Ṣanʿa*, Ajami writes, "...can mean 'over-crafting', 'fine craftsmanship', 'artistry', 'artificiality', 'employment of the figures of

[106] Ibid, 138.
[107] Ibid, 147.

speech', 'creativity', or even 'poetry' itself."[108] The data Ajami presents suggests that a shift took place, in and around the time of the writings of literary critic al-Āmidī (d. 980 CE), regarding what exactly is being contrasted in the natural/artificial diptych.

Prior to al-Āmidī, the major term of the natural/artificial debate was not *ṣanʿa* but instead *takalluf*, affectation. This is being contrasted with a sense of *tabʿ*, or natural aptitude. Thus, the critic al-Asmaʿi (d. 831) describes two styles of poetry, 'natural' and 'revised', the latter of which bears "the trace of over-crafting (*ṣanʿa*) and affectation."[109] Similarly, the critic Ibn Sallam al-Jumahi (d. 846) likens naturalness in poetry to ordinary speech, with *takalluf* being its opposite. The literary polypath and author al-Jāhiẓ (d. 868), too, placed naturalness (*ṭabʿ*), and especially the free-flowing, intuitive poetry of Bedouins, in contrast with *takalluf*. *Takalluf* for al-Jahiz is associated with "over-crafting" (*ṣanʿa*) and straining: "…the practitioners of overcrafting (*ṣanʿa*) and of those who seek to force speech and strain words…"[110]. Naturalness or natural poetry is what is not subjugated to the process of revision and scrutiny; bound to this is a sense of natural aptitude or inherent talent: "If you are afflicted with affectation and the practice of over-crafting (ṣanʿa) and your talent (*ṭibʿ*) does not respond immediately to the task [of composition] and it is difficult even after you ponder it, do not force it or become disquieted."[111] For Ibn Qutaybah (c. 828-889), author of the *Kitab al-shiʿr wa-l-shuʿara* (*Poetry and Poets*), the affected poet is "one who straightens his poetry, refines it with long scrutiny and constantly revises it…,"[112] while the natural poet is "one who [produces] facile poetry and is a master of rhymes…He is one whose poetry evinces the splendor of innate nature (*rawnaq al-ṭabʿ*) and the

[108] Mansour Ajami, *The Neckveins of Winter: The Controversy over Natural and Artificial Poetry in Medieval Arabic Literary Criticism* (Leiden: E.J. Brill, 1984), x.
[109] Ibid, 2.
[110] Ibid, 5.
[111] Ibid, 8.
[112] Ibid, 9.

richness of natural gift."[113] Ibn al-Muʿtazz (d 908) then develops the issue of rhetorical figures in poetry with his *Kitab al-Badiʿ*, wherein he notes the transition from the rareness of figuration to its ready use in Abu Tamman's poetry. However, only the fifth figure, dialectical mannerisms (*al-madhhab al-kalāmī*) was "attributed to affectation" by Ibn al-Muʿtazz.[114]

With and following al-Āmidī, however, *ṣanʿa* begins to be used in a systematic way. As Ajami writes, "Until al-Āmidī wrote *al-Muwazanah*, *tabʿ* (natural aptitude) was still contrasted with *takalluf* (affectation). The term *ṣanʿa* (as artificiality) came to be employed by al-Āmidī and later critics."[115] Al-Āmidī, in comparing the poets Abu Tammam and al-Buhturi, as said, the representatives of artificial and natural poetry, respectively, defined *ṣanʿa* (artificiality) as "the straining of words and meanings", and associated this, as well as far-fetched metaphors and contrived meanings, with Abu Tammam.[116] Furthermore, 'artificial poets' *(al-shuʿara ashāb al-ṣanʿa*) on whole were associated with "those who were disposed to produce intricate and philosophical discourse."[117] Al-Āmidī —a traditionalist in his approach to poetry—preferred and prized spontaneous meanings, easy comprehensibility, and ready cognizance, notably all characteristics of natural poetry. Ajami writes, "al-Āmidī rested his concept of the issue of natural and artificial poetry on the rejection or observance of set patterns and his reliance on or defiance of natural aptitude. He stated that the objectionable qualities that typify Abu Tamman's poetry, such as worthlessness and 'barbarous meanings and phraseology', repulsive metaphors, coerced and convoluted composition and obsession with oddity, all features of artificial poetry."[118] Artificiality in the context of al-Āmidī, therefore, relates to "nebulous meanings that

[113] Ibid, 11.
[114] Ibid, 15.
[115] Ibid, 17.
[116] Ibid, 25.
[117] Ibid, 24.
[118] Ibid, 28-29.

can be explicated only through cognition"[119], innovation (*ibdaʿ*) in themes, affectation (*takalluf*), and exaggerated mannerisms.[120]

Of course, al-Āmidī's is not the only opinion. For literary critic Abd al-ʿAziz al-Jurjānī (1001), in his *al-Wasatah* on al-Mutanabbi, *tabʿ* was "…the cultured natural aptitude which has been refined by literary training (adab), sharpened by oral recitation, polished by acumen, given the inspiration to separate the good from the bad and to conceive of the standards of beauty and repulsiveness."[121] No precise definition of *tabʿ*'s apparent opposite, artificiality (be that *ṣanʿa* or *taṣannuʿ*), is given, but it is noted that "Straining of the language, immoderate employment of the figures of speech and fervent search for convoluted meanings…rendered this kind of poetry ponderous and repugnant."[122] Further, al-Jurjānī does provide three principle components of the natural/artificial debate: 1) al-tabʿ, natural aptitude, which is related to practice (*al-ʿadah*) and natural disposition (*al-tabiʿa*); 2) *al-ṣanʿa*, overcrafting or overwrought craftsmanship, which Ajami notes is "an elastic generic term and an intermediate between two extremes. A mild form of it, delicate craftsmanship or artistry (*ṣanʿa latifah*), is much appreciated by al-Jurjani when it is complemented by *tabʿ*. *Ṣanʿa* for is own sake was undesirable and any heavily exaggerated form of it led to objectionable artificiality (*taṣannuʿ*)"[123]; and 3) *al-taṣannuʿ*, artificiality, the extreme opposite of *tabʿ* and an unacceptable form of overcrafting (*ṣanʿa*), which is related to affectation (*takalluf*) and mannerism (*taʿamul*), as well as innovation/novelty (*ibdaʿ*) and farfetchedness (*ighrab*).[124]

Al-ʿAskari also offers another different interpretation on artificiality, in his *Kitab al-sinaʿtayn*. I will reproduce Ajami's helpful interpretation at length:

[119] Ibid, 31.
[120] Ibid, 29.
[121] Ibid, 33.
[122] Ibid.
[123] Ibid, 38-9.
[124] Ibid, 39.

> "Al-ʿAskari explained that the 'artificial' element, or affectation, according to Jaʿfar's [Jaʿfar b Yahya d 802] definition of eloquence was the arduous pursuit of an end because of one's ignorance of an easier means of attaining it. Accordingly, discourse would be affected if the words were farfetchedness and strained. Al-ʿAskari also explained that bad craftsmanship was manifested in several ways: by incorrect subdivision, wrong interpretation, distasteful metaphor and antithesis, and unsound composition.
> Al-ʿAskari's concept of craftsmanship (ṣanʿa) was oriented towards its technical nature, with affectation referring to deficiencies or faults in the formal structure of the verse. He presented ṣanʿa as the falling short of excellence and proficiency, i.e. it is imperfection in style or prosody."[125]

Furthermore, al-ʿAskari draws a relationship between the idea of complexity (*taʿqid*) and *ṣanʿa*, associating *ṣanʿa* with obfuscation. This is due to the "convoluted interdependence" of words which renders the poetic meaning unclear. Ajami writes, "This, in the opinion of medieval critics in general, was a basic feature of artificiality in any formal discourse, prose or poetry."[126]

In sum, Ajami's analysis posits a change in poetics; subsequently, too, a shift in the meaning of ṣanʿa and therefore potentially in the way in which artificiality was modeled. Literary critics moved from a critiquing an over-crafted or affected poetic style, contrasted with the natural (here meaning free-flowing and easy to comprehend), to a critique of a particular usage of highly-wrought poetic figures which require a specific kind of cognition to make sense of the poetic meaning. This change seems to have occurred first with al-Āmidī or in the course of al-Āmidī's lifetime; *ṣanʿa* in al-Āmidī carries a strong relationship to wroughtness, complexity, and even philosophical thinking.

Scholar of classical Arabic literature Geert Jan van Gelder offered a quite critical review to *The Neckveins of Winter*, however, in 1986. Two points stand out: first, van Gelder feels that even Ajami's narrative is too polarizing: "Of course, for many critics the simple dichotomy

[125] Ibid, 40.
[126] Ibid, 41.

'natural' vs 'artificial' was too crude. In fact, the division, by Ajami, into a 'polarizing' period and a synthesis prevailing afterwards is itself an example of polarizing, perhaps introduced as a narrative device."[127] Second, he derides the lack of reference to Hellenic and Roman sources on notions of *techne*/*phusis* or *ars*/*natura*, suggesting that *ṣanʿa* and *tabʿ* hold the same or a similar relationship as the aforementioned pairs by 800 CE.

While *ṣanʿa* is used as a literal translation of *technē* at times, the need to harken all aspects of Arabic philosophy and literary theory to Greek sources remains troubling; the apparent need to cite Greek originality goes above and beyond the precepts of responsible intellectual history. George Qanazi, in his monograph *Studies in the Kitab al-Sinaʿtayn of Abu Hilal al-ʿAskari* addresses the issue of technē in relation to *ṣanʿa*. He first offers a brief history of the term in relation to literature, noting the consistent presence of the word. He writes, "The term *ṣanʿa* is applied to both spiritual and physical creations, to literature as well as to manual crafts…it is therefore no wonder that *ṣanʿa* or *ṣināʿa* were used extensively in literature, meaning a skillful creation."[128] Anticipating van Gelder's critique of Ajami, Qanazi notes that *ṣanʿa* is used as a literal translation of the Greek *'technē'* in Arabic translations of Aristotle's *Rhetorics* and *Poetics* (such as Matta b. Yunis' *Poetics* translation); thus Qanazi questions whether the use of the term in literature was related to the Aristotelian translations. However, Qanazi argues, importantly, for the indigeneity of *ṣanʿa* as an Arab/Arabic literary term, based on its usage in the Qur'an and early poetic criticism.[129] Additionally, "the pre-Islamic concepts of

[127] Geert Jan van Gelder, "The Neckveins of Winter: The Controversy over Natural and Artificial Poetry in Medieval Arabic Literary Criticism Mansour Ajami," review of *The Neckveins of Winter: The Controversy over Natural and Artificial Poetry in Medieval Arabic Literary Criticism* by Mansour Ajami, *Die Welt des Islams* Vol 26, 1986: 173.
[128] Qanāzi', 27.
[129] Ibid, 26-7.

poets as 'weavers of poetry' and poetry as a woven garment is a good indication of the early concept of literary creation as craft."[130]

As for the topic of Qanazi's study, Abu Hilal al-ʿAskari's *Kitab al-Sinaʿtayn* (*Two Arts)*, just as Ajami also notes, for Abu Hilal, *ṣanʿa* in this work is "…falling short of reaching the utmost perfection, and the inability to reach the utmost limits of successful creation…is similar to the saying used by common people: this thing still needs work' which means that it is not yet exact."[131] Therefore, Qanazi explains, "…the term *ṣanʿa* in practical criticism implies a defect in literary creation which can be corrected by means of more careful application of the principles of the art of writing."[132] Qanazi is keen to point out that while *ṣanʿa* points to defects in poetry, he believes it to be in the sense of "…meaning that there is room for further application of the principles of the art of writing."[133] In one *Kitab al-Sinaʿtayn* manuscript (Fatiḥ), however, "*ṣanʿa* has a different meaning, and that is when it is taken as an opposite of the natural talent (*tabʿ*): [therefore] artificially wrought poetry (*masnuʿ*) is different from that which [is the product of] the natural talent."[134]

Two passages outside the *Kitab al-Sinaʿtayn* shed light on exactly what this alternate definition has to offer for both Abu Hilal's understanding of *ṣanʿa* and its broader comprehension. First, Abu Hilal's theory is expounded upon in another one of his works, the *Furūq al-lughawiyya* (*Linguistic differences*) (pg 110):

> "*Ṣanʿa* is the ability to create anything in accordance with a pre-conceived plan, using certain skills already acquired. This conclusion can be drawn from the distinction he makes between *ʿamal* and *sunʿ*. *Sunʿ*, he says 'is the organization of a certain work, and its arrangement according to previous knowledge, and according to what will bring about

[130] Ibid, 27.
[131] Ibid, 28.
[132] Ibid.
[133] Ibid, 30.
[134] Ibid.

> the desired results. This is why a carpenter is called *sāniʿ*, but not the merchant, because the carpenter has pre-knowledge of what he is going to make, a bed or a door, and of the means which he needs to apply to make it; while the merchant can never know, while trading, whether he will make the desired profits or not.'…In all these cases, *sunʿ* implies excellence."[135]

Second, in *al-ʿUmda fi ṣināʿat al-shiʿr wa naḳdih* (*The Art of Poetry and its Criticism*) of Ibn Rashīq (b. 1000 CE), the difference between *matbuʿ* and *masnuʿ* poetry is discussed at further length:

> "Ibn Rashiq explains that the *matbuʿ* poetry is the original (*aṣl*) and should be considered as a model and as the most important achievement in the art; and the masnuʿ, even though it is given such a name, is not affected like the poetry of the non-Arabs, but rather it is so called because of the ṣanʿa which occurs in it unintentionally…the old Arabs did not care for figures like homonyms, antithesis and parallelism, which would necessitate the replacement of one word or concept by another. The ancients were primarily concerned with eloquence and chasteness of expression, clear exposition of the concept, perfect poetic structure, coherent rhyme-words that are in keeping with the rest of the line, and congruous parts of the kalam."[136]

Ibn Rashīq is slightly late for our purposes; however, I find his theorization particularly worthy of note first due to its explicitness regarding the meanings of *matbūʿ* and *maṣnūʿ*, but also on the basis of this description given in the EI2 (Ibn Rashiq):

> "But his [Ibn Rashiq's] poetry is characterized above all by its conscious artistic elegance, in which the poet's exertions, although evident, nevertheless achieve real beauty…He is above all the poet most skilled in felicitously applying the theories and rules of Arabic poetry, so expertly expounded in his major work…This derives from an essential principle which seems to be that of poetry as an "art", as the Arabs have always conceived it—either achieved by effort, *maṣnūʿ*, or spontaneous, *maṭbūʿ*, rather than an "inspiration": poetry, whose importance to the Arabs is primordial and in which the

[135] Ibid, 31.
[136] Ibid, 30.

> "Moderns" are just as successful as the "Ancients", is superior to prose through its meaning and form."[137]

What I want to draw attention to, then, with regards to *ṣanʿa* in a literary-critical or poetic context, is the following. First, medieval Arabic poetic discourse is not particularly separate from medieval Arabic craft discourse; in fact, the poetic and literary-critical materials elaborate upon particular notions also found within craft discourse, such as the pre-conception necessary for *ṣanʿa*. Second, and relatedly, the act of this preconceived, planned type of making is what designates something as 'artificial'—this is to say, 'artifice' and 'artificiality' in poetic discourse are tightly bound. Third, from this poetic context, a number of additional resonances can be drawn together for *ṣanʿa*: the relationship of ṣanʿa to a philosophical or deeply intellected meaning, the relationship of ṣanʿa to modification by way of affectation and figures, and the continued sense of excellence related to ṣanʿa when used appropriately. Finally, the binary of 'natural' and 'artificial' appears to be more fully understood as one of 'free flowing and immediately comprehensible' poetry versus poetry which requires planning, execution, and consideration to be both produced and understood.

Reading for *ṣanʿa* within texts on craft, craftsmanship, and material culture suggested a relationship between *ṣanʿa* and wonder (*ʿajab*); does the consideration of *ṣanʿa* in a poetic context suggest a similar resonance? In the 8th-10th century, not explicitly. However, as Harb's work demonstrates, wonder is a driving feature of aesthetics in New School literary criticism and particularly in the work of ʿAbd al-Qahir al-Jurjānī (d.1078).[138] In the late 10th and 11th centuries, a theory of wonder that "prioritizes aesthetic experience over the uncompromising characteristics of naturalness and truthfulness…provides a new way of describing and evaluating

[137] Ch. Bouyahia, "Ibn Rashīk," in P. Bearman (ed.), *Encyclopaedia of Islam New Edition Online (EI-2 English)*, (Brill, 2012).
[138] See not only Harb's dissertation (previously cited) but also her monograph *Arabic Poetics: Aesthetic Experience in Classical Arabic Literature* (Cambridge University Press, 2020).

poetry" emerged both in the Aristotelian tradition of poetics and also in literary theory, beginning with al-Jurjānī. [139] Harb writes, "I argue that instead of transforming a negative attitude towards artificiality and falsehood to a positive one, the 'new school of criticism' goes beyond these dualities altogether and articulates a new aesthetic defined by a poetic statement's ability to move the listener and evoke wonder."[140]

Literary figures and literary characteristics that generate strangeness or novelty–the attributes that define so-called *maṣnūʿ* poetry–and their subsequent contemplation produce wonder and pleasure. Take, for example, a literary figure known itself as "*taʿajjub*", used by the poet al-Buḥturī (d. 898):

You appeared to them at dawn so that they saw (طلعتَ لهم وقتَ الشروقِ فعاينوا
The rays of the sun from one horizon and your face from another (سنا الشمسِ من أُفقٍ ووجَهك
افقِ)
Never before had they seen two suns (وما عاينوا شمسينِ قبلَهُما، التقى
Whose light met in concord from west and east (ضياؤهما وَفقاً من الغرب والشرق)

Here, al-Buḥturī takes the metaphor of the beloved as the sun literally. Commenting on this, al-Jurjānī says, "It is known the the intention is to bring the listeners to a state of wonder for seeing that which they have never seen before and which is out of the ordinary."[141] But the listener is required to participate in a trick: "forcing the mind, willingly or not, to imagine a second sun that has risen from where the sun [normally] sets."[142] Thus, Harb explains, "It is not merely the fact that is fantasy that makes it wonder-evoking…Rather, it is the fact that the listener is, willingly or not, forced to 'buy into' an illusion and see something never seen before based on accepting this false premise."[143]

[139] Harb, 152-53.
[140] Ibid, 153.
[141] Ibid, 172.
[142] Ibid.
[143] Ibid.

A similar example is given from Ibn Ṭabāṭabā (d. 934), who writes, "Do not be surprised at the wearing out of his garment/For its buttons are buttoned on the moon (لا تعجبوا من بِلَى غِلاته/قد زرَّ أزرارَه القمرِ)."[144] Harb notes that it was believed that the moon wore out clothes, thus the moon's ability to spoil fabric is applied to a person who is described as the moon, a common metaphor for beauty.

For al-Jurjānī, a poet's artfulness lies in their use of images and illusions to delight and surprise the listener. He writes,

> "Just as [an excellent painting or sculpture] amazes and enchants, pleases and delights, and brings into the soul a strange state upon seeing it that did not exist before, that is characterized by a kind of seductive appeal that cannot be denied or concealed [...] so does poetry with the images it creates, the artifices it shapes, and the meanings it conjures up in the soul which give the illusion that a speechless inanimate object is alive and able to speak [...etc.]"[145]

al-Jurjānī then compares the ability of the poet to that of an alchemy that employs imagination and intellect instead of heavenly and earthly bodies.[146]

While al-Jurjānī did not articulate his aesthetic vision unified by wonder until the 11th century, he theorizes on the basis of poetry written in the 9th and 10th centuries. A link between careful, fine wroughting–this particular quality of *ṣanʿa* as human artifice–and wonder is seeded in 8th-10th century literary-critical discourse and its debates about naturalness and artificiality, and bears fruit in the century after, as the importance of *ṣanʿa* in poetry evolved from intricate and intellected verses (often to their aesthetic detriment) towards a broader linguistic and figural crafting (as when Jurjani calls poetry itself *ṣanʿa*).

[144] Ibid.
[145] Ibid, 178.
[146] Ibid, 179.

"Literary-Religious" Texts

The last category in which I would like to consider ambient meanings of *ṣanʿa* is literary-religious texts. Often, theological and *kalām* works touch upon the question of artificiality from the perspective of distinguishing between what is human and what is divine. Debates around modalities–particularly those centering on the limits of what is possible for the divine and the discernment of genuine prophecy–address how divine creation is subject to different rules than human creation, even if not explicitly in those terms.[147] Additionally, other *kalām* texts will establish differences between events or actions which are magic and those which are miracles, which is another mode of boundary-marking between divine and human action.[148] However, *ṣanʿa* is not invoked in these contexts.

In developing a sense of artifice and artificiality that emerges from *ṣanʿa*–itself a methodology that could be described as more literary-historical than philosophical or purely historical–texts that I would describe as "literary-religious" instead of systematically theological or *kalām* become sources of insight. These works, which have tremendous religious value but are also regarded as literary masterpieces and definitional of the highest standard of Arabic eloquence, round out a sense of what nexus of meanings the use of *ṣanʿa* invoked at a religious register (and at a literary register quite different from the literary-critical one). Here I discuss the use of the root ṣ-n-ʿ in the Qur'ān and in *Nahj al-balāgha*.

Variants of the root *ṣ-n-ʿ* appear in numerous places and forms in the Qur'ān. Comprehensively, these are the ṣūrāt and ayāt in which the root appears: 5:14, 5:63, 7:137, 11:16,

[147] See, for example, Maimonides' *Guide for the Perplexed* (1.73, premise 10) and his critique of 'admissibility', or the idea that anything that is imaginable is possible for God. This notion is picked up further by al-Ghazali (*Tahāfut* 17) and refuted by Ibn Rushd in *Tahāfut al-tahāfut* and *K. al-kashf ʿan manāhij al-ʿadilla fī ʿaqā'id al-milla.*
[148] E.g. works of al-Baqillānī and al-Ghazālī.

11:37-38, 13:31, 16:112, 18:104, 20:39, 20:41, 20:69, 21:80, 23:27, 24:30, 26:129, 27:88, 29:45, 35:8. The following table provides a brief sampling:

Table 3: *ṣ-n-ʿ* in the Qur'ān

27:88: And you see the mountains that you suppose are solid pass away like clouds–the Work of God, Who perfects all things. Truly He is Aware of whatsoever you do.	وَتَرَى ٱلْجِبَالَ تَحْسَبُهَا جَامِدَةً وَّهِيَ تَمُرُّ مَرَّ السَّحَابِ صُنْعَ اللَّهِ الَّذِي أَتْقَنَ كُلَّ شَيْءٍ إِنَّهُ خَبِيرٌ بِمَا تَفْعَلُونَ
21:79-80: We made Solomon to understand it, and unto both We gave judgment and knowledge. We compelled the mountains and the birds to glorify along with David; We did this. And We taught him how to make garments for you to protect you against your own might, but are you thankful?	فَفَهَّمْنَـٰهَا سُلَيْمَـٰنَ ۚ وَكُلًّا ءَاتَيْنَا حُكْمًا وَعِلْمًا ۚ وَسَخَّرْنَا مَعَ دَاوُۥدَ ٱلْجِبَالَ يُسَبِّحْنَ وَٱلطَّيْرَ ۚ وَكُنَّا فَـٰعِلِينَ ٧٩ ۝ وَعَلَّمْنَـٰهُ صَنْعَةَ لَبُوسٍ لَّكُمْ لِتُحْصِنَكُمْ مِنۢ بَأْسِكُمْ ۖ فَهَلْ أَنتُمْ شَـٰكِرُونَ
11:37-38: And construct the ship under Our Eyes and with Our Revelation, and call not upon Me on behalf of those who did wrong; they are surely to be drowned. And as he was constructing the ship, whenever the chiefs of his people passed by him, they mocked at him. He said: "If you mock at us, so do we mock at you likewise for your mocking.	وَاصنَعِ الفُلكَ بِأَعيُنِنا وَوَحيِنا وَلا تُخاطِبني فِي الَّذينَ ظَلَموا ۚ إِنَّهُم مُغرَقونَ. وَيَصنَعُ الفُلكَ وَكُلَّما مَرَّ عَلَيهِ مَلَأٌ مِن قَومِهِ سَخِروا مِنهُ ۚ قالَ إِن تَسخَروا مِنّا فَإِنّا نَسخَرُ مِنكُم كَما تَسخَرونَ

Much of the sense of ṣanʿa found here is fairly commonplace compared with what we have already read: ṣ-n-ʿ is for construction by hand, be that of protective garments (21:79-80) or Noah's ark (11:37-38; 23:27). Verse 27:88, however, is perhaps the most interesting for our purposes: *ṣunʿ Allāh*, the Work of God, is identified as features of the natural landscape (clouds, mountains), and furthermore, God's work is described in the same breath as God's action in perfecting all things. I would also add that, in 21:79-80; as God teaches the making (*ṣanʿa*) of armor, a sense of analogy between apprentice and master craftsman is evoked.

The majesty and perfection of Allah's creation, *ṣunʿ*, as emphasized in 27:88, is echoed in the *Nahj al-balāgha* (*Way of Eloquence*). This text is the collated sermons of ʿAli ibn Abi Talib (d. 661) by al-Sharif al-Radi of Baghdad (d. 1016). The following examples specifically use the idea of *ṣanʿa* as part of a broader discussion of divine creation (translations mine):

Table 4: *ṣanʿa* in the *Nahj al-balāgha*

He issued them as a wondrous creation from among the living and the dead, and the still and those with movement, and erected the examples of the proofs according to the subtleties of his making and the greatness of his power…	ابتدعهم خلقا عجيبا من حيوان وموات وساكن وذي حركات وإقامة من شواهد البينات على لطيف صنعته وعظيم قدرته[149]
He made them [from nothing] after when they did not exist in the wonders of manifest forms, and composed them in containers with concealed joints, and forbid some of them in by the thickening of his creation from being elevated in the air lightly, and he made it [so that it was] flapping greatly, and arranged them, including all the varieties of color by the subtleties of his power and the delicacy/subtlety of his making…	كوّنها بعد إذا لم تكن في عجائب صور ظاهرة وركّبها في حقاق مفاصلة محتجبة ومعنى بعضها بعبالة خلقه أن يسمو في الهواء جفوفا وجعله يدفّ دفيفا ونسقها على اختلافها في الأصابيغ بلطيف قدرته ودقيق صنعته[150]
And among the subtleties of his making and the wonders of his creation is that which he showed us of the enigmatic wisdom in these bats…	ومن لطائف صنعته وعجائب خلقته ما أرانا من غوامض الحكمة في هذه الخفافيش[151]

In each of these examples, *ṣanʿa*, and specifically the *ṣanʿa* of the divine, is invoked with regards to its subtlety (*laṭīf*, *laṭā'if*) or fineness (*daqīq*). God makes, and the making demonstrates power, majesty, and wisdom. The example of the bats is particularly demonstrative; the passage continues:

[149] al-Sharīf al-Raḍī, *Nahj al-balāghah*, ed. Qays Bahjat al-ʿAṭṭār (Mu'assasat al-Rāfid li-l-Maṭbuʿāt, 2010): 312.
[150] Ibid.
[151] Ibid, 288.

> "...[bats], who extending light restrains from every thing, while grasping darkness extends them into every quarter, and how their eyes are blind from receiving from the shining sun a light which guides [them] to their going-places, and they arrive to their education in the [??] of the evidence of the sun. They are hindered/restrained by the radiance of its glow from the path of the majesty of its splendor, and they keep hidden in their hiding places from going in the shining of its gleaming, so they hang down their wings by day to encompass them, and the coming of night is as a lamp guiding in their search for sustenance, so the twilight of darkness does not refute their vision, nor are they prevented in their pursuit by the dusk of gloom."[152]

Thus it is the strange and enigmatic nature of bats that showcase divine making power in all its careful, precise wroughting; *ṣanʿat Allāh* gives bats wings to keep them from the sun and which does not make darkness as a veil to their sight, complementing their abhorrence of the sun. Matthew Saba also draws attention to ʿAli's sermon on birds, noting, as above, that birds are given in general as an example of the wonders of God's creation: "They are…a visible testament to God's fine craftsmanship (*ṣanʿa*). Again, the metaphor of craft is employed and God is the arch-artisan."[153]

These passages also draw clear links between the notion of the wondrous (*ʿajīb*) and *ṣanʿa*: the manifest forms of creatures are wonders (*fī ʿajā'ibi ṣūrin ẓāhiratin*) which God has arranged according to the delicacy of his making, and the wondrous creation (*khalqan ʿajīban*) which God issues are according to the subtleties of his making. Furthermore, *ṣanʿa* and the type of making the term implies are made distinct from other varieties of creation: *ṣanʿa* here is not the same as what God brings immediately into existence or issues (*kawwana; ibtada*). Thus aside from locating the concept of *ṣanʿa* amongst divine creative providence, these snippets of the *Nahj al-balāgha* also offer some hints as to what is uniquely divine about divine creation: God's crafting is not dissimilar to human crafting in the care it requires, the excellence it produces, and

[152] Ibid.
[153] Saba, 199.

even the wonder it may inspire, but its timescale is instantaneous. This harkens back to the Ikhwān al-Ṣafa', who wrote:

> "While the divine makings are forms abstracted from matter, as the inventions of the Sublime Creator of sublime creations, as brought into existence from nothingness, in being from non-being, as a thing is from no-thing, in one go without time, place, or a material of a given constitution, nor a form, nor motion, since they are all the sublime creations of the Maker..."[154]

But this, again, is somewhat separate from *ṣanʿa*, a component of generative and creative acts that occurs across a cosmic scale with similar valuation (fineness, wroughtedness, planning, delicacy) attached. A notable difference, however, between the craft discourse of the Ikhwān al-Ṣafa' and these literary-religious texts is that the literary-religious texts seem to elide 'nature' or the 'natural' as a category; what we might describe as the creations or operations of nature and the natural world are subsumed into the divine. This is perhaps another reason why a theory of artifice and artificiality based not on the triangulation of the natural, the artificial, and the divine is useful: relying on *ṣanʿa* as a central term, we are able to speak of a broader sense of artifice for 8th-10th century Muslims that nevertheless accommodates theoretical differences amongst groups.

The ambient sense of *ṣanʿa* in literary-religious texts, then, resonates with the sense elucidated within craft discourse: the masterful makings of an artisan are lauded and wondrous for the same qualities, like well-wrought redness and subtlety, even across a cosmic scale, and even as differences in how the making is conducted (i.e. timescale) exist between divine and human actors.

[154] Ikhwān al-Ṣafā', 141.

Conclusion

Reading material cultural and literary texts in conversation around the theme of *ṣanʿa* allows us to synthesize a broader sense of how artifice was theorized in Islamic discourse of the Jabirian milieu around aesthetics. To summarize, across genres, the presence and uses of *ṣanʿa* creates an ambiance of the following ideas: preconception, purposefulness, planning, time, intellection, complexity, well-wroughtedness, fineness, delicacy, modification, excellence, subtleties, pleasure, and wonder.

In fact, the ideas that begin the previous list lead directly to those at its end: there is a consistent relationship between *ṣanʿa* specifically and terms for wonder and wonders, because carefully wrought work, well-laid plans, and intricate design produce a sense of wonderment. Through their invocation of *ṣanʿa*, these collective discourses participate in what Matt Saba has termed an aesthetics of wonder (*ʿajab*).

Furthermore, this production of wonder is scalable cosmologically: artifice is a type of making that takes place on human, natural, and divine scales with the same qualities and considerations, even as the actor differs. I argue that *ṣanʿa* itself structures a theorization of artifice in these Jabirian-milieu Islamic discourses: artifice across these disciplines is modeled as a cosmologically-scalable, devotionally-imitative process that harkens back to the wonders of divine creation. This is different from a sense of artifice wherein human making is posited as something in opposition to ontological categories of either divinity or naturalness.

Chapter Two

Art/ifice, Craft, and Wonder in Jābirian *Ṣanʿa*

Introduction

The previous chapter considered how the concept of artifice, tracked through the word *ṣanʿa*, is discussed across Arabo-Islamic sources of the "Jābirian milieu" (8th-10th centuries). I argued that, while there do exist unique qualities of artifice as it is done by humans, this artifice continually participates in an aesthetic of wonder (*ʿajab*), binding it to other cosmological levels of making that also routinely invoke the same aesthetic. In other words, interpreting *ṣanʿa* across genres reifies artifice as a type of making that scales cosmologically but retains key features as a category of action regardless of the ontology of the actor (i.e. as human, natural, or divine).

In this chapter, I explore how the Jābirian corpus theorizes artifice. I am guided by the following set of questions: what is it to make something *as a human* according to the Jābirian author, with the unique preoccupations, concerns, placement, and subject matter of Jābirian writings? What do humans make, and how do they do it? Furthermore, does the Jābirian corpus see artifice as participating in the same aesthetic of *ʿajab* found in contemporaneous texts across genres?

To accomplish this, I again take up the word *ṣanʿa* and track its meaning and usage in three Jābirian texts. First, I explore what *ṣanʿa* is in the Jābirian corpus, and how it is defined, both on its own and in relationship or contradistinction to other terms. I then consider if and how Jābirian *ṣanʿa* might participate in the same conversation around the aesthetics of *ʿajab* that we find in contemporaneous, cross-genre material.

I find that these Jābirian texts harbor a theorization of *ṣanʿa* that is simultaneously a) unique to its Jābirian context in some of its preoccupations and technical meanings and b) also clearly participatory in the same cross-generic discourse that theorizes *ṣanʿa* as cosmologically-scalable artifice by way of an aesthetic of *ʿajab*, thereby also yoking Jābirian making to a notion of positive, devotional imitation of the divine. This indicates the existence of a broader, cross-generic 8th-10th century theorization about artifice and the relationship between making and wonder that was inclusive of Jābirian writings, or at least that Jābirian writings participated in. It therefore challenges the notion that Jābirian texts should be read solely in reference to other alchemical, occult-scientific, or natural philosophy texts and without reference to contemporaneous craft, literary, aesthetic, and religious discourses. This Jābirian theorization of *ṣanʿa* emerges into our view when Jābirian texts are read together and intertextually; as such, this chapter continues to argue for methods of Jābirian studies that include capacious contemporaneous contextualization and intertextual readings of the Jābirian corpus as a whole.

Texts and Intratextuality

This chapter draws from an array of Jābirian texts across the collected corpus, focusing specifically on previously edited works where *ṣanʿa* is explicitly discussed or conceptualized. These are the *Kitāb al-ḥudūd* (The Book of Definitions, pages 97-115 in Kraus' edited *Mukhtār al-rasā'il*), which defines a collection of both specific terms and the meaning of the knowledge or science of those particular terms (i.e. a definition is given for *ṣanʿa* and for *ʿilm al-ṣanʿa*); the *K. ikhrāj mā fi-l-qūwa ilā al-fiʿl* (The Book of Extruding What is in Potential into Action), particularly its *Qawl al-ṣanʿa* (Discourse on the Work, pg. 61-73 of the *Mukhtār*), which

discusses what a practitioner (*al-ṣāniʿīn*) must know and key components of Jābirian work within the context of the theories foundational to Jābirian ideation; and the *K. al-khawāṣṣ al-kabīr* (The Big Book of Special Properties, selections in pages 224-332 of the *Mukhtār*), which offers addenda to a number of Jābirian theories and additionally discusses the special properties of materia, magic, and pharmacology. I discuss each text in greater detail below.

Before delving into the details of each text, however, I want to speak briefly to my choice of these treatises. These three texts allow me to translate not only the key theoretical concepts they discuss (*ṣanʿa*/artifice, craft, *ʿajab*/wonder), but also some of the major methodological concepts upon which this dissertation relies, in a specific way. Each of these texts discusses foundational aspects of Jābirian discourse, whether through definitions of terms, schematizations of knowledge, theorizations of ideas, or commentary on materia. They are not "deep dives" into niche aspects of Jābirian alchemy, but systematically-minded works that conceptualize Jābirian thinking as a whole. On the level of theory, therefore, not only do these texts explicitly take up *ṣanʿa* as a foundational idea of the corpus from a few differing perspectives, but they also have been structured with literary intent. What I mean by this is, these texts are trying to tell the reader something about what it means to think or practice in a Jābirian way. They make use of rhetoric and structure to do so, and we, in turn, can consider and study those choices.

With regards to methodology, this choice of texts resonates with my prerogative of treating the Jābirian corpus as a corpus in conversation with itself, I discuss in the introduction of this dissertation at greater length. The Jābirian corpus was organized in the European-American academies by a scheme Kraus designed according to his theory of dating. It is divided into six collections of books made up of individual treatises, a single early work (*K. al-raḥma, The Book of Mercy*), and a number of writings on themes, such as philosophy, pharmacology, and theurgy.

Particularly within each of the six collections, the treatises talk to one another and knowledge of almost any topic is dissimulated among them. This dissimulation of knowledge has been discussed at some length. Kraus also mentions the use of this technique by medieval authors such as Maimonides and Roger Bacon. He does take care to point out both the uniqueness and prevalence of dissimulation in the Jābirian corpus, writing: "Jābir is therefore not the only one to use the method of dispersing science. But never elsewhere has it been raised in principle governing the literary structure of a multitude of treaties, never before has it taken on such disturbing proportions."[1] Thus, to read intertextually reflects the texts; to read Jābirian texts without an intertextual awareness is to deny the reading methods put forth by the works themselves.

There are also strong, treatise-specific arguments for reading these texts together: the manuscript of the *k. al-ḥudūd* was found within a *k. ikhrāj* manuscript; the *k. khawāṣṣ al-kabīr* contains specific additions to theories and treatises of the broader corpus. Typically, however, scholars have not made comparisons across Jābirian treatises, preferring to focus instead of very close investigations of individual texts. I believe, however, that these texts reward an intertextual reading by offering together a broadly-theorized perspective on foundational terms that readily enables thematic comparison. We are able to track, for example, consistency in a theorization of artifice when we see how, even across different uses of the term *ṣanʿa*, the idea of cosmological scalability or references to an aesthetic of *ʿajab* persist.

Turning to the texts: the *K. al-ḥudūd* is what its title suggests: it is a book of definitions that outlines disciplinary boundaries and key terms as they relate to Jābirian thought. The text begins with an explication on the nature of definitions and their qualities themselves, before

[1] Paul Kraus, *Jābir ibn Ḥayyān, Contribution à l'histoire des idées scientifiques dans l'Islam* (Cairo, Imprimerie d l'Institut français d'archéologie orientale, 1942-43), vol 1: xxxiii.

delineating a scheme for the organization of differing branches of knowledge. Following the scheme, the treatise provides definitions for these different disciplines, and then gives definitions for specific aspects of or within these disciplines themselves. The treatise ends with definitions and discussion of a few particular terms that the Jābirian author finds particularly problematic, such as *nafs* (soul) and *fiʿl* (action).

A "book of definitions" is not a uniquely Jābirian undertaking. The genre refers generally to "short lexicons of terms used to express foreign concepts."[2] The development of technical language in Arabic can be traced, at its earliest, to works of *fiqḥ* and *ḥadīth*, and then religious subjects, grammar, and philosophy.[3] Greek philosophy and philosophical subjects, with their own particular and technical language, were then translated and incorporated into Arabic and Islamic sciences. As Abdel Haleem notes, "The definition of technical terms was an already established feature of these subjects, as was the writing of separate treatises on philosophical terms."[4] Arabic books of definitions functioned to explain new technical vocabulary[5] and draw maps which enabled the reader to understand the construction of the author's philosophical, cosmological, or metaphysical system[6]. They may include essentialist definitions, prescriptive definitions, or linguistic definitions.[7]

The major study that exists on the Jābirian *k. al-ḥudūd* is Paul Kraus' 1931 article, "Studien zu Jābir ibn Hayyān."[8] Kraus' primary concern is with the *Wissenschaftslehre*

[2] Kiki Kennedy-Day, *Books of Definition in Islamic Philosophy: The Limits of Words* (London; New York: RoutledgeCurzon, 2003), 9.
[3] M.A.S. Abdel Haleem, "Early Islamic Theological and Juristic Terminology: 'Kitāb al-ḥudūd fi 'l-uṣūl,' by Ibn Fūrak," *Bulletin of the School of Oriental and African Studies, University of London* 54, no. 1 (1991): 7.
[4] Ibid.
[5] Kennedy-Day, 11.
[6] Kennedy-Day, 14.
[7] "Essentialist definitions attempt to discover a core meaning that all members of a class share; prescriptive definitions give rules and assign which members qualify in a class; and linguistic definitions merely report on current practice (Kennedy-Day, 14)."
[8] The *k. al-ḥudūd* exists in/as a single manuscript, housed in Cairo, and Kraus received it from Dr. M. Meyerhof of the Forschungs-Institut. The *k. al-ḥudūd* manuscript is contained within a manuscript of the *k. Ikhrāj*, copied in 1587 from a manuscript dated to 1340. Of the text, Kraus writes, "The present book does not simply give definitions of

(epistemology or theorization of knowledge), which the treatise establishes. Indeed, he says "The important thing here is not so much the Book of Definitions and its uniqueness, but rather the use of its information for the scientific teaching of Jabir."[9] Kraus focuses upon Jābir's *Wissenschaftslehre* because he finds evidence within the larger scheme of Jābirian knowledge that indicates a particular religious, philosophical, and historical provenance.[10] Regardless of the continued controversy of Jābirian dating and provenance, the *K. al-ḥudūd* is quite valuable for the insight it provides on a Jābirian theorization of knowledge; Kraus is, in my opinion, correct to highlight the broader schematic nature of the treatise even as he and I are interested in different aspects of what the scheme tells us.

As for the *K. ikhrāj*, it first bears stating that the manuscript copy of the *k. al-ḥudūd* off which Kraus based his study was found or contained within a manuscript of the *K. ikhrāj*. Kraus presented an edited Arabic version of the *K. ikhrāj* in his *Textes Choisis*[11]; Kathleen Malone O'Connor also provides partial translations of the text in her dissertation. While Kraus discusses material from the *K. ikhrāj* extensively in *Jabir et la science grecque*, O'Connor nevertheless provides a more concisely descriptive summary: "[the *Ikhrāj*] provides general knowledge on alchemical materia and procedures, the nature and operation of talismans, and the principles of mixture and balance which enable the elixir…[it] covers in a preliminary way the hierarchy of material preparation which begins with the basic alchemical reagents and leads to the highest expression, *takwīn*…it introduces the concept [of *takwīn*] and allows the progression from basic to complex elements to be established."[12]

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various philosophical concepts, but, which goes far beyond the title of the treatise, definitions of various scientific disciplines as they are presented to the author in their mutual relationship (Kraus, v. 1, 11)."

[9] Kraus, v. 1, 11.

[10] See Paul Kraus, "Studien zu Jābir ibn Hayyān," in *Isis* 15, no. 1 (1931): 7-30 and the relationship Kraus articulates between Jābirian texts and Ismāʿīlism.

[11] See Kraus, v.1, 84 for his discussion of manuscripts of the text.

[12] Kathleen Malone O'Connor, "The alchemical creation of life (takwīn) and other concepts of Genesis in medieval Islam" (PhD diss., University of Pennsylvania, 1994), 56-57.

In his manuscript catalogue, Kraus details the contents of the *K. ikhrāj* as follows:

> "Philosophical exposition on the Aristotelian notions of potency and act. Grammatico-logical research. Nature, the four qualities and the four elements; meteorology based on the theory of the four elementary qualities. The elementary qualities in their relation to the seven planets and the twelve signs of the zodiac. Celestial movements and their relationship to religious events. The climates. The influence of the planets on the sublunar world. The seven Arts to which the Jabirian Corpus is devoted, namely medicine, alchemy, the science of properties, theurgy, the subjection of the stars, the science of Balance, the science of the artificial generation of living beings."[13]

Kraus preserves the order of the *K. ikhrāj*'s progression in his description. Thus crucial theories underlying the Jābirian philosophical and cosmological system are presented for the reader; following this, the author details the seven sciences that sit within the system he previously described. These seven build upon each other, such that they point like an arrow towards *takwīn*, which is not extensively discussed but indeed presented as the highest aim of this Jābirian system.

Both the *K. al-ḥudūd* and the *K. ikhrāj* address aspects foundational to Jābirian discourse: technical definitions in the former, and theories–which is to say, underlying world processes and their interconnectedness– in the latter. While the *K. al-ḥudūd* is often cited as the place wherein scholars see the order of a Jābirian system of knowledge, the same can be said of the *K. ikhrāj*, which presents its own schema leading from the concept of potential into actuality to its most powerful manifestation, *takwīn*.

[13] "Exposé philosophique sur les notions aristoeliciennes de la puissance et de l'acte. Recherches grammatico-logiques. La nature, les quatre qualités et les quatre elements; la meteorologie basee sur la theorie des quatre qualites elementaires. Les qualites elementaires dans leurs rapports aux sept planetes et aux douze signes du zodiaque. Les mouvements celestes et leurs rapports avec les evenements religieux. Les climats. L'influence des planetes sur le monde sublunaire. Les sept Arts auxquels est consacre le Corpus jabirien, a savoir la medecine, l'alchimie, la science des proprietes, la theurgie, l'asservissement des astres, la science de la Balance, la science de la generation artificillence des etres vivants (Kraus, v.1, 85)."

Before detailing some specifics of the *K. al-khawāṣṣ al-kabīr*, the reader should know to what the term "*khawāṣṣ*" refers in medieval Arabic texts more broadly. *Khawāṣṣ* is the plural of *khāṣṣa*, and is often translated as 'special property', 'occult property', or 'sympathetic quality'. Manfred Ullman writes that the idea of *khawāṣṣ* is,

> "...a recurring theme in magic and occult sciences indicating the unaccountable, esoteric forces in animate and inanimate Nature. The conception that everywhere in Nature such forces are active or can be activated, developed during the Hellenistic period. It was believed that all objects were in relation to one another through sympathy and antipathy—as is evident in the mysterious forces of the magnet—and that diseases could be caused and cured, good and ill fortune be brought about as a result of the relations of these tensions."[14]

Of the *K. al-khawāṣṣ al-kabīr*, Fuat Sezgin's *Geschichte des arabischen Schrifttums* offers the following succinct description:

> "*Al-khawāṣṣ al-kabir* is perhaps the most complicated part of the corpus of Jābir in terms of its layout and arrangement. The author himself does not appear to have been satisfied with the arrangement. With Kraus, the lack of a system in this collection has to be explained by the development it has undergone over a longer period of time. Another sign of this development can be seen in the fact that Gabir did not remain true to the plan outlined at the beginning. The first chapter gives an introduction, the 2nd, 5th and 15th, 17th, 25th chapters form a unit and deal with the rejection of the Manichaean dualism. The 12th, 13th, 62nd to 71st deal with the theory of equilibrium relations, the 32nd to 41st deal with the content of the 70 books, chapters 6 to 11 and 14 are the properties of different elixirs dedicated. 'The remaining chapters discuss the wondrous properties of stones, plants, animals, the sympathies and antipathies between animals, magical experiments, medicinal and toxicological prescriptions . . .' (see Kraus, v.1, 149-150)."[15]

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[14] M Ullmann, "Khāṣṣa," in P. Bearman (ed.), *Encyclopaedia of Islam New Edition Online (EI-2 English)*, (Brill, 2012) doi: https://doi-org.proxy.uchicago.edu/10.1163/1573-3912_islam_SIM_4227

[15] Fuat Sezgin, *Geschichte Des Arabischen Schrifttums* (Leiden: E.J. Brill, 1967), v. 4, 264. "al-Hawäss al-kabir ist hinsichtlich seiner Anlage und Anordnung vielleicht der komphzierteste Teil des Corpus von Gäbir. Der Verfasser scheint selbst, mit der Anordnung nicht zufrieden gewesen zu sein^. Mit Kraus muß man die Systemlosigkeit dieser Sammlung mit der Entwick lung erklären, die sie in einem längeren Zeitraum durchgemacht hat. Ein anderes Zeichen für diese Entwicklung ist darin zu sehen, daß Gäbir dem am Anfang dargelegten Plan gar nicht treu geblieben ist. Das erste Kapitel gibt eine Einführung, das 2., 5. und 15., 17., 25. Kapitel bilden eine Einheit und behandeln die Ablehnung des manichäi- schen Dualismus. Das 12., 13., 62. bis 71. befaßt sich mit der Theorie der Gleichgewichtsverhältnisse, das 32. bis 41. setzt sich mit dem Inhalt der 70 Bücher auseinander, die Kapitel 6 bis 11

Sezgin references Kraus' argument for understanding the *K. al-khawāṣṣ al-kabīr* as a text that has developed diachronically: this argument stems from the text's "random disorder"[16], which can only be explained by interpreting the book as undergoing "a rather long and rather complicated evolution before reaching its current form"[17], and is supported by a lower number of chapters attributed to the *K. al-khawāṣṣ al-kabīr* in other Jābirian books referencing it as compared to the version of the text we have now.[18]

The *K. al-khawāṣṣ al-kabīr* tells us, in two bibliographic notices that Kraus marks, that 21 of its chapters complete the theory of Balance (*ʿilm al-mīzān*), while the rest (50 chapters) are dedicated to the science of philosophy (*ʿilm al-falsafa*). It then elaborates further on this (and its own) distinction: there are chapters dedicated to the science of the Balance and are considered an addition to the *Kutub al-mawāzīn*; chapters which contain additions to the *112 Books*; chapters which contain additions to the *70 Books*; and an independent unit on what may be more typically understood as *ʿilm al-khawāṣṣ*, which Sezgin quotes Kraus describing above.[19]

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und 14 sind den Eigen schaften von verschiedenen Elixieren gewidmet. „Die übrigen Kapitel erörtern die wunderbaren Eigenschaften der Steine, der Pflanzen, der Tiere, die Sympathien und Antipathien zwischen den Tieren, die magi schen Experimente, medizinische und toxikologische Vorschriften . . ." (s. Kraus I, 149-150)."

[16] Kraus, v.1, 149. "Even more than in the other parts of the Corpus, the reader is disconcerted by the random disorder in which the author presents the materials of different origin. Without prior notice, he sees him pass from one subject to another, insert digressions that have nothing to do with the original theme of the work, and resume, after several chapters of interruption, the abandoned thread (Plus encore que dans les autres parties du Corpus, el lecteur est deconcerte par le desordre pelemele dans lequel l'auteru presente les materiaux d'origine differente. Sans avis prealable, il le voit passer d'un sujet a l'autre, inserer des digressions qui n'ont rien a voir avec le theme originel de l'ouvrage, et reprendre, apres plusieurs chapitres d'interruption, le fil abandonne)."

[17] Ibid. "Pour expliquer ce desordre, il ne suffit plus de recourir a la tendance generale de l'auteur a disperser les materiaux a travers ses ovrages. Il faut plutot croire que le kitab a subi une evolution assez longue et assez compliquee avant de parvenir a sa forme actuelle."

[18] Ibid. "That we really have the right to speak of an evolution of the work and to consider the different parts raised in its composition as successive layers which were attached to the primitive nucleus, this is confirmed by certain other notices contained in the Corpus from Jabir. Indeed, the work is quite often quoted in other collections, notably in the Kutub al-Mawazin, in k. al-bahth, as well as in several treatises from the 500 Books collection. But according to these quotations, it does not have 71, but only 50 chapters; that is to say, the 21 chapters which are set apart by the bibliographic notice analyzed above, are not yet included in it (Mais selon ces citations, il n'a point 71, mais seulement 50 chapitres; c'est-a-dire les 21 chapitres qui sont mis a part par la notice bibliographique analysee plus haut, n'y sont pas encore compris. A cote de cela, on rencontre souvent la mention d'une explication d'un commentaire ou d'additions au k. al-khawass)."

[19] See Kraus, v.1, 149 and forward.

Kraus dedicates the second section of *Jābir et la science grecque* to "La science des propriétés" and the *K. al-khawāṣṣ al-kabīr*. In particular, he is focused on the Hellenistic roots of this tradition: "Almost all of this part of the Body can be traced to a Greek or rather Hellenistic tradition: it also reveals to us a new aspect of the milieu from which Jabirian science emerged."[20] I believe this idea of a 'new aspect' refers to the combination of ancient Greek source material and Eastern Hellenistic sources: Kraus writes, "We will highlight on the one hand examples where Jābir meets with the ancient authors, on the other hand we will underline the 'properties' which are foreign to Greek literature and derive in all probability from oriental sources."

In my opinion, the most pertinent and powerful contribution of Kraus' chapter is the relationship he notes between the 'science of properties' and the 'science of the Balance' in the *k. al-khawāṣṣ al-kabīr*. Kraus comments that Jābir does not merely classify properties, but synthesizes them into his larger system. In his words, "...they [the properties] must be submitted to a rational explanation, without which they would not be the subject of a true science. Beyond empirical observation, which establishes the very fact of the extraordinary virtues of natural things, it is necessary to determine the causes on which they depend."[21] Kraus summarizes the Jābirian synthesis as follows:

> "Properties depend on the physical consistency of the things to which they are inherent. Now, thanks to the method of the balance, the physical constitution of any thing can be

[20] Paul Kraus, *Jābir ibn Ḥayyān, Contribution à l'histoire des idées scientifiques dans l'Islam* (Cairo, Imprimerie d l'Institut français d'archéologie orientale, 1942-43), vol 2, 62. "Presque toute cette partie du Corpus peut etre ramenee a une tradition grecque ou plutot hellenistique: aussi nous revele-t-elle un nouvel aspect du milieu d'ou est sortie la sicence jabirienne."

[21] Ibid, 93-94. "Les riches materiaux reunis sous le titre de 'science des proprietes' et que nous avons pu ramener, malgre les additions posterieures de provenance orientale, au cadre antique de la litterature des [grec], n'epuisent point l'interet que possede pour nous cette partie de la doctrine jabierienne. En effet, Jabir ne se contente pas d'une simple enumeration ou classification de ces proprietes: si miraculeuses qu'elles semblent, elles doivent etre soumsies a une explicationr ationelle, sans laquelle elles ne feraient pas l'objet d'une vraie science. Au dela de l'observation empirique qui constate le fait meme des vertus extraordinaires des choses naturelles, il faut determiner les causes dont elles dependent."

> subjected to laws of quantity and measure, and the properties, being the result of the appropriate mixture of the elements, are by the same token justified."[22]

Thus, in sum, we can say that the *k. al-khawāṣṣ al-kabīr* complements the *k. al-ḥudūd* and the *k. ikhrāj*, as it offers further commentary and information on aspects of foundational theories, disciplines, and materia which are the subjects of the other two books.

The world of Jābirian alchemy

Before diving into an investigation of *ṣanʿa* in the *k. al-ḥudūd, k. ikhrāj*, and the *k. al-khawāṣṣ al-kabīr*, I want to take a moment to situate the non-specialist reader within the world of alchemical procedures and definitions, as much of what is discussed vis-a-vis *ṣanʿa* within the Jābirian corpus does assume a particular depth of technical knowledge. This is not an exhaustive or comprehensive exploration of Islamic or Jābirian alchemy, but a brief exploration of key terms and ideas for one's basic orientation.

The definition of alchemy given by Ibn al-Nadīm in the *k. al-fihrist* reads: "*ṣanʿat al-dhahab wa 'l-fiḍḍa min ghayr maʿādinihā,*" or the making of gold and silver without their materials.[23] This is to say, alchemy is a practice of transformation and production, wherein what are termed 'base metals' (e.g. copper, tin, zinc) are turned into 'precious metals', such as (and most commonly) silver and gold. How is this possible? The German Arabist and scholar of natural philosophy Manfred Ullmann provides this concise summary of the basics:

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[22] Ibid, 95. "Cette explication, Jabir croit la trouver dans le principe de la balance, que nous avons deja rencontre dans sa theorie alchimique et dont l'analyse sera abordee par la suite. Les proprietes dependent de la consistution physique des choses auxquelles elles sont inherentes. Or, grace a la methode de la balance, la constitution physique de toute chose peut etre soumise a des lois de quantite et mesure, et les proprietes, etant le resultat du melange approprie des elements, sont part la meme justifiees."

[23] Ibn al-Nadīm, *Kitāb al-fihrist*, ed. Riḍā Tajaddud, Tehran 1393/1973, pg. 351

> "Transmutation is possible because the various sorts (*anwāʿ*) of metals form only one single species (*djins*). They are differentiated only in accidents (*aʿrāḍ*) which can be proper (*dhātiyya*) or occasional (*ʿaraḍiyya*). The accidents, however, are not stable but changeable, as can be seen in nature."[24]

Arabic translations of Aristotle's *Meteorology* and the encyclopedias of the *Ikhwān al-Ṣafā'* highlight the adoption of Greek natural philosophical ideas on the origins of metals, including the notion that all metals were the same species, born underground in a mix of vapors and fumes (exhalations, in Aristotelian terms) engendered by the four elements, into Arabic traditions of metallurgy, mineralogy, and alchemy.[25]

The most famous way in which transmutation occurs is through the creation of the notorious alchemical elixir. *Al-iksīr* in Arabic, this is an agent "believed to make possible the transformation (transmutation) of imperfect bodies, metals in particular, into noble and immutable bodies (transmutation into 'gold' and 'silver')."[26] In the Jābirian corpus, *al-iksīr* is defined in relation to the tinging or dyeing of substances, which "impart[s] a tincture that is stable in the assay [the testing of a metal or ore to determine its ingredients and quality], transforming it from its own species to a species that is nobler" as well as given a medical usage, being termed a medicine (*dawā'*) and a poison of imperfection.[27] This substance is made from mineral, vegetable, and/or animal matter and put upon a base metal rendered passive (black, or without any quality).[28]

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[24]Ullmann, M. "al-Kīmiyāʾ". In P. Bearman (ed.), *Encyclopaedia of Islam New Edition Online (EI-2 English)*, (Brill, 2012) doi: https://doi-org.proxy.uchicago.edu/10.1163/1573-3912_islam_SIM_4374

[25] Tuna Artun, "Hearts of Silver and Gold: The Production of Alchemical Knowledge in the Early Modern Ottoman World," diss. Princeton University, 2013, pg 66.

[26] Carusi, Paola. "Elixir". In K. Fleet, G. Krämer, D. Matringe, J. Nawas and D. J. Stewart (eds.), *Encyclopaedia of Islam Three Online*, (Brill, 2013) doi: https://doi-org.proxy.uchicago.edu/10.1163/1573-3912_ei3_COM_26171

[27] Ibid.

[28] Ullmann, M. "al-Kīmiyāʾ". In P. Bearman (ed.), *Encyclopaedia of Islam New Edition Online (EI-2 English)*, (Brill, 2012) doi: https://doi-org.proxy.uchicago.edu/10.1163/1573-3912_islam_SIM_4374

In the Jābirian context, transmutation by an elixir was certainly possible, but the corpus also contains two principles and theories of transmutation that were innovations of the Jābirian corpus. These are known as the mercury/sulfur theory and the science of the balance (*ʿilm al-mīzān*). To be fair, versions of the mercury/sulphur theory seem to have preexisted Jābirian writings; however, the idea is developed in two crucial ways in the corpus. First, the Jābirian corpus adds an additional step to the origin of metals, positing that the mixture of fumes and vapors in the belly of the earth gave rise to quintessential substances termed 'mercury' and 'sulfur' (for they have characteristics closely resembling mercury and sulfur as found in the wild). Accidental qualities that are the result of celestial influences at the time of the combination of this quintessential mercury and quintessential sulphur determine whether the metal produced is precious or base, gold or lead. The perfect balance of hot and humid qualities in the quintessential sulfur is what specifically produces gold.[29] Second, while Greco-Egyptian alchemists of the Alexandrian school had associated metals and elemental qualities, it was the Jābirian corpus which advanced "the application of elemental qualities (*ṭabāʾiʿ*) to the sulfur-mercury theory, under which the qualities [Aristotle's four qualities, hot/cold, dry/moist] were brought into the new-born metal by both sulfur, the male component which is hot and dry, and mercury, the female component which is cold and moist."[30] In the Jābirian view, "each metal not only exhibited a pairing of accidental qualities externally, but also had a diametrically opposed pairing of qualities internally."[31]

The "science of the balance", meanwhile, refers to the idea that everything in the world is made up of measurable quantities. It is a comprehensive system in which the "weights" of different "natures" or "qualities" (*ṭabāʾiʿ* or *arkān*, which are heat, cold, dryness, and humidity)

[29] Artun, 66-68.
[30] Ibid, 68.
[31] Ibid, 69.

could be calculated. To change the proportion of these weights or quantities in a substance changed the substance. Thus, this enabled both the production of the elixir and the transformation of metallic bodies, for the alchemist could increase or decrease a substance's weights and thus transform it into a different substance. As scholar of Islamic science S. N. Haq describes, "...all bodies contained the four qualities in a specific, immutable, and noble proportion which was governed by the Supreme Principle…The alchemist who has mastered the Science discovers through this proportion the quantitative structure of all things. He is then able to change anything into any other by creating in it a new configuration of qualities."[32] On this, Artun elaborates,

> "...the science of the balance employed an impossibly complicated numerological system to compute the weights of hotness and coldness, dryness and moistness in bodies. This was the first step towards the transmutation of one kind of body to another kind in stable condition…The stability of all metallic substances, in turn, depended on their qualities maintaining an equilibrium that was expressed in the number 17…Each metal was balanced only when its coldness, hotness, moisture, and dryness conformed to this number of its multiples by maintaining a ration of 1:3:5:8."[33]

The four qualities were also ascribed four degrees of intensity, a concept from Galenic medicine, and those four degrees were each divided into seven degrees, giving a total of 28 degrees total. 28 is also the number of letters in the Arabic *abjad*, and so each position is accorded a letter of the *abjad*, and each letter is given an elemental or qualitative correspondence (i.e. *alif* is hot, *bā'* is cold, etc). Thus, the science of balance presents a coordination of numbers, letters, and natures: words are composed of letters just as things are composed of natures, and the composition of letters corresponds to the composition of natures. As Artun neatly explains, "Since the degrees of intensity depended on the position of these letters in the name of a given

[32] S. N. Haq, *Names, Natures, and Things: The Alchemist Jābir Ibn Ḥayyān and His Kitāb Al-Aḥjār (Book of Stones)* (Dordrecht ; Boston: Kluwer Academic Publishers, 1994: 67-68.
[33] Artun, 84-85.

body, in order to compute the "weights" (*awzān*) of a body's qualities, one had to first and foremost analyze its name. That necessitated, in turn, ascertaining the true name of a body…"[34]

Numerous processes and substances were utilized in transmutations. Technically, anything–not just minerals, but vegetables and animals–could be reduced to its "natures", and those could be combined to produce or cultivate the elixir.[35] Aside from vegetable and animal matter, metals (metallic bodies), distillates (spirits), combinations of the two, and tinctures derived from them were all regularly used. To extract natures, there were a number of chemical treatments, or processes (*tadābir*):

> "Distillation (*takqtīr*), for example, removed earthiness from both liquids and solid, especially organic, materials (i.e. dry distillation); calcination (*taklīs*), both by fire and corrosive substances such as sal ammoniac, in a similar fashion removed moistness. The same result, albeit being chemically a different procedure altogether, was achieved for mercurial substances through coagulation (*'aqd*), which in effect solidified them. Sublimation (*taṣ'īd*), which purified sulfur, and sulfides such as arsenic, led to the extraction of airiness (i.e. oiliness). To further disintegrate resulting materials by solution (*ḥall*), "divine water" (*al-mā' al-ilāhī*), solvents for whose preparation sal ammoniac was a key ingredient, were employed. The natures were then "mixed" (*tamzij*) according to their weights (*awzān*) and subjected to purification (*tanḳiyah*)."[36]

This is by no means a comprehensive discussion of the theories and practices of Jābirian alchemy. However, I hope it serves to situate the reader in their world and thus make more legible the components of the Jābirian corpus which follow, attending to *ṣanʿa* specifically.

[34] Ibid, 87.
[35] Ibid, 79.
[36] Ibid, 83.

Ṣanʿa in the Jābirian corpus

In what follows, I explore what *ṣanʿa* means within texts of the Jābirian corpus. This question can be addressed through positive definitions (i.e. places where Jābirian texts explicitly describe what the term means) as well as through its relationships and/or contradistinction to other terms and ideas. As such, I explore the definitions given in the *K. al-ḥudūd* for *ṣanʿa*, *ʿilm al-ṣanʿa*, and related terms that are nonetheless given their own specific definitions, such as *ṣanā'iʿ*. I then turn to the usage of the term in the *K. al-ikhrāj*, where there is a specific discourse dedicated to *ʿilm* al-*ṣanʿa* specifically, but also uses of the term throughout the broader treatise that add texture to the meaning of the word. Finally, I look to the *K. khawāṣṣ al-kabīr*, which places *ṣanʿa* and *ʿilm al-ṣanʿa* side by side with other disciplinary categories and complicates the definitions offered in the *K. al-ḥudūd*.

I find that, in the *k. al-ḥudūd*, *ṣanʿa* is used primarily to mean the discipline of alchemy. It is a category of action performed by human hands that enables a person to lead a good life "independently" in an "unusual manner". The manner is unusual because *ṣanʿa* is distinct from *ṣanā'iʿ* (crafts) by virtue of its positioning in a Jābirian scheme of knowledge as 'noble' as opposed to 'base'. In the *k. ikhrāj*, *ṣanʿa* as a term refers both to alchemy but also to artifice–there is intentional play in the text between these definitions. In the sense of alchemy, *ṣanʿa* is a category of action and/or knowledge that comprises work including the manifestation of the elixir from potential into actuality; as artifice, it is a process of making, ordering, and therefore seamlessly channeling forces from potential to actuality. This process of artifice can occur at any cosmological level and across a cosmological scale. Finally, in the *k. al-khawāṣṣ al-kabīr* craft knowledge–be it knowledge of disciplines termed *ṣanā'iʿ* or the crafting invoked in

the term *ṣanʿa* itself–always has virtuous benefits associated and, even as a specifically human action, has direct impact on the science of Balance, which itself affects aspects existing at numerous cosmological levels. *Ṣanʿa* (artifice) is also done not only by humans, but also by the world of generation and corruption, and by the divine.

Taken together across these three treatises, therefore, *ṣanʿa* consistently speaks to a kind of cosmologically-scalable artifice. I mean this in two ways: this category of action both has the capability to impact different cosmological levels or spheres through the manifestation of potential into actuality, or through the science of Balance, as a human action, but is also enacted at other cosmological levels or by other cosmological actors. Furthermore, and importantly, *ṣanʿa* contains benefits and value: that there is virtue involved in the process of *ṣanʿa* is insisted upon.

K. al-ḥudūd

The *k. al-ḥudūd* defines *ṣanʿa* as **"the instrument (*al-āla*) that enables the human to attain a state of independence by himself vis-a-vis others in gains in an unusual manner."**[37] The knowledge or science of *ṣanʿa* (*ʿilm al-ṣanʿa*) is defined as **"the knowledge of the elixir. When it is ordered, the noble knowledge of the lower world comes from it."**[38] Well and good, but these definitions are most meaningful when their context is fully understood. What does a 'state of independence' or 'in an unusual manner' actually mean? What is the elixir, what is it to order the elixir, and what is noble knowledge of the lower world?

[37] Jābir ibn Ḥayyān, *Mukhtār rasā'il Jābir ibn Ḥayyān*, ed. Paul Kraus (al-Qāhirah: al-Khānjī, 1935): 110.
[38] Ibid, 102.

In the *k. al-ḥudūd*, *ṣanʿa* and its *ʿilm* are situated within a larger systemization of disciplines of knowledge. The *K. al-ḥudūd* understands knowledge and its disciplines to be divided into knowledge pertaining to religion (*dīn*) and knowledge pertaining to the world (*dunya*). The Jābirian author organizes knowledge of the world and its different disciplines in the following manner:

> "The science of the lower world is divided into two parts: the noble (*sharīf*) and the low (*waḍīʿ*). The noble is the science of the Craft (*al-ṣanʿa*); the low is the science of crafts (*al-ṣanā'iʿ*). And the crafts which are among the low are divided into two parts: the crafts needed in alchemy, and the crafts needed in the support or the effectuation of alchemy. All of what we have recounted in these books is not outside of these divisions. This is because the natural sciences, the astrological sciences, the calculations passing through them, and the engineering which they contain enter into the whole of philosophical science, and the crafts of moistening and perfuming and dyeing and so forth which they contain enter upon the section which is desired for the completion and the aid in what happens from them according to alchemy. As for the science of *ṣanʿa*, it is divided into two parts: what is desired for itself and what is desired for something beyond it [*ghayrihi*]. What is desired unto itself is the complete and colored elixir, and what is desired for something beyond itself is in two parts: medicaments/produced drugs and processes/procedures (*tadābīr*). Medicaments have two types: the stone, which is matter, and medicaments which one effects. *Tadābīr* have two types: an air-type and a land-type. The air-type has two varieties: red and white, and the land-type has these two varieties also, but it [the land-type] is divided up nearly without end; however, what is in these books is the noblest of them. And the medicaments which one effects are of two varieties: simple and compound, and the simple ones are each *ghabīṭ*, meaning processing [*tadbīr*] does not enter upon it, and the compounded ones are the pillars (*arkān*). As for the elixir, there are two types: red and white."[39]

For the Jābirian writer, *ʿilm al-ṣanʿa* is both located at and identified as the noble branch of worldly knowledge. Kraus translates *ʿilm al-ṣanʿa* as 'alchemy'; indeed, he understands the *k. al-ḥudūd* as a text that on whole exemplifies the superiority of alchemy as the queen of empirical sciences. He writes,

[39] Ibid, 100-101.

> "Even a look at this overview clearly shows the tendency of the author. The empirical, 'secular' sciences are subordinate to the religious ones in rank and only learn their foundation from them. The most important far science is alchemy, the other disciplines are hardly mentioned in the *K. al-ḥudūd*. They serve it only as auxiliary sciences or are at most placed in an 'analogous relationship' to it. Alchemy, on the other hand, is the only secular science that is sought for its own sake. As is evident from other writings, it is the perfection of the empirical sciences; their task is the production of the elixir, which because of the harmonious relationship of its components is called a new, third cosmos, alongside the microcosm and macrocosm. In this way, through alchemy, the secular sciences are reunited with the religious ones from which they were separated from the beginning. The elixir can now bear the name Imam, which in religious language is applied to the human appearance of the deity. The decisive factor is not the material advantage that gold can be produced with the help of the elixir, because then alchemy would also be a science that is striven for for the sake of something else (for the sake of gold). All technical procedures are useless unless one sees a symbol of religious truth in the elixir."[40]

Kraus prioritizes the metaphysical components of alchemy: it is important because it is symbolic of a larger (and religiously particular) truth, not because of the material components it produces. Without signing off on Kraus' convictions regarding the particular brand of Jābirian religiosity, I agree that *ʿilm al-ṣanʿa* in the *k. al-ḥudūd* refers to a discipline best translated as alchemy, though with a very broad definition, as discussed below. Additionally, I believe Kraus is right that the process of *ṣanʿa* and not its product (gold) is what is valuable about the art.

But even as *ʿilm al-ṣanʿa* is defined as the noble branch of worldly knowledge or that which produces it, what does "the noble branch of worldly knowledge" actually mean? Fortunately, the Jābirian corpus defines its terms further. The following table provides the definitions given in the *K. al-ḥudūd* of these necessary contextual elements for understanding this definition of *ʿilm al-ṣanʿa*.

[40] Kraus, *Studien*, 11-13.

Table 5: *ʿilm al-ṣanʿa* in the *K. al-ḥudūd*

Noble knowledge of the lower world	"The knowledge by which man is independent from all people in leading a good life."[41]
Knowledge of the lower world	1. "Knowledge of the beneficial and the harmful and what attracts benefits or aids in it and offsets harm or aids against what is defended from it."[42] 2. "The forms which the intellect and the soul acquire for the procurement of benefits and offsetting harm before death. And indeed we have said in this definition "the intellect and soul acquires it" because among the benefits and [the offsetting of] harm are things attached to base desire (*al-shahwa*), which is among the properties of the soul, so knowledge of these properties is restricted to the soul since the intellect is the enemy of desire. To it are things related to opinion, so its knowledge is restricted to the intellect. Therefore we needed both in the definition."[43]
The lower world (*dunyā*)	"All of what is in the world of generation [the cosmos] in harmful and helpful happenings [temporally originated, non-eternal], in every way that exists."[44]
Nobility (*al-sharīf*)	"That which is independent of others with regards to things which are interdependent."[45]

Within the cosmos generated by the movement of celestial spheres (the lower world/*dunyā*), *ʿilm al-ṣanʿa* is a discrete, non-interdependent (noble/*sharīf*) discipline of knowledge that serves to assist its practitioners in independently or non-reliantly leading good lives, which includes the procurement of benefits and the offsetting of harm (worldly knowledge). Benefits here include things restricted to both the soul and the intellect, therefore this knowledge is knowledge acquired by both the soul and intellect.

[41] Jābir, *Mukhtār*, 105.
[42] Ibid.
[43] Ibid, 102.
[44] Ibid, 108.
[45] Ibid, 110.

It is worth flagging explicitly that this is a fairly broad definition of alchemy. My point is not to say here that *ʿilm al-ṣanʿa* should not be understood in this text to mean alchemy, but rather to remind the reader that, if this is alchemy, then the Jābirian understanding of alchemy contains much more than our common parlance of the term.

We can return, then, to our original definitions: *ṣanʿa* is "the instrument (*al-āla*) that enables the human to attain a state of independence by himself vis-a-vis others in gains in an unusual manner,"[46] and *ʿilm al-ṣanʿa* is "the knowledge of the elixir. When it is ordered, the noble knowledge of the lower world comes from it." The following table provides additional definitions from the *k. al-ḥudūd* that help to complete our understandings of *ṣanʿa* and *ʿilm al-ṣanʿa*:

Table 6: Additional *k. al-ḥudūd* definitions

Knowledge of the elixir	"The knowledge of an ordered thing, which colors and changes the wellsprings of the soluble base essences into soluble noble essences."[47]
Knowledge of the stone–which is the underlying substance/material substrate of the elixir[48]	"The knowledge of the essence which requires the changing of its accidents in order to achieve the elixir."[49]
Knowledge of the four elements (*arkān*)	"The knowledge of what comes to be as a result of its grouping together and its processing--the processing which contains the elixir."[50]
The complete elixir	"That which is transformative of substance, soluble, and intends permanent transformation by the trial in which it is altered from one type to a more noble type."[51]
Processing (*tadbīr*)	"The actions through which one seeks to attain what is sought for itself by the Work/*ṣanʿa*."[52]
The definition of knowledge of ordered things (things which are ordered)	"Knowledge of actions (processes) which change accidents from what indwells in them/their condition of being to other accidents, more noble than them and more conducive to the completion of the elixir."[53]

[46] Ibid, 110.
[47] Ibid, 106.
[48] Ibid, 111.
[49] Ibid, 107.
[50] Ibid, 108.
[51] Ibid, 112.
[52] Ibid, 111.
[53] Ibid, 106.

To summarize and synthesize the above: noble knowledge of the lower world (*ʿilm al-ṣanʿa*)–the knowledge by which someone can lead a good life, i.e. procure benefits and minimize harm, independently or without relying on others–is the result of the ordering of the knowledge of the elixir. The elixir is something which transforms substances permanently to a more noble type (e.g. from a base to a precious metal); it is made of the stone, which itself is the substance whose accidents can be changed to create the elixir. Things which have undergone ordering have undergone processes to change their accidents to more noble accidents. Ordering (*tadbīr*) itself is the collection of actions or processes by which one seeks to attain what is sought for itself by *ṣanʿa*. This last definition is perhaps the most cryptic of the bunch: it is not just a collection of processes but a collection of processes with specific intention. This definition leads easily to the question of what exactly is that which is sought for itself by *ṣanʿa*.

Neatly, the *k. al-ḥudūd* does answer this question, as *ṣanʿa* is divided into two types: *ṣanʿa* for itself/for its own end and *ṣanʿa* for something else. The text reads, "The definition of what is desired from *ṣanʿa* in and of itself is the thing which is intended by the operations of *ṣanʿa*."[54] So, what one intends from the operations of *ṣanʿa* is *ṣanʿa* for itself. This is made distinct by the Jābirian author from trying to achieve something by means of or as a product of *ṣanʿa*: "The definition of what is desired from *ṣanʿa* as a means (outside of itself) is the thing whose proximity to *ṣanʿa* is sought with a view to an end [lit. is sought for/with a view to what is sought from it, with a view to an end]."[55] There is a subtle but strong distinction between the process of *ṣanʿa* and the product of *ṣanʿa*. This also points us towards greater understanding regarding *tadbīr*: actions by which one conducts *ṣanʿa* for the purpose of its process, not product.

[54] Ibid, 111.
[55] Ibid.

As stated previously, an understanding of *ṣanʿa* can come not only from its explicit definition but also from what it is defined against. In the *K. al-ḥudūd*, *ṣanʿa* as the noble branch of worldly knowledge is contrasted with *ṣanāʾiʿ* (crafts or sciences), which are the lowly (*waḍīʿ*) branch of worldly knowledge.

Table 7: *ṣanāʾiʿ* in the *K. al-ḥudūd*

Low/base knowledge	"Knowledge by which one arrives to pleasures and benefits and the preservation of life before death"[56]
ṣanāʾiʿ/crafts	"Actions that enable one to reach the low or average benefits in a typical manner."[57]

Interestingly, the Jābirian author also specifically defines a category of *ṣanāʾiʿ* which are needed for *ʿilm al-ṣanʿa*: " "The definition of knowledge of crafts needed regarding the noble knowledge of the lower world is the knowledge without which the noble knowledge of the lower world is not complete."[58] This is further elucidated when they write, "The definition of the knowledge of crafts needed for sufficiency, partial and complete, and for the aid of the noble science of the lower world is the knowledge of what brings one, while remaining in life, to acquiring bounty beyond what one needs, which suffices in assistance for the noble knowledge which is desired."[59] In other words, some *ṣanāʾiʿ* produce things that assist with *ṣanʿa*. We can even say, the Jābirian theorization of *ṣanāʾiʿ* always points back to *ṣanʿa*; the orbit of the "noble branch" is inescapable for the "lowly".

To summarize, what do these definitions mean for artifice and its theorization in the *K. al-ḥudūd*? Or, repeating an earlier set of questions, as well, when 'human making' or 'crafting'

[56] Ibid, 105.
[57] Ibid, 110.
[58] Ibid, 105.
[59] Ibid, 106.

(*ṣanʿa*) is metonymic with 'alchemy' (the Craft), what does that mean for ontological delineations and categorical reifications (i.e. human, natural, divine)? First, it presupposes that alchemy is unique as a category: it is necessarily human or done by human hands, but by being noble instead of base, it has different aspects and provinces–we see that in the distinction made in the *K. al-ḥudūd* between *ṣanā'iʿ* and *ṣanʿa*. Here, to practice the Craft is given value insofar as it is the tool enabling a person to lead a good life "independently", and it allows them to do so in "an unusual manner". These terms (independently and unusual) are not explicitly defined: independence may refer to financial independence on the basis of the creation of precious metals and an unusual manner might simply be referencing the fact that alchemy is not the most common of career choices. However, as I discuss later in this chapter, regardless of the precise meaning, that *ṣanʿa* is marked as 'unusual' is important for understanding the relationship between *ṣanʿa* and *ʿajab* that the Jābirian corpus presents. *Ṣanā'iʿ* facilitate independent and unusual life, as well, as they perpetually point to *ṣanʿa*, but they do so in "a typical manner".

K. al-ikhrāj

Ṣanʿa is used throughout the *K. ikhrāj* with varying degrees of technical precision (i.e. sometimes to mean alchemy specifically and in the metonymic way discussed in the previous section; sometimes to refer to crafting, making, or a sense of artifice more broadly). Of particular interest to this study, however, is the section of the *K. ikhrāj* titled *Qawl ʿilm al-ṣanʿa*, or *Discourse on the Science of Alchemy/Artifice*.

In this section, *ṣanʿa* is presented as a discipline or body of knowledge related to a number of substances utilized in transmutative processes, including spirits (distillates, or

products condensed from vapor during distillation, such as mercury, arsenic, sulfur, ammonia, camphor, and fat[60]), metals (which are correlated with the planets: "black lead, which is by the nature of Saturn; white lead, which is by the nature of Jupiter; iron, by the nature of Mars; gold, by the nature of the sun; copper by the nature of Venus; silver by the nature of the moon; and zinc by the nature of Mercury"[61]), stones or material substances[62], and tinctures or dyes made from distillates.[63]

It is worthwhile to place this understanding of *ṣanʿa* in conversation with the introduction to the section immediately following the *Qawl ʿilm al-ṣanʿa*, which is the *Qawl al-kayfiyya*, or *Discourse on Quality*. The first sentence of this section reads,

> "Quality (*kayfiyya*) is the procedure (*tadbīr*) of the Art/alchemy (*ṣanʿa*), without which it would not be, and it is the processing (*tadbīr*). That is divided into parts: either for the spirits, for the [composite metallic] bodies (*jasd*), for the mixture, or for the casting away/removal (*tarḥ*). These four, they are the Art (*ṣanʿa*) in reality."[64]

The *K. ikhrāj* then proceeds to detail further aspects of these processes. As we saw in the *K. al-ḥudūd*, *ṣanʿa* is defined in large part through its relationship to *tadbīr* (processes), which here is further delineated into a series of specific acts. Collectively, then, the *Qawl ʿilm al-ṣanʿa* and this beginning line of the *Qawl al-kayfiyya* present an insider's view on a technical definition of *ṣanʿa*.

There is additionally the matter of the parallels drawn and the implicit definitions of those analogies. The *Qawl ʿilm al-ṣanʿa* states, "for whom it is possible to make the spirits enter upon the [metallic composite] bodies, the work of *al-ṣanʿa* and the manifestation of the elixir from potential into actuality is [also] possible."[65] Thus the action of making spirits enter upon

[60] Ibid, 61.
[61] Ibid, 62.
[62] Ibid, 64.
[63] Ibid, 65.
[64] Ibid, 66.
[65] Ibid, 65.

bodies–in an alchemical context, this refers to the making of stones and material substances by combining metals and distillates[66]–is itself not the *same* as alchemy or *al-ṣanʿa*, but rather a related process. Encased here, as well, is another take on the meaning of *ṣanʿa*: it is a category of action and/or knowledge that comprises work including the manifestation of the elixir from potential into actuality. This is not quite the same as saying *al-ṣanʿa* or alchemy is itself the creation of the elixir. Rather, as the *K. al-ḥudūd* can also be read, knowledge of alchemy is–'is' in the sense of 'is analogous to and includes'–knowledge of the elixir; the component processes of knowledge of the elixir are those definitional to alchemy itself.

Reading further, tucked into a section about the alchemical process of "projection" (*al-ṭarḥ*), in which a small amount of elixir is projected onto a suitable base metal to turn it into a precious metal, is a more explicit definition of *ṣanʿa*.[67] It is different from the technical sense of the word given prior, the "insider's technical definition", in that it both speaks from outside the perspective of the alchemical practitioner and that it defines *al-ṣanʿa* through a metaphor, not through component parts. The Jābirian author writes: "The belief of the practitioners of alchemy (*iʿtiqād al-ṣanʿuwiyyīn fi-l-ṣanʿa annahum yaʿtaqidūna anna*) is that the world is a big person, and alchemy (*al-ṣanʿa*) is a mid-sized person, and that human beings are a small person."[68] O'Connor notes that this passage refers to the:

> "...interrelation of the various levels of created existence, cosmos (or macrocosm, the 'great incarnation', literally the 'great human'),the alchemical world (or the mesocosm, the 'middle incarnation', the 'middle human'), and the human world (or the microcosm, the 'lesser incarnation', the 'lesser human'). The unity of all things is the fundamental principle underlying all alchemical theory and practice. The interconnectedness and interaction of the three worlds is another expression of that unity. It is interesting to note

[66] Ibid, 64.
[67] Artun, 83.
[68] Ibid, 71.

> the intermediary role of the alchemist and the alchemical work as the middle between the two extremes of the heavenly macrocosm and earthly microcosm."[69]

Interesting, indeed, and I suggest that alchemical work fills this middle ground not solely because the Jābirian author is preoccupied with the discipline of alchemy and its defense, but also because *al-ṣanʿa* is simultaneously the science of alchemy and the concept of human making or artifice. This statement is not only a definition of alchemy but itself a theorization of artifice as a larger concept. In parallel with the nested structure of the *K. ikhrāj* itself, wherein each component piece builds upon the next and leads from foundational theories of existence towards the furthest conclusion or expression of the potentials of the Jābirian system of thought, *ṣanʿa* or artifice is also tracked as a process of making that takes place on a number of cosmological levels. We can read the *K. ikhrāj* as a text which is, at its core, discussing types of making, the component pieces of a crafting enterprise that make up how the world functions and how power is channeled, step by step, within that world. Thus, as the *K. al-ikhrāj* says explicitly, artifice (*ṣanʿa*) is a category of action and/or knowledge that comprises work including the manifestation of the elixir from potential into actuality. At the level of human action, this is specifically alchemy– "alchemy is a mid-sized person"--and thus the technical use of *ṣanʿa* to mean that specific science, but *ṣanʿa* is also a process of making, ordering, and therefore seamlessly channeling forces from potential to actuality. Just as the *K. ikhrāj* begins with a conversation on *quwwa* and *fiʿl* and extends through *takwīn*, so too is the concept of artifice invoked at all levels of that process.

This reading of the *k. ikhrāj* is supported by the additional ways the term *ṣanʿa* is harnessed throughout the text. *Ṣanʿa* is not, however, reserved exclusively for alchemical use or

[69] O'Connor, 66.

for its technical meaning of the "science of alchemy". Take the following examples, where *ṣanʿa* and related terms, such as *ṣunʿ* and *ṣanā'iʿ*, are evoked:

> "So known that the axis of the constellations and the planets is a single axis and the measure of them both is a single measure, and this goes against this. And is that not among the making/craft (*ṣanʿa*) of the All-Wise (*ḥakīm*)?"[70]
>
> "People divide the natures of places into two general divisions: the first of them divides into four parts according to the division of the four secondary natures, because they are made (*ṣanaʿathā*) from them—I mean, the places are the product/creation (*ṣunʿ*) of four compounds—and they are: fire and air and water and earth."[71]
>
> "Discourse on Mars: Everything red and sharp-smelling and slaughter animals and the flaring up of blood and things which are of the same kind, such as sheep and goats and lambs and what is slaughtered and skinned and tortured. Among the stones are iron and sulfur and [al-marqashitha?] and magnesium and what is like that and red rubies. And from the trees, what is sharp and acrid and the like. And among the crafts (*al-ṣināʿāt*) are empire and leadership of armies and leather merchants and iron smiths and stokers and all of the workings of the fire and the like, so all of it is in the domain of Mars."[72]
>
> "Discourse on Mercury: Love and joking and hastiness of temper and speed of movement and the impression of every temperment and the uprightnesses of every opinion and saying. For Mercury among people and animals: the possessors of stratagems/ruses and laws and foxes and each/every thing having guile and imagination such as the great deceivers and the imposters and all who have guile/deceit, such as thieves. And from the trees, willows and the ones which have subtle/pleasant effects in remedies and medicaments specifically. And from the stones, quicksilver/mercury and pure oils/fats. And among the crafts (*al-ṣināʿāt*), subtle, difficult things, like writing and engineering and sciences of form and all subtle, delicate machines/tools."[73]

In the preceding examples, the *ṣ-n-ʿ* root is used in a general sense of craft, production, making, or creation. This emphasizes a facet of *ṣanʿa* discussed in the previous chapter: not only is the semantic range of the term the same, but its ability to be used for both general and technical

[70] Jābir, *Mukhtār*, 38-39.
[71] Ibid, 39.
[72] Ibid, 44.
[73] Ibid, 46.

aspects persists. Importantly, however, this *ṣanʿa* is located throughout a cosmological scheme. It calls to mind the various levels of made things (*maṣnūʿāt*) found in Ikhwānian discourse:

> "The human ones are like what the craftsmen make in terms of shapes, engravings, and dyes in natural bodies, and in the urban markets and other locales. While the natural artefacts consist of the forms of the skeletons of animals, their diverse shapes, and the variations of plants, along with the assortments of remedies and minerals. As for the psychical productions, they are like the ordering of the positions of the four elements below the orbit of the Moon, namely, fire, air, water, and earth, and like the configuration of the celestial spheres, and like the system of the form of the world in its entirety. While the divine makings are forms abstracted from matter, as the inventions of the Sublime Creator of sublime creations, as brought into existence from nothingness, in being from non-being, as a thing is from no-thing, in one go without time, place, or a material of a given constitution, nor a form, nor motion, since they are all the sublime creations of the Maker…."[74]

What I mean by this is, the above examples locate artifice as something humans do–in the makings of empire, fields of knowledge, or delicate tools–but also as something that is the provenance of what may alternatively be the "natural" world (the world of generation and corruption) and the provenance of the divine. Indeed, the four natures are engaged in artifice that produces specific types and qualities of land, as is God, the All-Wise, in the ordering of celestial bodies.

K. khawāṣṣ al-kabīr

The *K. khawaṣṣ al-kabīr* is an excellent source for exploring *ṣanʿa* and how the term is conceptualized vis a vis disciplines; in other words, the *K. khawāṣṣ al-kabīr* can help us locate

[74] Ikhwān al-Ṣafā' and Nader El-Bizri, "*al-risāla al-thāmina min al-qism al-'awwal fi-l-ʿulūm al-riyāḍiyya al-taʿlīmiyya fi-l-ṣanā'iʿ al-ʿamaliyya,*" in *Epistles of the Brethren of Purity: On Composition and the Arts*, ed. El-Bizri and de Callataÿ (Oxford: Oxford University Press, in association with the Institute of Ismaili Studies, 2018): 141/103.

ṣanʿa in relation to other fields of knowledge and technical ability. I have opted in the following examples to not translate *ṣanʿa* initially, in order to allow the text itself to define the term's meaning for us through explicit definition, context, and distinction from other disciplines. Additionally, I note in what follows a few examples where other related concepts are delineated, in order to better understand some of the boundaries set around *ṣanʿa* itself.

In the following two quotes, the Jābirian author speaks of *ʿilm al-ṣanʿa*. First, the author describes how knowledge of alchemical practice contains numerous benefits which are unique to three disciplines: *ʿilm al-ṣanʿa*, philosophy (*falsafa*), and the science of the natures (*ʿilm al-ṭabā'iʿ*):

> "So seek it and search for it and beware that you leave from looking for it for even a moment, and you, when you learn what is in it, the greatest knowledge of philosophy will be obtained for you, and in it are many benefits, precious and specific among the *ʿilm al-ṣanʿa* and philosophy and the science of the natures."[75]

It is difficult from this quote alone to determine how separate a discipline *ʿilm al-ṣanʿa* is from the other disciplines listed beside it. It shares "benefits, precious and specific" with philosophy and the natural sciences, but is nonetheless its own variety of *ʿilm*.

Much later in the *K. al-khawāṣṣ al-kabīr*, the author tells us of the importance of both quicksilver and mercury as the "philosophers' stones" within the discipline *ʿilm al-ṣanʿa*: "As we said, quicksilver and sulfur are the stones of the philosophers for *ʿilm al-ṣanʿa*, so we need to know about the secret of what is under it in order that it be complete and revealed."[76] In this instance, *ʿilm al-ṣanʿa* does seem–as in the *K. ikhrāj* sections–to be referring to a specific, metallurgic discipline.

[75] Jābir, *Mukhtār*, 321-22.
[76] Ibid, 331.

Delineating *ṣanʿa* or *ʿilm al-ṣanʿa* often occurs in conversations around the books in which its knowledge is housed. In one example, the Jābirian author writes, regarding seeking out specific books:

> "And after that, by God, what is most knowledgeable and most beautiful and most specific from them by description and by leaving something for nothing, and rather all of it, by God, is from what people need urgently because you gather every art of the world, if you wish, in terms of medicine and astrology and *ṣanʿa* and what is desired and knowledge and engineering and invocations and processes and special properties and games and diversions and all types of sciences/knowledges and *adab*s and the likes of that."[77]

Here, *ṣanʿa* is included among a list of "every art of the world", and this collection is fascinating in what arts are highlighted, games and forms of *adab* included among engineering and medicine. It is curious that some of what is listed are very specific–again, medicine, astrology, engineering, even *khawāṣṣ*–and some are broader, seemingly more conceptual categories: knowledge, processes (*tadabīr*), diversions.

In another example of bibliographic excursus, we have the following:

> "And this is the topic of these books. Would that we recounted in this books in their margins what was beyond/out from scattered/dispersed crafts, among them things from medicine and things from incantations and things from astrology and things from many crafts for they are, in that meaning/ each one from crafts (*ṣanāʾiʿ*). It is necessary that crafts, all of them are prepared for the like of that to go out from them from what we do not recount and not test that for the volume/measure of that and its frequency/abundance. And would that we reached from the special properties of al-*ṣanʿa* and its processes and its benefits in things, venerating its use in the world in many deficiencies and virtues."[78]

Here the reader is given both *al-ṣanʿa* and also its lexical counterpart *ṣanāʾiʿ*. Disciplines like medicine, astrology, and incantations are described as *ṣanāʾiʿ*, instead of either *funūn* as in the

[77] Ibid, 325.
[78] Ibid, 232-33.
فهذا موضوع هذه الكتب. ولعلنا أن نذكر في هذه الكبت في حواشيها ما يكون خارجا من صنائع شتّي، منها أشياء من الطب وأشياء من العزائم وأشياء من النجوم وأشياء من صنائع كثيرة لتكون في ذلك دلالة في كل واحد من الصنائع. وإنه يجب أن تراصد الصنائع كلها ليخرج منها مثل ذلك مما لم نذكره ولا امتحناه ايضا لسعة ذلك وكثرته. ولعلنا أن نأتى من خواص الصنعة وتدابيرها ومنافعها بأشياء يعظم نفعها في العالم في كثير من العلل والمنافع.

quote above, or *ʿulūm*. *Al-ṣanʿa* is not included amongst the *ṣanā'iʿ*, but instead cited immediately following their reference, where it is noted that there are special properties associated with *ṣanʿa*, specific processes, and also venerable benefits–a theme continuously returned to in conversations around *ṣanʿa*.

The Jābirian author also makes reference to specific "people of *al-ṣanʿa*", presumably meaning practitioners of *al-ṣanʿa*:

> "[My master] says: "By God, Jābir, if I were not to teach that one only takes this knowledge from what is considered worthy and the best of all the sure knowledge–indeed, like you–then you would command the abolition of this book from the world. Do you know what was revealed to people in it? They did not arrive to it, so seek it and indeed all the enigmas of my books and all the science of the balance and all the benefits of wisdom and what comes to pass by it will be drawn out for you--by the truth of my master, upon him peace–from the people of *al-ṣanʿa* and know the corruption of the pious."[79]

Here, too, the term is invoked with regards to the science of Balance, specific benefits, and enigmatic–potentially even dangerous–knowledge.

On the whole, the *K. al-khawāṣṣ al-kabīr* offers two major additions to our thinking about Jābirian *ṣanʿa*. First, the book consistently pairs *ṣanʿa* with benefits (*fawā'id*). This is not a new idea, as we have seen the same association with benefits in other texts, but the *K. al-khawāṣṣ al-kabīr* cannot seem to mention one without the other. This strikes me as a tacit argument for the virtue and value of *ṣanʿa*, a perpetual reminder that it results in unique, desirable provisions.

Second, the location of *ṣanʿa* within the organizational scheme of the *K. al-khawāṣṣ al-kabīr* with regards to types of disciplines and knowledge does not seem to exactly match that of the *K. al-ḥudūd*. Recall that *ṣanʿa* in the *K. al-ḥudūd* is the noble branch of worldly knowledge, contrasted with *ṣanā'iʿ* as the base or lowly branch. In the *K. al-khawāṣṣ al-kabīr*,

[79] Ibid, 311.

ṣanʿa is paired side by side with a number of other disciplines, including philosophy, natural sciences, astrology, medicine, *adab*, games, invocations, and more. Its value is consistently argued for, as stated above, but the *K. al-khawāṣṣ al-kabīr* may have a slightly different take on the hierarchy of disciplines of knowledge.

This may be due to the importance placed on the science of Balance in the *K. al-khawāṣṣ al-kabīr*. The Jābirian author writes, in defining specific disciplines, such as *ʿilm al-falsafa*:

> "And these definitions are also according to the opinion of those who said that the first cause possessed the intellect, and the intellect possessed knowledge (*ʿilm*), and the balance possessed knowledge. So know what is under that and from here derive conclusions from it. And the balance is not that which becomes a partner of philosophy and other [disciplines]. But look, do not make a mistake, because every philosophy and science is balance, and so balance is the body of the discipline of philosophy and each thing entering under philosophy."[80]

Every philosophy and science is Balance; perhaps in this book, *ṣanʿa* is a component with unique virtues that contributes to the formation of the body of Balance, as do its other, sister disciplines.

What, then, does the *K. al-khawāṣṣ al-kabīr* offer us with regards to theorizations of artifice in the Jābirian corpus? Here, craft knowledge–be it knowledge of disciplines termed *ṣanā'iʿ* or the crafting invoked in the term *ṣanʿa* itself–contributes to the body of Balance and always has virtuous benefits associated. It is a human action, like other arts and disciplines mentioned, but one with direct impact on the science of Balance, which itself affects aspects existing at numerous cosmological levels.

Conclusions

This section has delved into the meaning of the term *ṣanʿa* as found in numerous Jābirian books. Across the Jābirian *k. al-ḥudūd, k. ikhrāj,* and *k. al-khawāṣṣ al-kabīr*, there are three

[80] Ibid, 250.

crucial and linked points about *ṣanʿa* that emerge through an intertextual reading that I want to draw out.

First, *ṣanʿa* is often used metonymically. The term can mean 'alchemy' or 'artifice', depending on its context; very often, however, it is used to mean both simultaneously ('alchemy' and/or 'artifice'). Alchemy swaps in for a broader process of artifice, such as we find in the Jābirian adage "alchemy is a mid-sized person". I think this is worth noting because it is a rhetorical move simultaneously literary and technical. In part, it forms a justification for literary readings of the Jābirian corpus.

The metonymy of *ṣanʿa* ties to the second of these key points, which is scalability. *Ṣanʿa* used metonymically allows for the concept to scale cosmologically–it is alchemy and artifice. Additionally, cosmological scaling–that *ṣanʿa*, artifice, is a process occuring at numerous cosmological levels and by differing cosmological actors (human, natural world, divine)--is a consistent feature of the term across these texts.

Finally, this cosmologically-scaled *ṣanʿa* is taken to be positive: it is cited in consistent reference to benefits, value, and virtue. This, I believe, is relevant as I move to a consideration of Jābirian *ṣanʿa* and its participation in the same aesthetics of *ʿajab* that I traced in contemporaneous, cross-generic texts throughout Chapter 1. As I argued, there is a positive notion of devotional imitation garnered through an aesthetics of *ʿajab*, wherein the wonderment found in human making and craft refers to the wonders of divine creation by way of cosmological scalability. That *ṣanʿa* is associated with benefits, value, and virtue is, I suggest, our first clue linking Jābirian *ṣanʿa* and *ʿajab*, which is the topic of the following section.

Jābirian ṣanʿa *and the aesthetics of* ʿajab

Having examined the usage of the term *ṣanʿa* in the Jābirian *K. al-ḥudūd, K. ikhrāj,* and *K. al-khawāṣṣ al-kabīr*, I now turn to a consideration of if and how Jābirian *ṣanʿa*–taken here at its broadest meaning of 'artifice'–might participate in the same aesthetics of *ʿajab* that the previous chapter located in contemporaneous, cross-disciplinary materials. I have shown that *ṣanʿa* across disciplines invokes an ambiance of preconception, purposefulness, planning, time, intellection, complexity, well-wroughtedness, fineness, delicacy, modification, excellence, subtleties, pleasure, and wonder. This category of action is engendered and enacted by differing cosmological actors at different cosmological levels: this type of making with its associated qualities exists at human, natural, and divine levels of being. Carefully wrought work, well-laid plans, and intricate design also produce a sense of wonderment, regardless of who or what is making those plans and designs (i.e. regardless of their cosmological level). Furthermore, artifice often references back to the wonders of divine creation; as such, wonder is a through-line to the cosmological scalability of artifice that grounds a theorization of the concept in a positive notion of devotional imitation.

I argue here that Jābirian texts, and therefore a Jābirian theorization of artifice, also participate in that same aesthetic of *ʿajab*. This is most apparent in the *K. al-khawāṣṣ al-kabīr* and the *K. ikhrāj*; however, reading across Jābirian texts also helps to demonstrate how the *K. al-ḥudūd* motions to an aesthetics of *ʿajab* or implicitly invokes it, as well. This means, therefore that Jābirian *ṣanʿa*, like the *ṣanʿa* of contemporaneous, cross-disciplinary texts, carries with it a positive notion of devotional imitation.

That this is the case carries with it three major implications. First, finding that Jābirian texts participate in the same aesthetic of *ʿajab* as other contemporaneous materials across genres reveals the presence of a cross-generic 8th-10th century cultural discourse on the idea of artifice. It also reveals that alchemical texts (or work that is often ghettoized within the occult sciences, or even the history of science) take part in this discourse, as well. There is a cultural through-line; there is a broader, 8th-10th century conversation that took place on theorizing artifice across genres that scholars are often hesitant to place into conversation with one another. Furthermore, the participants in this conversation defy contemporary categorizations and marginalizations of disciplines: the conversation itself is more capacious than scholarship has been.

Second, this relationship of *ʿajab* to Jābirian texts shows, akin to the first point about participation across discourses, that the reification of fields of medieval Islamic 'science' and/as opposed to 'art' may be a transposition of our understandings of contemporary categories onto the past. Jābirian texts–that, as I have said, tend to be read as part of natural philosophy or the occult sciences–have internal aspects and external connections to disciplines beyond natural philosophy and the occult sciences. The aesthetic of *ʿajab* highlights this. We do these texts a disservice when we only interpret them according to paradigms of 'science', effectively speaking over them, and relegate the conversations of craft discourse to implicitly inferior classifications of 'art' or 'manual labor'.

Third, the place of *ʿajab* in Jābirian alchemy challenges the teleological sense of alchemy's direct rise into European chemistry that I critiqued in the Introduction, as well as the sharp delineation between science and art that I have just mentioned above. This is not to say that chemical knowledge in Jābirian alchemy has no relationship to contemporary chemistry, nor that

chemistry does not have any origins in alchemy. Instead, it is to say that Jābirian alchemy is not "pure science" as historians of chemistry in 20th century Europe often represented it, borne safely through history from the ancient Alexandrians and Greeks to the modern Europeans by way of the rare rational medieval Muslim. It is neither unique to nor untouched by its cultural context. It is, rather, a *part* of its cultural context, a participating member in medieval Islamic aesthetics, theorizations, and discourses.

Directly related, the presence of *ʿajab* in Jābirian alchemical thought also invites us to spot a critique of the historical meaning (and therefore also the present meaning and valuation) of 'science' that is internal to Jābirian materials. Jābirian science is not absent of wonder, or of literary qualities, or of religiosity. Its value to its practitioners and readers does not exclusively rest on its objectivity or even its methodology. These Jābirian texts challenge the presupposition that scientific-mindedness, scientific learning, and scientific knowledge are necessarily absent of wonder, aesthetics, or cosmology in order that they be 'scientific'.

K. al-khawāṣṣ al-kabīr

We begin with the *K. al-khawāṣṣ al-kabīr*. The linkage between artifice and wonder is drawn sharply in the following discourse in the text on the science of Balance, which specifically discusses Balance as a *craft*. The Jābirian author writes:

> "And would that we recount the hidden properties in the Balance according to its four paths/ways which are in processed/ordered things and *al-ghabīṭa* and individual processed/ordered [things] and individual/singularized *al-ghabīṭa* and the system of the letters and the installment of their actions and their names to what follows that among the

> wonders (*ʿajā'ib*) of the actions and how it falls in order that indications in that exist according to what is needed among the craft (*ṣinā ʿah*) of Balance, so know that."[81]

In this passage, we learn that actions can be wondrous, and that these wondrous actions are a component of the science of Balance. Furthermore, Balance is here described as a craft, implying human agency in the undertaking of the science of Balance.

Balance is not the only science that is sketched in relation to wonder in the *K. al-khawāṣṣ al-kabīr*. There are examples of where sciences, as well as books detailing aspects of sciences and bodies of knowledge, are understood to be specifically wondrous:

> "And we need to speak on the research of the agent (*fā ʿil*) according to the obligation of the balance and its special properties and the properties of the ancient and the intellect and knowledge and what is the image of that in this book, in order that the speech regarding all of its parts becomes clear according to the truth of that and the rarities of the sciences are continued for you in this book."[82]

> "Therefore these books, I mean the [books of] special properties, gather an elegant thing and their composure is a wondrous composition. As for these books and the letters in them, they encompass the science of the Balance and they add to the books of balances and what is in them is necessary for you regarding the science of the Balance."[83]

> "And by God, I certainly worked it by my hands and by my intellect before and searched for it in order that it be true and I examined it and it did not lie. The wounding for you is necessary if you abandon its quest, so look what is in it and you will find it wondrous, inshaAllah."[84]

> "Certainly we elucidated from these books, which are about the metallic bodies (*ajsād*) specifically and how they are and about the spirits and how they are and about the material bodies (*ajsām*) and how they are in the Book of the Individual Bodies among the hundred and twelve, many rarities and wonders."[85]

[81] Ibid, 233.
[82] Ibid, 261.
[83] Ibid, 299.
[84] Ibid, 322.
[85] Ibid, 327.

> "And certainly we judged it in our book that is known on reserved knowledge and in it are the rarities of sciences and it [the book] is the achievement/realization of hidden knowledge."[86]

These examples demonstrate a consistent relationship charted between Jābirian knowledge and wonderment. A key theme is how composition is wondrous: the compilation of material into books, the way in which *ajsād*, *arwāḥ*, and *ajsām* interrelate to form composed bodies, scientific knowledge, and the science of Balance, which itself–as has been noted before–is compiled from a number of disciplines, *ʿilm al-ṣanʿa* among them. This resonates with the planning and careful designing of an overall aesthetic of *ʿajab*: the careful way in which things are ordered is wondrous. The kinds of compositions described here as wondrous also include those conducted by humans; it is not as though *ʿajīb* is a term used only to describe qualities that "naturally" inhere or appear in the universe.

Processes and properties are also routinely described as wondrous. Take the following examples:

> "And this is, in the Balance, a wonder that one of the sciences does not enter upon it nor the process nor other-than-it."[87]

> "And we need to speak about, in another of these treatises, another issue regarding living and dying and we make it another of these treatises, so indeed this is among the wondrous special properties."[88]

> "So they asked me about the cause and they wondered at it, then they said: indeed we, when we work this, [it is] with oil and we halt it without fire and dye, so is it not intended regarding the oil and gold that the gold dye/color it? I said: I seek refuge in Allah. So they asked me about the accident/efficient cause in that and they made it pure in quality and indeed this is among the wonders."[89]

[86] Ibid, 328.
[87] Ibid, 246.
[88] Ibid, 269.
[89] Ibid, 308.

> "One must know the search for Balance because who athers the letters of titles of these books of mine regarding balances and their titles and their systems according to what we taught you in the teaching of the letters goes out from them–by the truth of my master prayers of God upon him–knowledge of the greatest, nearest gate along the path of balance. Is this not among the greatest special properties and the precious, wondrous virtues?"[90]

The description of processes as wondrous emphasizes the fact that wonder and artifice are related to one another. This is especially notable in the quote discussing dyeing and oils above. This quote also makes explicit a connection between alchemical processes in their narrowest sense (i.e. operations performed on gold in a laboratory setting)--and thus *ṣanʿa* on one specific level of meaning–and wonderment.

One might reasonably ask if special properties are or have a relation to human making. Granted, a number of different aspects of special properties, both related and unrelated to artifice, could also participate in an aesthetic of *ʿajab*. However–and this is very exciting–the *K. al-khawāṣṣ al-kabīr* comments on the question of the 'naturalness' of special properties. The text explicitly defines special properties as *not* natural: ""And for the special qualities–which are situational/substantial, not natural–is the Book of Hoarded Knowledge which collates all of these books and among them…"[91]

Additional information on the relationship of special properties to naturalness delineated is provided elsewhere in the *K. al-khawāṣṣ al-kabīr*, when the Jābirian author writes:

> "So know these rules, oh Brother, and derive from them the Science of the Balance only according to the positions of the letters, which is a thing difficult to seek, which is situational/low. But when it is situational/low, indeed its composition is natural, specific. **Indeed, however, the Balance is worked by the thing which is necessary and natural,**

[90] Ibid, 319.
[91] Ibid, 332.

> **and the positional rather is connected to the natural thing, so the two natures have a result**. And the situational/low is connected, then removed, so know that."[92]

Thus the continued relationship strung between wonder and properties is further evidence of the participation of artifice in an aesthetics of *ʿajab* in Jābirian texts.

Finally, the *K. al-khawāṣṣ al-kabīr*, in the examples previously given above, notes the wondrousness of virtues. Recalling the aforementioned obsession the *K. al-khawāṣṣ al-kabīr* possesses vis-a-vis describing *ṣanʿa* as related to virtues and benefits, we can note that this reference to the wonder of virtues, too, may further indicate a link between artifice and a sense of wonder.

K. ikhrāj

Does the *K. ikhrāj* also locate *ṣanʿa* within a broader aesthetic of *ʿajab*? To address this question, I discuss the presence and uses of wonder-terms within the text, and the broader literary sensibility presence in the *K. ikhrāj* on the basis of its structure. I argue that the text as a whole is a), itself a broad theorization of artifice which b) associates artifice and *ʿajab* through structure and style.

If we are reading the *K. al-ikhrāj*, and specifically the *Qawl al-ṣanʿa*, for an explicit relationship between *ṣanʿa* and *ʿajab*, there is only a singular example where the two concepts are explicitly linked–and there it is by way of *badīʿ*, a synonym for *ʿajīb*. While discussing medicine (*ʿilm al-ṭibb*) and the makeup of the eye specifically, the Jābirian author writes: "And I will recount here what is suitable of the wonders (*badīʿ*) of the world and formation/crafting (*ṣanʿ*) of nature."[93] Thus there is a connection between the marvelous and *ṣanʿa*, though it is

[92] Ibid, 282.
[93] Ibid, 58.

brief; this example also emphasizes again that artifice occurs at a number of levels of the universe. However, on the whole, on a word-by-word level, the *K. ikhrāj* does not routinely link *ṣanʿa* with features of an aesthetics of *ʿajab* such as excellence, positive abnormality, and devotional imitation.

However, if we examine this *Qawl* not for what it says explicitly about *ṣanʿa* but instead for how it locates *ṣanʿa* within the greater scheme of the entire *K. ikhrāj*–if we are reading for *ṣanʿa* as artifice beyond the technicalities of alchemy, and if we take up more literary methods in our considerations of alchemical texts–then I suggest that it does. The regular invocation of component parts of the universe as wondrous situates the entire enterprise of artifice–which I am arguing is the topic of the *K. ikhrāj* writ large–within an aesthetics of *ʿajab*.

The *K. ikhrāj* consistently notes processes, materia, and phenomena as wonders or wondrous. Terms used include *ʿajā'ib*, *ʿajīb*, and synonyms such as *badiʿ* and *ṭarā'if*. Take the following smattering of examples:

> "And I will recount here what is suitable of the wonders/marvelous things (*bi-badīʿ*) of the world and the formation/crafting (*ṣunʿ*) of nature."[94]

> "And fire, which flares in the upper part of vials [filled] with wine and boiled salt and what is like that from among things regarding marvelous innate properties *(al-khawāṣṣ al-badīʿah*), which it is thought that the amount of the benefit in it flows."[95]

> "Among the *bukhūr* of Mars, for inclination, hot and dry: a particular kind of perfume (*al-sukk*), saffron, the rust of iron, verdigris, balm-tree, seed of balm-tree, gum-resin, pepper, and mastic only. Among the *bukhūr* for opposition, cold and wet: grape of the fox, "life of the world" (stonecrop), "pastor's rod" (knot-grass), opium poppy, psyllium seed—and all of these are dried. Indeed they are among the wonders (*al-ʿajā'ib*)."[96]

[94] Ibid.
[95] Ibid, 76.
[96] Ibid, 88.

> "And this is the *khabar* which has the occurrence of benefit, all of it, and to it is that which may be truth or falsehood and in it wonders (*al-ʿajā'ib*) are hidden in discourse on the impossible and the true."[97]
>
> "As for Venus, it also resembles Mars, and the moon is two and half days, and how wonderful (*aʿjab*) is what is in the matter."[98]
>
> "My brother, listen to what I tell you here regarding the science of the stars and the rarities/oddities (*ṭarā'if*) of their work which extrudes from potential into actuality."[99]
>
> "My master, prayers of Allāh upon him, loved it [the Arabic language] and the view of it endures due to its beauty. It is wondrous (*ʿajība*), strange (*gharība*), we understand from it the movement of all things which move and the articulation of every sound either by the meaning from it or by something else…"[100]

Wonders or what is wondrous are presented in these examples as a) a category of excellence within the world, which includes the "crafting" of nature, b) materia with special properties that increase benefit, c) a number of *bukhūr*, some of which are processed and some of which are unprocessed, as al-Khawāzrimi noted, d) an aspect or element of language, and e) aspects of celestial bodies, including the rarities produced by the workings of celestial bodies that draws potential into actuality. This is to say, wonders are described not exclusively as of a "natural" providence, for materia processed by human hands is included (i.e. verdigris) as are celestial bodies, which contemporary readers may intuitively position as 'natural' but for the medieval Arabic philosopher would be above the world of generation and corruption ('psychical') and thus beyond the natural.

As I have said, we can read the *K. ikhrāj* as a text fundamentally about artifice, about the component pieces of a crafting enterprise that make up how the world functions and how power is channeled within that world. Throughout this synthesized discourse, diverse concepts of

[97] Ibid, 10.
[98] Ibid, 38.
[99] Ibid, 33.
[100] Ibid, 15.

wonder are consistently invoked, as demonstrated in the examples above. Wonder is not invoked with regards to a single specific thing across the text, but readily noted as part of the experience of dealing with psychical, natural, and human "crafting" and cosmic relations. I would argue, too, that, throughout the *K. ikhrāj*, concepts of wonder are also *evoked*: even when the author does not explicitly label something as 'wondrous', the same form of listing and enumerating a multitude of (often rare, often esoteric) materia related to a planet or a concept works to affectively stimulate a sense of wonder throughout the reader's experience, strengthened by the fact that sometimes indeed the author makes the relationship between "stuff" and wonder explicit.

In this way, through structure and style, the *K. ikhrāj* also suggests the participation of *ṣanʿa*, both as artifice and alchemy, in an aesthetic of *ʿajab*.

K. al-ḥudūd

As for the *K. al-ḥudūd*, the two aspects of the presentation, location, and definition of *ṣanʿa* in this text strike me as particularly noteworthy with regards to a broader aesthetic of *ʿajab* constructed in the text. First, *ṣanʿa* is explicitly harnessed in an "unusual" manner (*min jiha ghayr muʿtāda*), directly contrasted to the "typical" manner of other sciences and crafts (*ṣanā'iʿ*) (*min al-jihāt al-muʿtāda*). Second, the goals of Jābirian *ṣanʿa* in the *K. al-ḥudūd* are, on the one hand, specific and unique to the alchemical context–the creation of the elixir–and, on the other hand, very much in line with the type of cosmological artisanal imitation described by the Ikhwān al-Ṣafa'. A major feature of divinity is an independence, singularity, and uniqueness not found in any aspect of creation. *ʿIlm al-ṣanʿa* produces the noble knowledge of the lower world,

which, as discussed before, can be more precisely understood through additional Jābirian definitions as the discrete knowledge by which one is independent in leading a good life. *Ṣanʿa* is the means by which other sciences are harnessed towards a goal: the creation of the elixir and also (and thus, *which* is also) the means by which humans attain a state of independence. One can assume from this that a practitioner of *ʿilm al-ṣanʿa* is intentionally striving towards independence–an action that can be interpreted as akin to a craftsperson working to perfect their craft in devotional imitation of the divine.

My interpretation of *k. al-ḥudūd* and its relationship to a broader aesthetic of *ʻajab* benefits tremendously from intratextual readings of other Jabirian treatises; in fact, it is truly in placing the *k al-ḥudūd* in conversation with other Jabirian works that we can best see how well the *k al-ḥudūd* fits within the same paradigm of an aesthetic of *ʻajab*, despite its lack of explicit references to the notion of *ʻajab* itself. First, the discussion of benefits in the *K. al-khawāṣṣ al-kabīr* provides a valuable link to the *K. al-ḥudūd*, which so fundamentally defines *ṣanʿa* on the basis of the benefits incurred through it: independence, or the ability to lead a good life and to acquire benefits independently. This talk of benefits also resonates with another Jabirian text that I have not yet discussed at length. The *k. al-nukhab*, widely but incorrectly known as the *k. al-baḥth,* is a Jabirian text concerned with teaching the craft of talismanery and its natural-philosophical foundations.[101] In that text, the Jabirian author juxtaposes bodies (*ajsām*) that are *ṣanāʾiʿ* and *mihanī.* As scholar of Jābirian studies Liana Saif notes, “The root *ma-ha-na* signifies having or obtaining profession or providing a service; whereas *ṣa-na-ʿa* indicates creating, making, and devising.”[102] Saif goes on to describe how the *k. al-nukhab* then goes on to discuss how there are different and specific benefits associated with these two approaches:

[101] Liana Saif, "The Jābirian Kitāb al-Nukhab and Teaching the Science of Talismans in the Abbasid Era," in *Journal of Abbasid Studies* 1, no. aop (2024): 3.
[102] Ibid, 5.

> "The first approach is utilitarian, exemplified by the profits gained from arithmetic in commerce and accounting, geometry in land surveying and building, astrology in agriculture, and music in holidays and festivals. The benefits of the second approach are found on the level of 'intellectual matters' (*al-umūr al-ʿaqliyya*) or 'the shrewdness and the discipline (*al-riyāḍa*) of the senses.' This is the epistemological refinement that is required for all who seek the knowledge of the verified truth behind everything in order to access *falsafa, ḥikma,* and *kamāl*—philosophy, wisdom, and perfection."[103]

Ten sciences total (talismanery, mathematics, arithmetic, geometry, astronomy, music, the science of qualities and conditions of natural things, alchemy, the science of the nature of the planets and their actions, and philosophy) are necessary for wisdom.[104] The pursuit of wisdom through this learning, according to the *k al-nukhab, "*...carries immense benefits…Once this matter is envisioned by a human being, he ascends beyond the ranks of [ordinary] people and finds himself in the class where the mysteries of wisdom are grasped…profound understanding of every sublime thing is mastered by complete competence…God guides one towards beneficial directions…"[105] Here, not only is there a resonance around the discourse of benefits found in the pursuit of *ṣanʿa*, but also in the atypicality or unusualness of a certain kind of knowledge and its relationship to sublimity. Even further, the acquisition of numerous branches of knowledge for a higher end resonates, too, with the *k. ikhrāj* and the varieties of knowledge one must acquire to work towards the ultimate end of *ṣanʿa*, presented there as *takwīn*.

Something emphasized across these definitions of and relating to *ṣanʿa* is how *ṣanʿa* enables human independence in such a manner that the knowledge or discipline of the use of this tool (alchemy) is the pinnacle of sciences. The connotation of excellence and even extremity, also witnessed in discourse on *ṣanʿa* in other genres, is also present in the *K. al-ḥudūd*. Indeed,

[103] Ibid, 6.
[104] Ibid.
[105] Ibid, 6-7.

with an eye trained to *ṣanʿa*, the *K. al-ḥudūd* reads like a work which provides a means of distinguishing alchemy from other crafts and elevating it in comparison.

Thus, the *k al-ḥudūd* can be taken as a complement to Jabirian texts that more explicitly draw relationships between *ṣanʿa* and *ʿajab*, such as the *k. ikhrāj,* the *k. al-khawāṣṣ al-kabīr*. Furthermore, the *k. al-nukhab* itself also routinely makes references to processes being *ʻajīb*, using phrases such as *al-khawāṣṣ al-ʻajība* (wondrous properties) and *afʻāl ʻajība* (wondrous actions). *ʻAjab* is explicitly mentioned, in fact, eleven times.[106] Thus, we can spot a matrix of interconnectivity between the abnormality and atypicality of *ṣanʿa*, the procurement of benefits and the acquisition of learning, and a sense of wonder and sublimity associated with this excellence in which the *k. ikhrāj,* the *k. al-khawāṣṣ al-kabīr,* the *k. al-ḥudūd,* and the *k. al-nukhab* all sit. Finally, it is worth noting that this nexus is reminiscent not only of the invocation of wonders through rarities and oddities as found in the *K. ikhrāj*, but also across the pairing of *ʿajā'ib* (wonders) with *gharā'ib* (the strange or unusual) across a broader wonder discourse. *Ṣanʿa* is unusual, exceptional–and much like we have witnessed in poetic discourse, that abnormality is part of what connects it to wonder.

Conclusion

This chapter has explored Jābirian theorizations of artifice by way of the term *ṣanʿa*, asking what comprises artifice according to the corpus, how human making is or is not distinguished from other ontological varieties of making, and whether artifice participates in the same aesthetic of *ʿajab* found in contemporaneous texts across genres. I have read the Jābirian *k.*

[106] I thank Liana Saif for allowing me early access to her edited text of the *K. al-nukhab*, which enabled me to make these observations.

al-ḥudūd, k. ikhrāj, and *k. al-khawāṣṣ al-kabīr* as a means of pursuing answers to these questions in Jābirian texts that are systemically-minded (i.e. deal with a larger system of Jābirian thought) and address fundamentals of a Jābirian worldview.

Notable features of Jābirian *ṣanʿa* include the tendency towards metonymy–*ṣanʿa* is used to mean alchemy and artifice, often with alchemy metonymically standing in for a human level of artifice. This usage enables, in fact, a cosmological scalability (*ṣanʿa*, artifice, is a process occuring at numerous cosmological levels and by differing cosmological actors) that is one of the theorization's major features, and one of its most consistent qualities across texts. The scalable sense of artifice is also a positive one, cited in regular reference to benefits, value, and virtue. Taken together, these qualities indicate that Jābirian *ṣanʿa* is being theorized in a similar manner to contemporaneous, cross-generic texts. Furthermore, my readings of these three texts show how Jābirian *ṣanʿa* also participates in the same aesthetic of *ʿajab* found in other sources. The cosmological scalability of artifice comes in part from the throughline across ontological levels and actors of *ʿajab* that references back to divine creation and makes artifice an activity of positive, devotional imitation.

I therefore find that Jābirian writings do participate in a broader, cross-generic theorization of artifice throughout the 8th-10th centuries that uses wonder as a means to reference and transition across cosmological levels in creation and making. There are numerous implications to this, including a challenge to sharp delinations betweens arts and sciences, a critique internal to the Jābirian corpus of the disenchantment of 20th century science, and a refutation of Jābirian alchemy as an eternal nugget of enlightened scientific thinking that transcends its cultural contexts and exists solely to become modern European chemistry.

Altogether, this supports the value of intertextual and comparative methods in reading the Jābirian corpus.

In future iterations, this chapter would benefit from the inclusion of a discussion of Jābirian poetry and its relationships to *ʿajab*, as well as more thorough additions of numerous other Jābirian texts that presently exist only in manuscript form, such as the *k. al-nukhab*. As I have discussed in brief, these texts also contain references to *ʿajab* and alchemical processes, and so detailing their theorizations further would bolster my existing discussions on a subsisting aesthetics of *ʿajab* within highly technical Jābirian material.

Part Two

Artificiality

Chapter Three

‘Artificial’ Life? Theorizing *Takwīn* as a Category of Making

Introduction

> “If lettuce leaves are ground, combined with the blood of a camel or its butter, and buried in manure in a lead container, a riding animal with a form that has a head like the head of a camel and two eyes and two small wings will be generated from it.”[1]

So the 12th century alchemist al-ʿIrāqī describes the generation (*takwīn*) of a camel-faced creature in his *ʿUyūn al-ḥaqā’iq*. The creation of a fantastical creature through this sort of strange means is by no means unique to al-ʿIrāqī; rather, there is a long tradition of “artificial generation” through magical, alchemical, and natural-scientific practices found in Greek, Arabic, and Latin texts of the antique, medieval, and early modern periods. The idea could fairly be described as notorious: no shortage of ink has been spilled in scholarship on *takwīn*, which is the Arabic word for “artificial generation”, or its Greek and Latin counterparts. This is for a few reasons. *Takwīn* is a link between ancient Greek, the medieval Arabic, and the later-medieval Latin texts, making it an idea of great interest to those focused on origins, exchanges, and developments of particular ideas within the history of science and natural philosophy in the Mediterranean. It stretches credulity, but it is discussed by historical authors with matter-of-fact seriousness and specific instructions for specific results are usually given. It is also often disturbing: the above example of a lettuce and camel blood mixture is tame compared to some procedures of *takwīn*, which can include vivid descriptions of bestiality, violent killings, and

[1] Liana Saif, "The cows and the bees: Arabic sources and parallels for pseudo-Plato's Liber Vaccae (Kitāb al-Nawāmīs)," in *Journal of the Warburg and Courtauld Institutes* 79, no. 1 (2016): 34. Translation mine.
“إذا دق الخس وأُوِّث بدم الجمل أو زبده ودفن في الزبل في إناء رصاص تولد منه دابة في خلقه لها رأس شبيه رأس الجمل ولها عينان ولها جناحان صغير ان وهذا مثالها"

unsavory mixtures of blood, semen, and flesh–all performed in the name of creating new, unique lifeforms.

Takwīn is a term central to the Jābirian corpus, representing the furthest end of Jābirian cosmological potentiality, talismanic construction, and natural philosophy: it is, in short, the crafting of new and unique lifeforms. In the Jābirian corpus, the procedures of *takwīn* detailed are fairly mild, all things considered: they are still grisly in the presence of animal matter and the post-mortem combinations of human and non-human flesh, but violence and sex acts are both by and large glossed. What is, however, so special about *takwīn* in the Jābirian corpus (aside from it being the pinnacle of Jābirian potentiality) is that the Jābirian author describes a machine that reads much like an artificial womb for undergoing the procedure. It is a fascinating piece of text and a fascinating larger idea within the corpus. Paul Kraus wrote extensively about the concept in his 1942-1943 opus about the topic, which features a large section on 'artificial generation' that begins by establishing distinctions between "création divine et création humaine". According to Kraus, the Jābirian alchemist imitates divine creation through an application of natural science to create artificial life. This is exemplified in the Jābirian *K. al-tajmīʿ*, which features the construction of what is best termed a machine for procedures of this process.

Though it may seem initially innocuous, the translation of *takwīn* as 'artificial generation' necessarily imposes a modern ideation upon a medieval concept. Generally speaking, premodern and modern thinkers legislate the differences between divine, natural, and human creation with unique assumptions about the relationship and connectedness (or disconnect) of the divine to creation on the whole. In other words, for something to be artificial for a 20th or 21st century means something different than it does for a medieval audience. Certainly, speaking from the 21st century, the notion of the artificial is one laden with anxiety, as artificiality has connotations

of the unreal, the fictive, and the negative: both artificial intelligence (whether that is a computer or Frankenstein[2]), artificial terraforming ("fake snow" at ski resorts or man-made islands off the coast of the Arabian peninsula[3]), and clones[4] are all marked as distinct from their naturally-occurring counterparts. They haunt discourses of science fiction and ecocriticism in particular; they are tainted with a sense of danger and a moral warning. This happens on a smaller scale, as well: detractors of body modifications, ranging from tattoos to *in vitro* fertilization to hormone replacement therapy to gene therapy, find the language of critique and its underlying ideation in this negative, unreal sense of what it is for something to be artificial. Regardless of the scale of impact, the stakes of artificiality are high: ethics, the limits of human capacity, the appropriateness of human ambition, and the relationship of humans to a sense of the divine are all captured in artificiality's discourse.

Thus, to not consider what a theorization of artificiality meant for a Jābirian author when reading around ideas of craft, making, and creation is to neglect to take seriously the historicity of the Jābirian corpus. This is especially important to hold in mind when thinking about *takwīn*, because *takwīn* sits at the intersection of numerous provenances and categories of making, and, in so doing, strongly challenges the reification of these categories in a contemporary sensibility. *Takwīn* is a process that simultaneously invokes what a contemporary reader would term the divine, the natural, and the artificial. The alchemist chooses to attempt the process of *takwīn* and makes use of technology to accomplish it; however, *takwīn* is often discussed in the same breath as *tawlīd*, *tawallud*, and *taʿfīn*, varieties of generations that are translated as spontaneous generation (*tawlīd*, *tawallud*) and putrefaction (*taʿfīn*)--terms that are associated with natural

[2] Examples extend to include novels such as *Neuromancer* (1984) and *Frankenstein in Baghdad* (2005), movies such as "Blade Runner" and "Poor Things" (2023), and all cultural criticism following the advent of ChatGPT.
[3] E.g. the art and criticism of Sophia al-Maria.
[4] Bananas and Daisy the Sheep are two examples of this.

processes. It has divine resonances not only because *takwīn* claims to accomplish the creation of rational and ensouled beings, but because of the root of the word, *k-w-n*, is shared with the Qur'ānic edict of creation *kun fa-yakūn*, be and it is, as well as with the concept *kawn wa-fasād*, generation and corruption, found in philosophical writings of the early medieval Islamic period. Thus to interpret, translate, and define *takwīn* as 'artificial generation' is to meaningfully theorize the act itself, and not neutrally (no theorization is). Translating with the term 'generation' here is an "uber-Aristotelianization" of *takwīn* that overlooks the exegetical and Qur'ānic meaning derived from the Qur'ānic *kun*. There are two major reasons why scholars have done this to *takwīn*: Islamic agency and Orientalism. On the one hand, Muslim translators did themselves see a parallel between the Aristotelian notion of *gígnomai* (to come into being) and *takwīn*. On the other hand, scholars such as Paul Kraus viewed the Jābirian corpus as a mine for Greek fossils and neglected to consider the existence of the term *takwīn* before the Greek terms came into the Arabic lexicon during the translation movements of the 8th and 9th centuries. *Takwīn* carries its own (Arabic and Islamic) baggage which cannot be ignored, including cosmological and divine meanings. To collapse *takwīn* into the Aristotelian 'generation' actually serves to impose lines that need not be there: for the Jābirian corpus, *takwīn* conceptually included the Aristotelian "*gígnoma*ntic" sense and also the Qur'ānic sense of the term simultaneously. Directly related to this last point, translating *takwīn* with the term 'artificial' continues this anachronism and sets *takwīn* as a creative act apart: it necessitates de-coupling of the idea and process of *takwīn* from both natural and divine actions.

This is not to say artificiality is a topic un-considered by ancient, medieval, and/or Islamic thinkers: artificiality is not the exclusive intellectual property of modern subjects, even if contemporary discourse on the idea is shaped strongly by frames of modernity and secularism.

Much of the medieval Islamic takes the Aristotelian and/or pseudo-Aristotelian as an initial interlocutor. In his *Physics*, Aristotle defined the artificial as different from the natural on the basis of innate principles of movement and change;[5] Aristotle also posited two functions of art, which served, respectively, to perfect processes of nature or to simply imitate it.[6] Even further, in *Mechanical Problems* (*Problemata Mechanica*)[7], a Greek pseudo-Aristotelian treatise on mechanical questions, the author claims that "...marvelous phenomena can be produced either when we do not know the cause of a thing or when art is induced to act 'against nature' (*para physin*),"[8] meant in the sense of contrary to the natural operations of the four natural qualities without depending on the physical natures of bodies (in an Aristotelian, four-quality perspective).[9]

The philosopher and polymath al-Kindī (d. circa 801-66 CE) argued in his works that humans cannot reproduce the actions of nature; the physician and philosopher Abū Bakr Muhammad ibn Zakarīyā al-Rāzī (c. 864/865–925/935 CE) rebutted al-Kindī's claim, largely on the basis of their differing conceptions of matter, in his philosophical and cosmological writings.[10] The philosopher al-Farābī (d. 950 CE) argued that metals are only distinguishable by their accidents and so can be transmuted across one another. The physician Ibn Sīnā (d. 1037), in his refutation of alchemy in the *K. al-shifā'* (Book of the Remedy), argued against this idea:

> "Art (*al-ṣinā'ah*) is weaker than nature and does not overtake it, however much it labors. Therefore let the artificers of alchemy (*aṣḥāb al-kīmīyā'*) know that the species of metals cannot be transmuted…But they can make similar things, and tint a red [metal] with

[5] William R. Newman, *Promethean ambitions: alchemy and the quest to perfect nature* (Chicago: University of Chicago Press, 2019), 16.
[6] Ibid, 17.
[7] On the contested history of the transmission of *Problemata Mechanica* into Arabic, see Mohammed Abattouy's "*Nutuf min al-ḥiyal*: a Partial Arabic Version of Pseudo-Aristotle's *Problemata Mechanica*" (2001).
[8] Ibid, 20.
[9] Ibid, 21-22.
[10] Manfred Ullmann, *Die Natur- und Geheimwissenschaften im Islam* (Leiden: Brill, 1972), 250 and Peter Adamson, "Abu Bakr al-Razi", in *The Stanford Encyclopedia of Philosophy* (Summer 2021 Edition), ed. Edward N. Zalta, URL = <https://plato.stanford.edu/archives/sum2021/entries/abu-bakr-al-razi/>.

> yellow so that it seems gold, and tint a white one with the color that they want until it is very similar to gold or copper. They can also cleanse the impurities of lead, although it will always be lead. Even though it may seem silver, alien qualities will dominate in it, so that men err in this just as those who accept [artificial] salt and sal ammoniac err. I do not believe that it is possible to take away the specific difference by some technique because it is not due to such [accidents] that one complexion is converted into another, since these sensible things are not those by which species are transmuted; rather they are accidents and properties. For the differences of the metals are not known, and since the difference is not known, how will it be possible to know whether it is removed or not, or how it could be removed?"[11]

As historian of medieval alchemy William Newman discusses, Ibn Sīnā holds that "...the perceptible accidents of a natural object—such as the color, density, or melting point of a metal–played no part in determining its essence. The substantial forms of all things lurking beneath the phenomena–insofar as they were causes underlying the sensible world–were to Avicenna unknowable…It was reserved to God and the celestial intelligences to have real access to the substantial forms that underlay the phenomena surrounding us."[12] Jābirian texts do believe in the validity of their alchemical practice, in the real power of transmutation and alchemical transformative processes, whereas Ibn Sīnā refutes the possibility.[13]

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[11] Ibid, 37, and C.D. Mandeville and J.E. Holmyard, "Avicennae De Congelatione Et Conglutinatione Lapidum Being Sections of the Kitâb Al-Shifâ' the Latin and Arabic Texts Edited with an English Translation of the Latter and with Critical Note." RCP Library, Paul Geuthner, Wiley Digital Archives: The Royal College of Physicians. 1927. Accessed February 19, 2025. Pg 85.

[12] Ibid, 39-40.

[13] This refutation, which emerges at core from the belief that species are intransmutable, is referred to by bibliographers as *sciant artifces*, for the Latin translation of Ibn Sīnā's *k. al-shifā'* which was inserted by Alfred of Sareshel in 1200 into the fourth book of Aristotle's *Meterologica* reads, "Let the artisans of alchemy know that the species of metals cannot be transmuted" ("sciant artifices alkimie species metallorum mutare non posse") (Athanasios Rinotas, "The Sciant Artifices in the Work of Albert the Great: Towards Two Kinds of Transmutation?" in *Early Science & Medicine* 27, 1 (2022): 57–82. doi:10.1163/15733823-12340037). Both the dictum and idea are highly influential in medieval discourses on alchemy in a European context and in modern Euro-American scholarship on medieval alchemy. Responding to this dictum, alchemists of the medieval and early modern Latin West "...adopted a radical view of technology in which man assumed extraordinary power over nature…Their justification of human art was not based on vague optimism, however; it was supported by practical observation, analogical reasoning, and a Neoplatonizing Aristotelianism," as Newman writes in "Technology and Alchemical Debate in the Late Middle Ages" (William Newman, "Technology and alchemical debate in the late Middle Ages," in *Isis* 80, no. 3 (1989): 429). Newman and Rinotas discuss *sciant artifces* in great detail (in the aforementioned cited articles as well as the edited volume by Newman entitled "The Artificial and the Natural: An Evolving Polarity"), though from a eurocentric perspective focused on Latin responses to Avicenna and not the Arabo-Islamic alchemical tradition and its perspective on the transmutation of species or theorizations of technology.

Ibn Sīnā's view, Newman argues, is the same as the view found in the *K. al-siyāsa fī tadbīr al-ri'āsa* (The Book of Governance and Administration), known more commonly by its subtitle, *Sirr asrār* (the Secret of Secrets). The *Sirr asrār* is a highly-influential pseudo-Aristotelian work on astrology, magic, alchemy, medicine, and numerous other occult topics, and sits firmly within the Jābirian milieu.[14] On the matter of imitation and artifice, the text posits that, since a person can know only an object's accidents, only superficial imitations can be made.[15] Scholar of Arabic philosophy M. Grignaschi provides the following passage from a manuscript in the Suhāj Municipal Library:

> "The science of sciences is the science of making silver and gold. But the true substance of these minerals is inaccessible (to the alchemist) because (man) cannot make himself equal to the Creator — Sublime is His name — in the creation of substances. This is quite certain; nevertheless accidents are accessible and are not beyond the reach (of human action) They are part of the necessary laws. You must work on accidents, because when one follows in the treatment of accidents the path of harmony (of humors), it becomes easy to manipulate them…."[16]

However, of this passage, Grignaschi says,

> "We immediately recognize in these lines the teaching of Avicenna who, while conceding the possibility of 'dyeing' imperfect metals, denied that the techniques of Art were capable of transforming them into gold and silver. This denial, it is true, was already

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[14] While presently outside the scope of this dissertation chapter, I look forward to future endeavors placing the *Sirr al-asrār* and the Jābirian corpus in conversation, especially around the themes found in this work. For a thorough background on the *Sirr al-asrār*, I direct the reader to M. Manzalaoui, "The Pseudo-Aristotelian 'Kitāb Sirr al-asrār': Facts and Problems," Oriens 23/24 (1974): 147–257; M. Grignaschi, "L'origine et les métamorphoses du Sirr al-asrâr," Archives d'histoire doctrinale et littéraire du Moyen Âge 43 (1976): 7–112; idem, "La diffusion du Secretum Secretorum dans l'Europe occidentale," Archives d'histoire doctrinale et littéraire du Moyen Âge 48 (1980): 7–70; idem, "Remarques sur la formation et l'interprétation du Sirr al-asrâr," in Pseudo-Aristotle's "The Secret of Secrets": Sources and Influences, ed. W. F. Ryan and C. B. Schmitt, 3–33 (London: Warburg Institute, 1982).

[15] Newman, *Promethean Ambitions*, 41.

[16] *'ilmu l-'ulumi huwa 'ilmu 'amali 1-fiddati wa-d-dahabi wa haqiqatuha mumtani'ah 'id la yumkinu t-tasbihu bi-1-bari'i galla dikruhu IT masugati 1-gawhariyyah.wa 'ida sahha hada fa-l-'a'radu mudrakatun gayru muta'addirati wa hiya min gumlati 1-nawamisi d-daruriyyah fa-yagibu 'an tusgala bi- 1-a'radi fa-'innaha 'ida sulika biha maslaku 1-i'tidal ha fa 'amruhu. fa-hud mina z-zirnihi guz'an...* In M. Grignaschi, "Remarques sur la formation et l'interprétation du Sirr al-asrâr," in Pseudo-Aristotle's "The Secret of Secrets": Sources and Influences, ed. W. F. Ryan and C. B. Schmitt (London: Warburg Institute, 1982): 32.

> suggested by the translation that Yuhanna b. Batriq had given *Meteorologica*…But it would be difficult to attribute to a simple copyist of *Sirr al-'asrār* the merit of having extracted from this isolated passage of the Arabic translation of the *Meteorologica* such precise conclusions which were to arouse the reactions of the followers of Art. It is much more probable that the ms. Suhāj presents here an interpolation made at a time when Avicenna's theory was already known (11th century or even 12th century) (translation mine)."[17]

Thus further and deeper studies of the views of the *Sirr al-khalīqa* and its relationship to Jābirian theorizations will be a boon to both this research project and the field writ large.

In both al-Kindī and Ibn Sīnā's writings, there is a clear dividing line between what acts belong to nature and what ones belong to humans; there is an ontological distinction made between things made by these different actors. These debates about belonging and the provenance of natural, divine, and human actors are situated within a larger conversation about the definition of nature itself, the proper sources of authority on defining these ideas, and the causal relationship of the divine to the universe. In the intellectual tradition of *falsafa*–and here I borrow scholar of natural philosophy Jon McGinnis' delineation of *falsafa* not as 'philosophy' (contra 'theology') but rather a tradition adopting, adapting, and extending a Greek philosophical and scientific tradition–Aristotle's definition of nature was translated into Arabic with the word *ṭabīʿa* for *phusis* (nature) ("Nature [*ṭabīʿa*] is a certain principle and cause on account of which the thing in which it is primarily is essentially, not accidentally, moved and at rest"[18]). *Ṭabīʿā* and its root relates to stamping, sealing, and impressing. The Greek *phusis* relates to generating from within. However, McGinnis writes, "...while the notion that nature is a principle and cause is explicit in both the Greek and Arabic philosophical definitions of nature, the Arabic account carries with it an implicit sense that nature is imposed from without, whether by God or some

[17] Ibid.
[18] Jon McGinnis, "Natural Knowledge in the Arabic Middle Ages," in *Wrestling with Nature: From Omens to Science*, edited by Peter Harrison, Ronald L. Numbers and Michael H. Shank (Chicago: University of Chicago Press, 2011): 61.

other agent, and that it is only once a thing is so impressed that its nature acts as a cause of the various natural activities arise from it."[19] Building out from this point and from a synthesis of Galenic, Aristotelian, and Ptolemaic influences, the *falsafa* tradition understands the divine to be the ultimate cause of absolute existence of natures, and thus turns its inquiry to the question, "What causes the particular existence of a given nature in some bit of matter at a precise time?"[20] In the *kalam* tradition (which prioritizes and links the Arabic language and Islamic beliefs to these cosmological matters of inquiry), however, nature was often termed *ḥaqīqa* and it came directly from the divine, who was the true and sole cause (of existence, actions, motions, and changes) of all things. Thus the stakes of ontological provenance are quite high in the Jābirian milieu, both within the *falsafa* tradition in which many occult scientific texts are seen to participate and also across the discourse between *falsafa* and *kalam* as separate schools of thought.

The question that follows, to me, then, is do Jābirian texts make the same distinctions of provenance (natural, divine, human) as found in the above examples when discussing so-called "artificial life" and processes of *takwīn*? Or, put mostly broadly, is *takwīn* theorized as artificial in the Jābirian corpus? If so, what are the stakes of it being artificial, anyways?

In this dissertation, I have suggested that the use of conceptual frameworks of medieval Muslim agents, the establishment of context for Jābirian texts across different genres of medieval Arabic texts, and a more robust consideration of Jābirian intratextuality and corporeality (its nature as a corpus) lead scholars to a more capacious periodization for Jābirian writings, a more capious inclusion of Jābirian interlocutors, and more engagement across texts within the Jābirian corpus itself (Introduction). I have shown how the application of these principles–which enable

[19] Ibid, 63
[20] Ibid, 68.

our egress from the hold of that 20th century scholarship upon the Jābirian corpus as either an object or topic of study–onto Jābirian discourse reveals that 8th-10th century texts across numerous genres but all concerned with kinds of creation and making, including the Jābirian corpus, theorize artifice, theorize *making*, as an action across a cosmological scale that is invested positively in analogizing divine creation. Furthermore, it is one that participates in a large and cross-generic discourse around both craft and ʿ*ajab* (wonder) (Chapter One and Chapter Two). In the two chapters that conclude this dissertation, I trouble both the translation and interpretation of *takwīn* as 'artificial generation' by situating *takwīn* within a paradigm of artifice rather than through a paradigm of artificiality. The connotations of artificiality as they exist in the modern era do not align with what it means for *takwīn* to be a process undertaken by human hands. *Takwīn*, in its analogization of divine creation, makes imitation and the process of imitation something wondrous. It is best thought of as artificed generation (not artificial generation) because it is part of a cosmological sliding scale of making (of artifice) wherein there is *positive* value, not negative value, to human-made imitations.

I explore in this chapter, Chapter Three, if *takwīn* can and should be understood as a craft akin to the makings previously theorized in cross-generic sources contemporaneous to the Jābirian corpus. I argued in the Introduction that, when read with the methodological principles of cross-generic comparison, intratextuality, and autochthonous Muslim frameworks that I established as necessary for new directions of studying the Jābirian corpus, artifice (*ṣanʿa*) is cosmologically-scalable, planned, fine making or crafting that operates on human, natural, and divine levels and participates in an aesthetic of wonder (ʿ*ajab*) wherein it is modeled as a devotional imitative process that harkens back to the wonders of divine creation. In this chapter, much like Chapter One, I examine *takwīn* as it is found outside of the Jabirian corpus with these

same methodological principles. First, I examine different theories and varieties of generation across medieval Islamic thought, which are brought to mind by the *k-w-n* root from which *takwīn* is derived. I therefore explore resonances between *takwīn* and categories of the divine, the natural, the cosmological, and the human. I then turn to a set of texts in the Jābirian milieu that discuss *takwīn* to establish how the idea is broadly but explicitly theorized, including a discussion of the relationship between talisman-making and *takwīn*. Finally, I consider how *takwīn* in cross-generic, contemporaneous sources of the Jābirian milieu relates to craft, artifice, and wonder, complicating the theorization of the term as 'artificial generation' even before turning to its usage in the Jābirian corpus. On the whole, I argue that *takwīn* is a type of making that is associated with the crafting of talismans and with certain modes of production (*ṣanʿa*), invoking the same senses of complexity, forethought, and careful making as craft in other Jabirian-milieu sources, and explicitly linking craft and *takwīn* through terms such as *ṣanʿa*. *Takwīn* also participates in the same aesthetics of *ʿajab* (wonder), wherein the things crafted produce a sense of wonderment.

The work of this chapter is unique from previous scholarship on *takwīn* because no pre-existing studies, to my knowledge, explicitly interrogate the relationship between *takwīn* and artificiality beginning at the level of theorizing artificiality itself, questioning the appropriateness of the underlying concept of artificiality to *takwīn*. This chapter also highlights the relationship of wonder to medieval Islamic natural scientific and occult scientific discourse. While this is not an entirely new idea to the Islamicate occult sciences (both scholars of Islamic intellectual and cultural history Travis Zadeh and Persis Berlekamp come to mind as exceptional examples of the co-construction of wonder and (occult) sciences in medieval Islamic discourses), wonder has not, to my knowledge, been placed in relation to Jābirian studies and Jābirian texts before. There is a

lot of wonder implicit in Jābirian studies: take Jābir as the psychopomp of Ruska's "neue Chemie" or the almost-perverse fascination that permeates scholarship around Jābirian rituals of generation that produce scorpions, snakes, and hornets. As my students can well attest, there is routinely some horror or disgust at the fleshy "grossness" of what is described in texts of *takwīn*, including the Jābirian—but even as this horror can be said to inform and frame reactions to contemporary issues of artificiality, rarely is the relationship between wonder and horror considered in these forums. Are wonder and horror not flip sides of the same coin? Regardless, not only is the attestation of wonder within texts on *takwīn* a previously unexplored line of inquiry, wonder is, furthermore, rarely taken seriously as an interpretive or aesthetic strategy for Jābirian texts, which are otherwise siloed into natural philosophy and taken up with the seriousness of 20th and 21st century scientific study. Here, then, not only does my work take Jābirian historicity seriously in interpreting ideas, but it also asks about the possibilities of participating in pleasure and wonder while reading Arabo-Islamic texts in a non-Orientalist way, and offers a constructive attempt to participate in the wonder summoned by Jābirian texts while nonetheless still taking Jābir on his own terms. Finally, it offers new modes of interpretation for the artificial in the contemporary world and in relation to the questions of ethics, of human agency and capacity, of cosmology, raised by discourses around it.

Varieties of Generation

To begin interrogating if *takwīn* can and should be understood as something artificed akin to the craft and makings I have previously theorized throughout the Jābirian corpus and in contemporaneous, cross-generic sources, I explore connections between *takwīn* and different

provenances and varieties of making by examining different theories and varieties of generation across medieval Islamic thought brought to mind by *takwīn*'s lexical root. Here, I am organizing my research into categories of divine and sublunary (often what we would term 'natural'). Previous scholarship on *takwīn* has discussed the term with this same (divine/natural) division, tending by and large to explore it from the perspective of natural philosophy exclusively. In using this breakdown myself, I recognize that I am indeed perpetuating the same categories that I claim to challenge. I choose to do so in this instance not because I believe these elements of *takwīn* should be considered as separate or divisible within the term, but because it is the current scheme of scholarship and, in expanding our conception of *takwīn*, it is helpful to begin building out a richer understanding of the term and all its resonances from these previous categorizations.

With regards to divine forms of making, I look to works of theology and philosophy foundational across a broad swath of major doctrinal schools in the Jābirian milieu: the Qur'ān, works of scholastic theology (*kalam*), philosophical responses to *kalam* (*falsafa),* to Shīʿī and Ismaʿīlī theological works, and the *Ishārāt* of Ibn Sīnā. As for sublunary generation, I look to Aristotelian, Galenic, and Neoplatonic works of the same time period, in order to cover major trends of natural-philosophical thought.

Divine

There is no place to begin but the beginning: *kun fa-yakūn*, Be! So it is. As stated previously, *takwīn* shares its root with the Qur'ānic edict of creation, necessarily calling to mind this divine edict and creation *ex nihilo*. I begin, therefore, by examining varieties of divine

creation, including those involving the *k-w-n* root, and the theological and philosophical considerations that emerge out of engagements with ideas of divine creative providence.

K-w-n is readily associated with creation out of nothing (*ex nihilo*). While there is no explicitly formulated doctrine of creation *ex nihilo* in the Qur'ān, the Qur'ānic creative edict does suggest the notion.[21] An interesting note for our purposes is that 3:59 ("Truly the likeness of Jesus in the sight of God is that of Adam; He created him from dust, then said to him, "Be!" and he was"), God analogously creates Jesus as He did Adam, by shaping material–in this case, dust–and then commanding it to Be. Creation in the Qur'ān aside from the divine edict is thematized around ideas breathing, shaping, molding, and perfecting.[22] This is made manifest not only in the ways creation is described, but also in the divine names given that center around creation and generation. The divine is given numerous names that reference the attribute of creation: al-Khāliq[23], al-Bāri'[24], al-Muṣawwir[25], al-Khalāq[26], and al-Badīʿ[27]. The first three of these names are listed together in verse 59:24 ("He is God, the Creator, the Maker, the Fashioner"), which is the sole use of al-Bāri' and al-Muṣawwir as nouns in the Qur'ān. The verbal forms, *bara'a* and *sawwara*, are used: take, for example, verse 22 of the Surat al-Ḥadid ("No misfortune befalls the earth nor yourselfs, save that it is in a Book before We bring it forth (*nabra'hā*))". The Study Qur'ān notes that,

> "*The Creator, the Maker, the Fashioner* can be correlated to three stages in the unfolding of creation: *the Creator* indicates the Quality of God through which He measures things out before they come into existence in this world; *the Maker* indicates the manner in which God then brings things into being; and *the Fashioner* indicates the manner in which God then gives things form with various characteristics. Alternately, these three

[21] This edict is found in verses 2:117, 3:47, 3:59, 6:73, 16:40, 19:35, 36:82, 40:68.
[22] Ibid, 249. Also see Qur'ān 6:73.
[23] Found in Qur'ān 6:102, 13:16, 36:81, 39:62, 40:62, and 59:24.
[24] Found in Qur'ān 59:24.
[25] Found in Qur'ān 59:24.
[26] Found in Qur'ān 15:86 and 36:81.
[27] Found in Qur'ān 2:117 and 6:101.

> Divine Names can be seen as referring more specifically to the three stages through which creatures, in particular human beings, develop in the womb."[28]

Lexically, al-Khāliq is from the root *kh-l-q*. Abu Bakr b. al-Anbari, a tenth-century philologist, describes *khalq*, the *maṣdar* (verbal noun of the root), as "...either a product (*inshā'*) designed on an invented model (*abdaʿa*) or it is the act that determines the proportions (*taqdīr*) of something which is to be brought into being."[29] The *LA* gives a related take: "...to determine before it is cut how much leather is needed to make what is required, and to size it up with a view to cutting out a shopping bag, a water bottle, or a boot."[30] Thus al-Khāliq, from the perspective of language alone, relates to the determining of parts, to measuring, to deciding how much of something becomes something else or is used to make something else. al-Khallāq is a noun from the same trilateral root. In Lane's Lexicon, al-Khāliq and al-Khallāq are described together: "He who brings into existence according to the proper measure, or proportion, or adaptation; [and hence, the Creator; or] the Originator, not after the similitude of anything pre-existing…*al-khallāq* signifies the same; [i.e. the Creator of all things; or, as an intensive epithet, the Great Creator;] or the Creator of many creatures."[31]

al-Bārī' is the one who creates without imitating a model, from *b-r-y*.[32] The root refers to forming and fashioning by cutting, especially for reeds for writing, sticks, wood, and arrows.[33] Lane's Lexicon notes the expression or proverb *aʿṭi l-qawsa bāriyahā*, give the bow to its fashioner, which means "commit thou thine affair to him who will execute it well", which

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[28] *The Study Qur'ān: a new translation and commentary*, ed. and trans. Seyyed Hossein Nasr, Caner K. Dagli, Maria Massi Dakake, Joseph E. B. Lumbard, and Mohammad Rustom (New York: HarperOne, 2015): 1357.
[29] R. Arnaldez, "Khalḳ," in P. Bearman (ed.), *Encyclopaedia of Islam New Edition Online (EI-2 English)*, (Brill, 2012) doi: https://doi-org.proxy.uchicago.edu/10.1163/1573-3912_islam_COM_0488.
[30] Ibid.
[31] Edward William Lane and Stanley Lane-Poole, *Arabic-English Lexicon* (New York: F. Ungar Pub. Co, 1955): kh-l-q.
[32] Ibid.
[33] Edward William Lane and Stanley Lane-Poole, *Arabic-English Lexicon* (New York: F. Ungar Pub. Co, 1955): b-r-y.

resonates alongside the idea of well-wrought crafting found in discourse around *ṣ-n-ʿ*.[34] Paul Kraus identifies *bāri'* as the Demiurge, the creator of the universe, drawing from a Neoplatonic vocabulary and tradition.[35] al-Muṣawwir is the shaper or fashioner, from *ṣawwara*, which relates to giving shape or form; it is also from the same verb used to describe the shaping of a person in the womb (Qur'ān 3:6). It relates to *tarkīb*, composition and constitution. On the whole, *ṣ-w-r* is often used with regards to art and artistry, especially illustration and representation.[36]

God is also called Badīʿ. The root *b-d-ʿ* deals with radical innovation and therefore a sense of beginning that is absolute. Qur'ānic commentators note that God is called Badīʿ by virtue of the absolute creation of the heavens and earth, whereas He is Khāliq by virtue of the creation of humankind.[37] This is the name of God that is given alongside the creative edict in 2:117: "The Creator (*bādīʿ*) of the heavens and the earth, when He decrees a thing, He says to it only 'Be!', and it is." From this name stems the term *ibdāʿ*, which is predominantly a term of Shīʿism and *falsafa*, though it is also found in *ʿilm al-kalām* as a technical term pertaining to creation. *Ibdā'*, discussed below, generally expresses the act of God.[38]

In the development of theological and philosophical understandings of God's creative providence, medieval Muslim scholars incorporated insights borne from the *ḥadīth* of the Prophet Muḥammad, the previous scholarship of neighboring religious communities (Syriac Christians and the Jewish communities of the region, in particular), and from late antique Greek philosophical material.[39] In the tradition of *kalām*, broadly speaking, God's creation was taken to

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[34] Ibid.
[35] Paul Kraus, *Jābir ibn Ḥayyān, Contribution à l'histoire des idées scientifiques dans l'Islam* (Cairo, Imprimerie d l'Institut français d'archéologie orientale, 1942-43), vol 1, 99.
[36] Priscilla P. Soucek, L. M. Landau, and Silvia Naef, "Taṣwīr," in P. Bearman (ed.), *Encyclopaedia of Islam New Edition Online (EI-2 English)*, (Brill, 2012) doi: https://doi-org.proxy.uchicago.edu/10.1163/1573-3912_islam_COM_1195
[37] L Gardet, "Ibdāʿ," in P. Bearman (ed.), *Encyclopaedia of Islam New Edition Online (EI-2 English)*, (Brill, 2012) doi: https://doi-org.proxy.uchicago.edu/10.1163/1573-3912_islam_COM_0308
[38] Ibid.
[39] Chase, 249.

be a continuous act of endowing being. In a world made up of atomic substances and accidents, the divine is the eternal stand-mixer, mingling the two, continuously endowing being to the world by arranging the atomic components of creation. However, this continuous mingling happened after the world itself was created (*post-nihil* as opposed *pre-nihil* or *ex-nihilo*). The world came into existence after not having existed; God is *muḥdith* and the world is *muḥdath*, generated, composed, or compounded.[40]

Different theological schools differed in their understandings of what precisely the world was brought into existence out of, however. For the Muʿtazila, the nonexistent (*maʿdūm*) is a thing, for God has to know it, which does not exist but could exist: it is therefore the possible or the potential.[41] For the Ashʿarites, the nonexistent is nothingness, lest the nonexistent be a thing co-eternal with the divine. In contemporaneous 8th and 9th century Shīʿī traditions termed *ghulāt* ("extremist" for the extent of their devotion to the Imams)[42], texts such as the *K. al-ashbāḥ wa l-aẓilla* detail beliefs about God's creation of the world.[43] While there is not an explicit declaration of what the nonexistent is, the aforementioned text (which resonates with what is found in numerous other *ghulāt* cosmological treatises, according to Mushegh Asatryan) reads, "The first thing that God created (*khalaqa*) were the believers, whom He [first] created (*khalaqahum*) as phantoms before creating them as shadows. God praised Himself and glorified Himself, and the phantoms praised [Him] as God had praised [Himself], they glorified [Him] as God had glorified," thus *khalaqa* is once again used for God's creation.[44] Slightly later, the text

[40] Ibid.
[41] Ibid, 250.
[42] Mushegh Asatryan, "An Early Shi'i Cosmology; Kitab al-Ashbah wa l-Azilla and its Milieu," in *Studia Islamica* 110 (2015): 1.
[43] I describe *ghulāt* traditions of creation specifically because of previous work discussing these schools of thought and the Jābirian corpus. See: Capezzone, Leonardo. "The solitude of the Orphan: Ǧābir b. Ḥayyān and the Shiite heterodox milieu of the third/ninth–fourth/tenth centuries." *Bulletin of the School of Oriental and African Studies* 83, no. 1 (2020): 51-73.
[44] Asatryan, 56.

has a section titled "On the initial [making] (*ibtadā'*) of the shadows in the beginning of creation," here using *ibtadā'* to refer to the first of the first of creation.[45]

In the writings of al-Kindī, this theological question develops new emphases that extend past questions of whether the non-existent is a thing. al-Kindī makes use of the term *ibdaʿ* to mean the "the instantaneous bringing-into-being of the world from no material substrate" of the divine.[46] This is not, however, a translation of a single Greek word, suggesting that al-Kindī and others saw *ibdaʿ* as a divine, Qur'ānic notion that formed connections with *kawn*, *takwīn*, and *khalq*. al-Kindī writes,

> "So then, God said that He, great be His praise, needs no period [of time] to create (*ibdaʿ*). And this is clear, because He made 'it' from 'not-it'. If His power is such that it can produce (*yaʿmalu*) bodies from not-bodies, and bring being out of non-being, then, since He is able to perform a deed from no matter, He does not need to produce in time."[47]

This establishes a key paradigm for the philosophical school that emerges from al-Kindī's writings and for the tradition of *Neoplatonica Arabica* more broadly. The Creator is beyond time, as He creates it, so His creation does not require time, and this is termed *ibdaʿ*.[48] For later philosophers, such as Ibn Sīnā, *ibdaʿ* "...denotes the absoluteness of the creative (emanative) act in the production of beings that have no reason for existing in their own essence."[49] I return to Ibn Sīnā later in this chapter, when discussing *takwīn* specifically, for Ibn Sīnā situates that term within conversation around *ibdaʿ* and the production of being.

Ibdaʿ carries through into Shīʿī and Ismāʿilī thought and the works of the Ikhwān al-Ṣafa', where it is contrasted as divine creation from nothing as opposed to divine creation of pre-existing matter. In the writings of the Ismāʿīlī *daʿī* (missionary) and philosopher Abu Yaʿqūb

[45] Ibid, 65.
[46] Ibid, 251.
[47] Ibid, 250-51.
[48] Ibid, 253.
[49] EI², *ibdaʿ*.

al-Sijistānī, whose work brought Ismāʿīlī theology and Neoplatonism much more closely together, *ibdāʿ*, when formulated and active, is the First Hypostasis.[50] al-Sijistānī and his retinue highlight the immediacy of *kun* in relation to *ibdāʿ,* while the *faylasuf* take *ibdāʿ* as "...an absolute production of being." In the Ismāʿilī tradition in general, the *Mubdīʿ*, God, creates the intellect by a divine creative act (*ibdaʿ*) which occurs instantaneously and completely. The root *kh-l-q* refers to secondary, post-nihil creation.[51]

For al-Sijistānī, the first created being is intellect. Creation moves downward from the intellect to the universal soul, then to nature, and then into the physical world. God is absolutely and unqualifiedly transcendent, completely separate from His creation. Paul Walker writes,

> "To explain creation, which here is creation from nothing, *ex nihilo*, al-Sijistani…depends on a special kind of creation denoted by the Arabic verb *abdaʿa*, which means in this instance to bring something into being from nothing. All other forms of creation involve fashioning a new thing out of a pre-existing matter. He is careful to call these other types of creation by a different name. What is created by the process of origination (*abdaʿa*) is first of all intellect. In moving from intellect to the next stage…a different verb is used…A special characteristic of al-Sijistānī's thought…inserts between God and intellect a command. God creates by fiat; He wills the universe into being. This command is the divine logos (*kalima*) but it is not an existent. Once issued it becomes the thing it brings into being, that is, the intellect."[52]

Similarly, in the epistles of the Ikhwān, *ibdaʿ* and *khalq* are contrasted as pre- and post-nihil creation, respectively. The general term for creation is *ibdaʿ,* while *khalq* designates corporeal things and *amr* (spiritual substances).[53] *Ibdaʿ* and *ikhtira* (invention) are productions (*iḥdath*) of not-being into being; this is not the same as the *tarkīb* (combination) or *taʿlīf* (putting together)

[50] Ibid.
[51] Chase, 254-55.
[52] Paul E Walker, "Intellectual Traditions," in *The Shiʿi world. Pathways in tradition and modernity, London* (2015): 100.
[53] EI^2, *ibdaʿ*.

of pre-existing elements.[54] Thus, the Ikhwān make a clear distinction between Creator and craftsperson.[55]

Finally, while on the outskirts of its time frame (the 8th-10th century), I am considering Ibn Sīnā to nonetheless here be a part of the Jābirian milieu, as Ibn Sīnā is steeped in and comments extensively upon the same theological and philosophical works that defined 8th-10th century engagement on the topics of generation, creation, and cosmology more broadly. His *al-Ishārāt wa-l-Tanbihāt* (*Remarks and Admonitions*) (henceforth the *Ishārāt*) is an extensive work of philosophy with sections on physics and metaphysics that focus on understanding the nature of bodies and souls, as well as themes of creation and existence. Ibn Sīnā provides a definition of *takwīn* in the 9th chapter of the *Ishārāt*'s section on physics and metaphysics. It is worth discussing how he conceptualizes the term, for he defines *takwīn* explicitly and defines it in contradistinction to other terms previously discussed in this chapter. Ibn Sīnā writes:

> "On the meaning of *al-ibdāʿ*: immediate creation (*al-ibdāʿ*) is a thing's giving existence to another that depends on nothing other than it–without the mediation of matter, instrument, or time. That which is preceded by temporal nonexistence, on the other hand, cannot dispense with an intermediary. Immediate creation is in a nobler rank than material production (*al-takwīn*) and temporal production (*al-iḥdath*)."[56]

For Ibn Sīnā, *ibdāʿ* refers to production of incorruptible, eternal beings that do not have an intermediate pre-existence. It is the opposite kind of creation as *takwīn*, which is production, but material production necessitating an intermediary and resulting in corruptible beings.[57] As L. Gardet concludes, "Thus, then, in Ibn Sīnā's texts, *ibdāʿ, khlaq,* and *iḥdath* suggest above all, but

[54] Chase, 255.
[55] Ibid.
[56] Avicenna and Shams Constantine Inati, *Ibn Sina's Remarks and Admonitions: Physics and Metaphysics : An Analysis and Annotated Translation* (New York: Columbia University Press, 2014): 139.
[57] EI^2, *ibdaʿ*.

in differing degrees, creative emanation proceeding from the first Being; *takwīn* and *ṣunʿ* are reserved for the production ('manufacture') of compound beings from pre-existing elements."[58]

The *k-w-n* root found in *takwīn* seems to be most closely related conceptually to the terms made from the *b-d-ʿ* root, such as *ibdaʿ*, through the resonance of *ex nihilo* creation that is carried in both. In contrast, the type of creation associated with *k-w-n* seems to be a categorically different kind of creation than *kh-l-q* creation, which consistently refers to God's work. Yet, incorporating the work of Ibn Sīnā, we also see *takwīn* as an action that produces material, corruptible beings, different from the eternal productions of *ibdaʿ*. Together, this begins to suggest that *takwīn* shares features with divine creation *ex nihilo* or even parallels it, but its production (both its working/its being done as an action as well as what *takwīn* makes or produces) takes place at a different level of cosmology.

Sublunary

Despite the resonance of *kun fa-yakūn* in the term, *takwīn* is also imbricated in ideas of generation in the sublunary world. This is to say, *takwīn* resonates not only with divine creation, but also with a variety of types of generation that occur on earth: it shares a root with the natural philosophical phrase *kawn wa-l-fasād*, generation and corruption, and with aphorisms for *tawallud*, or spontaneous generation. This section explores, therefore, these different types of sublunary generation and theorizations surrounding them.

Found often in the vocabulary of *falsafa*, *kawn wa-fasād* references the Aristotelian cosmological notion of the sublunary world subject to change. In general, questions around 'generation and corruption' arise in relation to the production of beings in the sublunary world

[58] Ibid.

and how forms are given and received.[59] For Aristotle, generation is the coming-to-be of a substance: "…there must pre-exist something which potentially is, but actually is not; and this something is spoken of both as being and as not-being".[60] In other words, generation involves a change from a potentiality to an actuality. Actual actions require the participation of four causes (material, formal, efficient, and final) in processes of generation. Matter is what receives *kawn wa-l-fasād*; substance is compounded matter shaped by form.[61] Perpetual motion is the efficient cause of substance, and *kawn* is a cyclical process.[62] In his treatise *al-ʿilla al-fāʿila al-qarība li'l-kawn wa-l-fasād*, al-Kindī describes *kawn* as a changing of existence, but one that relies upon a creation *ex nihilo* for its first efficient cause–it is linked to *kun fa-yakūn.* In later texts–those of Ibn Sīnā, for example–the idea of generation in the sense of 'becoming' is linked to *kawn*.

When medieval Islamic theologians, physicians, and intellectuals theorized how the most commonly-thought form of generation–sexual reproduction–occurs, they applied these Aristotelian concepts. Reading human conception through an Aristotelian lens, male semen is an efficient cause that imparts motion and provides both the soul and vital heat that leads to the fetus' actualization. Female menstrual blood is the material cause. Together, they form an embryo, an instance of generation of substance.[63]

The Arisotelian is not the only theory of conception and/or generation operative in medieval Islamic thought and medical discourse, however. Galenic thought was also harnessed to understand human reproduction. Galenic discourse on generation generally contributes the idea that "...natural circumstances and the environment impact the shape and characteristics of living

[59] L Gardet, "Kawn wa-Fasād," in P. Bearman (ed.), *Encyclopaedia of Islam New Edition Online (EI-2 English)*, (Brill, 2012) doi: https://doi-org.proxy.uchicago.edu/10.1163/1573-3912_islam_SIM_4040
[60] Liana Saif, "The Universe and the Womb: Generation, Conception, and the Stars in Islamic Medieval Astrological and Medical Texts," in *Journal of Arabic and Islamic Studies* 16 (2016): 182.
[61] Ibid.
[62] Ibid, 182-83.
[63] Ibid, 183.

beings that are often taken to be hereditary."[64] Following logically from this, Galen rejects the exclusive association of efficient causality with the male principle and material causality with the female, arguing that male semen does contribute to the matter of an embryo by forming the membrane that holds the embryo together, and generating veins, arteries, and nerves.[65] As Liana Saif writes,

> "Thus for Galen the female and male both contribute matter and power; semen (male and female) is not only an efficient cause but also material, and since the embryo draws blood and pneuma from the menstrual blood, it is not only a material cause but also a kind of efficient power."[66]

To summarize, in an Aristotelian system, generation, form, matter, motion are the universal counterparts paralleled in the conception of a fetus of male semen, menstrual blood, and the motion of semen. In a Galenic system, the material cause is a combination of male semen, female semen, and menstrual blood, with the actualizing principles of motion and soul derived from those. It is worth noting that, by the mid-10th century, Ibn Sīnā had developed his own metaphysics that reconsidered the male and female components of reproduction, wherein male semen is generating power (*quwwa muwallida*) that imparts form (*muṣawwira*), while female "semen", which is really a moisture like semen but is not in fact properly semen, is reproductive power (*quwwa mutawallida*) that accepts form (*mutaṣawwira*). This tracks, of course, with the notions of subject (*mawḍuʿ*) and receptacle (*maḥall*) found in Ibn Sīnā's work on whole.

In all cases, the quickening of a fetus in a womb is analogous to the way a species is generated on a universal level and this notion is continually developed in medieval Islamic astrological and medical texts.[67] As Aristotle writes, the male and the female "are first principles

[64] Remke Kruk, "A frothy bubble: spontaneous generation in the medieval Islamic tradition," in *Journal of Semitic Studies* 35, no. 2 (1990): 271.
[65] Saif, "The Universe and the Womb", 184.
[66] Ibid.
[67] Ibid, 183.

of generation. For by a male animal we mean that which generates in another, and by a female that which generates in itself; that is why in the macrocosm also, men think of the earth as female and a mother, but address the heaven and the sun and other like entities as progenitors and fathers."[68] Furthermore, male semen has a divine nature on account of its efficacy for imbuing soul; Aristotle analogizes the breath provided by male semen to the elements of the stars. The astrological texts of Abū Mashʿar al-Balkhī (an early Persian Muslim astronomer of the Abbasid court, b.787 CE-d. 886 CE) describe how heat from the motion of celestial spheres is the efficient cause that unites form and matter, body and soul, as well as how astral causes operate to shape individuals alongside material and formal causes:

> "As for that which is affected in him due to the powers of the motions of the planets—by permission of God—that is not related to the elements or form, it is manifest and it is [determined by] their [the planets'] significations over the particularity of his genus and individuality among the rest of the genera and individuals; and [it is determined by] their significations over the composition of all natural things, the commixing of the form and elements in elemented things, the harmony between the animal and rational souls with the body, and other things like beauty and ugliness, height and shortness, maleness and femaleness, colors, motions, bravery and cowardice, good behavior, fatness and slimness, abrasiveness and softness."[69]

al-Kindī argues that the diversity of species is determined by astral rays, which is to say, generation is not just an internal and biological process like what is described in Aristotelian texts, but also includes an external and astral component. The *Sirr al-khalīqa* explicitly names the motion of the celestial sphere as the active and efficient cause of the generation of all minerals, plants, animals, and composition, with the elements serving as "mothers", passive and receptive, which directly parallels the secondary processes that occur within species. In the epistle of the Ikhwān al-Safa' that discusses conception, the celestial world is the efficient cause

[68] Ibid, 186.
[69] Ibid, 187.

of all generation, as the universal soul pours a particular soul into an embryo. In all of these examples, it is argued that astral causation actualizes generation in the universe and conception in the womb; the former is a continuation of the latter. While the precise roles of male and female generative principles in conception differ, the womb is perpetually understood to be a microscopic counterpart of the universe, receptive to the same astral influences that impact the generation of species.[70]

Another *kawn* bears discussing in relation to both *takwīn*, natural philosophy, and cosmology, and that is *kawn min tilqā' nafsihi min ghayr bizr*, also called *takhalluq al-hayāwan min ghayr al-hayāwan* and *tawallud*. This is the tradition of spontaneous generation in medieval Islamic thought, which refers most generally to the creation and appearance of animals brought forth from things other than parent animals.[71] It is used as a classification of a particular kind of generation by the Ikhwān al-Sāfa', and appears in the writings of al-Waṭwāt Mabāhij, Ibn Tufayl, Ibn Sīnā, al-Birūnī, al-Jāḥiẓ, and more.[72] Scholar Remke Kruk, who has written extensively about spontaneous generation in medieval Arabic texts, argues that this tradition emerges through underlying ideas about natural philosophy, many of which have their roots in Greek antiquity, that are Aristotelian, Galenic, and Neoplatonic.

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[70] Ibid, 188-191.

[71] Kruk, 266-67. "I referred to various forms of generation which are mentioned along with spontaneous generation proper. These include such ways of reproduction as (a) a form of parthenogenesis, mentioned for instance by Ibnabi-1-Ash'ath, quoted by Nuwayri (1342/1923, vol. X p. 174: ants drop 'something insignificant' on the earth, and this grows until it becomes sperm…and from that they come into being. A combination, thus, of organic generative matter, produced by a parent, and inorganic matter to create a new animal, not unlike the process in plants which we nowadays call asexual reproduction: for instance th eforming of little potatoes as offshoots of the mother-potato, as an alternative to the growing of potato plants from seeds; (b) the generation of a plant from the organic matter of two other, completely different plants, as an alternative to the usual way of reproduction: a banana tree is said to grow from a date kernel put into a colocasia tuber (Abd al-Latīf, 1965, pp. 55 fF.; Ibn al-'Awwam, 1864, vol. I, p. 459); c) alchemical procedures of creating life (recipe given in the Picatrix, see ref. Ullmann, 1972, p. 56; cf. also Jabir's K. at-tajmī, Kraus, 1935, pp. 341-92, which deals with the artificial production of animals (including man), plants and minerals; discussed, with many references, Kraus, 1943, pp. 97-134); (d) fertilization by wind (as is said to take place, for instance, in partridges; see the ref. given by Ullmann, 1972, p. 5 s); (e) animals (or human beings) growing from plants, as is mentioned by Bīrunī (1879, p. 214) about trees with leaves turning into drones, and about figs and basil turning into scorpions."

[72] See Kruk, 266 again, as well as Ullmann 54-55.

Kruk identifies thinking about spontaneous generation in the medieval Islamic context as arising from Aristotelian material originally: "The idea that living organisms could arise from matter independently from a parent…was given a theoretical foundation by Aristotle, who repeatedly explains his belief in spontaneous generation (*Historia Animalium, De Generatione Animalium*, *De Anima II*)"[73] In an Aristotelian view, generation of any kind requires pneuma, the principle of life, which be set into motion by heat, and matter, in order to form the new body. In routine sexual generation, generation occurs because "...the sperm of the male contains the formative principle which shapes the matter provided by the female into a being of the same species as the parents."[74] The male provides the life force and the female provides the matter. In spontaneous generation, generation without parent animals, the operative principles are the same. Pneuma is, according to Aristotle, found in moisture–it is present in every kind of moisture and therefore in every kind of matter which contains moisture–and when activated by heat, it becomes the principle of life that can act upon whatever matter is available to it.[75] In a Neoplatonic context, pneuma is complex: Plotinus and Porphyry criticize a Stoic meaning and use of the term, whereby pneuma was a corporeal principle, an "omnipresent igneous breath" that served to maintain cohesion in all bodies, especially the body of the world, on the basis of its corporeality, which does not enable a distinction between body and soul, instead making it the body of the invisible gods.[76]

In an Arabic Neoplatonic context, Aristotelian and Galenic notions of spontaneous generation are accommodated to a hierarchy of creation that follows from divine and celestial emanation.[77] Here, pneuma is translated most commonly as *rūḥ*, as in "And we breathed into him

[73] Kruk, 268.
[74] Ibid, 269.
[75] Ibid, 269-70.
[76] Personal correspondence with Liana Saif, January 1st, 2025.
[77] Ibid, 272.

[Adam] of our soul (*wa-nafakhtu fīhi min rūḥī*, Qur'ān 38:72)." This breath, found in moisture, is heated by the light of celestial bodies. It bubbles, and the generation process begins.[78] There is an inherent move "up" the celestial ladder across creation, as is emphasized in the writings of the Ikhwān al-Ṣafā':

> "(Ikhwan, 1347/1928, II,155) 'Know, O brother, that the complete [*tamma al-khalqa*) animals originally all came from earth (*ṭīn*), male and female. They mated and brought forth and dispersed over plains and mountains, land and sea, from under the equator where night and day are of equal length, and where the climate is always temperate, between hot and cold, and where there is always matter (*mawdd*) available that is ready to receive the ever-present form. There also came into being our father Adam, father of mankind, and his wife. They mated and brought forth their children, and the earth was filled with them."[79]

Kruk summarizes discourse on spontaneous generation in the medieval Islamic world as follows:

> "In this respect it is essential to realize that the ideas about generation which were current in the medieval Islamic world basically came down to the notion that there necessarily had to be (a) a principle of life which acted as 'mover' or 'organizer' of the generative process, and (b) a sufficient quantity of matter from which the new creature could be formed. If the formative power was not introduced together with the principle of life, the available matter had to be in the condition which was specific for a certain organism in order to grow into such an organism; this specific condition of matter might be brought about by external circumstances."[80]

Kruk is also careful to note that, "...the belief in spontaneous generation does not, in itself, run counter to the theological viewpoints about God as the Creator, as is sometimes suggested; spontaneous creation has nothing to do with creation *ex nihilo*. God created the universe and all the processes which take place in it, including generation, be it spontaneous or otherwise."[81]

[78] Ibid, 276.
[79] Ibid, 274.
[80] Ibid, 278.
[81] Ibid, 267.

Concluding remarks on divine generation, sublunary generation, and tawkīn

Through its lexical root alone, *takwīn* invokes both divine creation *ex nihilo* and natural-philosophical, metaphysical perspectives on different varieties of sublunar generation. That it utilizes the second verbal form (*faʿʿala*) suggests an intensification and a putting into practice: the making-do of generation and creation.

Takwīn and divine creation have a number of commonalities and resonances with one another in both of these contexts. There is a sense that one who performs *takwīn* is doing God-like work in bringing something new out of nothing. This emerges from the relationship between *takwīn* and the divine creation fiat, as well as the conceptually-similar relationship of *k-w-n* and *b-d-ʿ;* it is *kh-l-q* creation that seems to be a method of making that is uniquely used to refer to the divine.[82] The relationship of *takwīn* to pneuma, pneuma to *rūḥ*, and *rūḥ* to divine creation in the Qur'ān also serves to link human and divine making through the practice of *takwīn*. Furthermore, some of the makings most strongly associated with *takwīn* in the natural philosophical tradition–namely, spontaneous generation–also feature a creature being brought forth not quite from nothing, but not from a parent animal, either. *Takwīn* is also tied to reproduction and the making of new life on numerous scales of being, whether at the level of individuals, species, and the universe. Its association with both pneuma and *rūḥ* also links *takwīn* to broader systems of generation across different cosmological levels. Finally, there is

[82] There are other contexts outside the scope of this dissertation project where *takwīn* similarly refers to a God-like creation *ex nihilo*: briefly, Ibn al-ʿArabī uses the term *takwīn* in the *Futuhat al-makkiyya* in a few contexts: *al-mafʿūl al-takwīnī*, *al-takwīnāt al-ʿajība* of the *ṭabīʿiyyīn*, and the *takwīn* of things by the inhabitants of Paradise through their *himma*. This final example, wherein the saint's aspiration (*himma*) and immersion in the divine presence reaches a point of perfection such that the saint can also say "*kun*" to a thing and see it come to be, is a common description of *wilaya* in Sufism. In both the Sufi and alchemical cases of *takwīn*, there is the alignment of a human agent with divine creative power, blurring boundaries between human and divine agency. However, there are key differences, as the *wālī*'s creative command comes from a state of spiritual perfection and unity with God, whereas the alchemist bridges the spiritual and physical through embodied craft, deliberate experimentation, and manipulation of materials. From a correspondence with Yousef Casewit, March 20th 2024.

consistently an association of *takwīn* with the material (and thus sublunary), even alongside its divine resonances. What *takwīn* produces comes into being at a different place in the universe than what God creates: it is a similar process, but the results of both generative processes are found at different levels of being.

Takwīn *outside* Jābir

This section examines how *takwīn* is used as a technical term in non-Jābirian discourse. Even as *takwīn*'s *k-w-n* root resonates strongly with God's creative act and implies that both creative acts bring something new from nothing, *takwīn* is still theorized as distinct from divine creative activity by both its method and where cosmologically its production sits. In this section, I show how this is the case, and I argue that sources of the Jabirian milieu emphasize that *takwīn*, as a technical term, is a typology of creation that, while producing a being that did not exist before, still relies on preexisting, material parts. It is perhaps best understood across these sources as we saw Ibn Sina neatly describing it before: as a type of production resonant with *ṣ-n-ʿ*.

Takwīn appears primarily in occult-scientific, magical, natural-philosophical, and metaphysical works and is used with a greater degree of technical precision; it is significantly less common in usage than *ṣanʿa*, the term for artifice and making discussed in previous chapters. Nonetheless, it is possible to ascertain how the term was theorized within a broader cultural discourse. In this section, select non-Jabirian sources that discuss *takwīn* serve to emphasize how the term is understood within the Jabirian milieu. I look to the pseudo-Platonic *K. al-nawāmīs*, the *Ghayat al-Ḥakīm* attributed to al-Qurṭubī, and the *fīlāḥa al-nabaṭiyya* and the

k. al-sumūm of Ibn Waḥshīyah. Each of these works is situated within the Jabirian milieu and each discusses *takwīn*'s definition, theorization, and qualities.

Ibn Sīnā's location of *takwīn* in typologies of making is not anathema to the theorizations found in a collection of medieval Arabic texts often classified as 'natural magical'. Liana Saif has described "…a recognizable Arabic tradition of magical artificial generation"[83] that has theoretical connections to Arabic natural magic and reaches to encompass a number of magical and alchemical works, such as the *K. al-nawāmīs* ('The book of sacred secrets'), a ninth century pseudo-Platonic text; the *Ghāyat al-ḥakīm* ("The goal of the sage") of the polymath and occult scientist Maslama al-Qurṭubī (d. 964); the *K. al-sumūm* ("Book of poisons") and *al-Filāḥa al-nabaṭiyya* ("The Nabatean agriculture") of the alchemist and agriculturalist Ibn Waḥshīyah (d. 930-31); the *ʿuyūn al-haqā'iq wa Idāḥ al-tarā'iq* ("the sources of truth and explication of paths') of the alchemist Abū al-Qāsim al-'Iraqī (d. 1260); and our own Jābirian *K. al-tajmīʿ*.[84] These texts routinely cite *takwīn* and related operations, such as *taʿfīn* (fermentation or putrefaction) and *tawlīd* (spontaneous generation). For example, the *Ghāyat al-ḥakīm* very helpfully provides an explicit definition of *takwīn*: "the assemblage (*tajmīʿ*) and composition (*tarkīb*) of parts (*ajzā'*) which have been crushed (*taduqquha*), pulverized (*tashaquha*), or mixed (*tamzijuha*)."[85] This is in line with *takwīn* as a creative form that requires preexisting parts.

I want to focus on the works of Ibn Waḥshīyah here, as his texts place *takwīn* in relation to numerous other technical terms for varieties of generation. Thus, through contradistinction as well as considered reflection, Ibn Waḥshīyah gives us greater insight into what makes *takwīn* specifically *takwīn* and not anything else. Scholar J. Hameen-Anttila, the expert on the *Filāḥa*, summarizes Ibn Waḥshīyah's theorizations on varieties of generation as follows:

[83] Saif, "Cows and Bees", 7.
[84] Ibid, 1-2.
[85] Ibid, 11.

> "The terminology of generation consists of three almost synonymous words: *tawlīd*, *taʿfīn*, and *takwīn* (see texts 41-42). *Takwīn* is the most neutral of these, meaning merely 'making something come into being.' *Tawlīd* is used in reference to specific parts from which something is generated; the difference between the two, though, is not very marked as the NA does not admit the possibility of generation ex nihilo, so that every *takwīn* has to act on preexisting materials, the difference between the two merely being that in *tawlīd* one uses materials similar to the product (parts of plants, etc), whereas *takwīn* seems more general and might, thus, be translated as 'creation' as long as we remember that it is not creation ex nihilo. Finally, *taʿfīn*, 'putrefaction,' refers to the exact way, or method, of causing *tawlīd*, i.e. through letting the ingredients putrify in order to produce something new from them."[86]

Three terms for generation—*takwīn, tawlīd, and taʿfīn*—refer, therefore, to three different aspects of the process of generation: the overall process itself, the parts used, and the method used (fermentation). Note, too, the consistent insistence that *takwīn* is not quite creation ex nihilo, for it requires preexisting materials.

Ibn Waḥshīyah provides a deeper theorization of *takwīn* in his own words. He writes that *takwīn* and *tawlīd* are *li-maʿnā naql al-ashiyā' baʿḍiha ilā baʿḍ*—they have the meaning of changing some things to other things (translation mine)—and uses the examples of generations of wasps, scorpions, snakes, and other animals to describe this.[87] Later, he defines generation as something that happens through change and transformation (*bi'l-istiḥāla wa'l-inqilāb min shay' ilā shay' ākhar*).[88] Ibn Waḥshīyah then explains,

> "The power which we call 'the nature of Nature' is the effective cause which causes spontaneous growth without an origin. It is what we have taken on ourselves to study and to explain its matter so that whosoever wishes to generate (*takwīn*) a non-existent thing may act upon it by following the traces of Nature in its action."[89]

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[86] Jaakko Hämeen-Anttila and Aḥmad ibn 'Alī Ibn Waḥshīyah, *The Last Pagans of Iraq: Ibn Waḥshiyya and His Nabatean Agriculture* (Leiden; Boston: Brill, 2006): 130.
[87] Jaakko Hämeen-Anttila, "Artificial man and spontaneous generation in Ibn Waḥshiyya's al-Filāḥa an-Nabaṭiyya," in *Zeitschrift der Deutschen Morgenländischen Gesellschaft* 153, no. 1 (2003): 44.
[88] Hämeen-Anttila and Ibn Waḥshīyah, 330.
[89] Ibid, 288.

Thus, Ibn Waḥshīyah is interested in the underlying cause, the "nature of Nature", that causes generation—which, he suggests, one can do for oneself by taking a similar course of action as Nature itself. Indeed, what humans do is *ka-ʿamal at-ṭabīʿa*, or akin to/like the working of nature.[90] He continues, "It is within our abilities to emulate some of the actions of Nature, but not all of them, because the gods have given this ability to human beings but not in excess…."[91] In other words, humans cannot perfectly mimic the operations of the natural world, but their partial ability to do so is a uniquely human quality. He continues,

> "Through their arts (*ḥiyal*) and sagacity (*fiṭna*) and by following the traces of Nature they may, thus, be able to generate (*takwīn wa-tawlīd*) things similar to all plants, be they big or small. When we want to generate something similar, we must know the reason for it (the original generation) and aim at the same (as Nature)."[92]

We will return to Ibn Waḥshīyah's mention of the use of arts in a later section. What is important for the time being is that humanity is uniquely able to conduct generational activities because they a) have arts, b) have wisdom, and c) have the path of natural operations to follow. Ibn Waḥshīyah then explains further what is and is not within the realm of human capacity:

> "When people understood the manner of how Nature works, they were able to follow its traces and do the same in the measure that is possible for them and that is theirs to do. Thus, they generated many plants and called this action *tawlīdāt*–others call this putrefaction (*taʿfīnāt*), whilst yet others call it generation (*takwīnāt*). Each of the three, or some other designation of the same meaning, is permissible…It is not within human power to create something (out of nothing) or to bring something out of non-existence into existence…Nay, these *takwīn*s and *tawlīd*s are cases where we add something to something else and put them together and let nature take care of the rest (*nukhallīhā maʿa ṭ-ṭabīʿā*) until it has had its effect on them (the ingredients) and by this the generation

[90] Hämeen-Anttila, 44.
[91] Ibid, 39.
[92] Hämeen-Anttila and Ibn Waḥshīyah, 289.

> (*kawn*) becomes complete. The real act (*ʿamal*) in this belongs to the nature of the thing (to be generated); our part in this is (merely) joining similars or dissimilars together…"[93]

Creation ex nihilo is not within human capacity. Rather, *takwīn* and *tawlīd* are the conglomeration of parts which are then effected by nature; the 'human' component of *takwīn* is joining aspects together, but the *'amal*, the doing or making, is of nature.[94]

A question that emerges in the consideration of this broader tradition is the relationship between talismans and *takwīn.* This is especially important given the question of craft: does one craft a talisman, and if one does, is one crafting in the process of *takwīn*? Activities of this tradition of generation are sometimes termed "psychic magic", as in the case of scholar of mathematics and mathematical occult sciences David Pingree's work, in which "…a soul—daemonic and astral—is implanted into an object, rendering it talismanic."[95] This is also called "Neoplatonic magic", as it relies on magical powers that emanate from the One on down, through the celestial regions. Jābirian scholar Kathleen Malone O'Connor similarly associates *takwīn* in the Jabirian context with 'sympathetic' magic making use of astral/astrological forces, and argues that *takwīn* is both an alchemical operation as well as the ultimate goal of the talisman-maker.[96] Yet, Hämeen-Anttila notes with regards to Ibn Waḥshīyah that,

> "What is interesting is that the generation of man is not described as a magical act, despite the reference to Ankabutha's abilities as a talisman maker and magician. We are, strictly speaking, within the limits of *Naturwissenschaft*. In the case of generating plants, the author does make passing reference to astrology and the effects of the celestial bodies, as in the case of talismans (p. 1331). But even this stays within the limits of *Naturwissenschaft*, as the effects of the celestial bodies are natural and they are not

[93] Ibid, 290.
[94] As Liana Saif describes it in "The Cows and the Bees" (page 16): "Practitioners simply 'set up' (*nasba*) the circumstances for natural processes, particularly fermentation, which nature then carries through, and in this way the processed elements 'assemble' (*tarkīb*)."
[95] Saif, "Cows and Bees", 8.
[96] See ibid, 10, as well as O'Connor's dissertation.

> invoked as deities, as they are in magical actions. They merely have an effect because of their location in the sky."[97]

In other words, scholars understand a referential tradition of magic with different interpretive categories: astral, talismanic, psychic, natural, and so forth. Saif makes a crucial point in her discussion of this broader tradition: "The distinctions separating astral, natural, and organic magic are unhelpful, even arbitrary interpretive constructs…A consideration of the texts' understanding of magical efficacy reveals that the dichotomy of Neoplatonic talismans *versus* sympathetic organic operations cannot be sustained".[98] In all cases, she argues, celestial bodies are needed to produce efficacy, whether in generation or talismans, thus it is less accurate to call *takwīn* or "artificial generation" 'organic magic'. As al-Qurṭubī writes,

> "People make talismans without knowing, all the time. For if you want to generate some animal, compose some plant, or make some stone, you first head for the parts of that thing and assemble them according to the type of these parts, then you pulverize or mix them, or [process them] in other ways, until your operation is finished. In addition to this, Nature—still acting—and the planets will adapt and complete it until the thing reaches its ultimate goal."[99]

Qurṭubī uses very similar language to describe the creation of talismans as he does to describe *takwīn*: assemblage, pulverization, mixing.

Liana Saif, scholar of Arabic occult scientific texts, argues that the tradition of these texts is, on whole, best described as natural/astral, and not Neoplatonic or psychic, but also that *taʿfīn*, or fermentation, which is where Nature is acting, is a key distinction between the making of talismans and the generation of living beings. In other words, to make something alive, fermentation is necessary (and a defining factor), whereas talismans do not require that particular

[97] Hämeen-Anttila, 45.
[98] Saif, "Cows and Bees", 10.
[99] Ibid, 11.

process. It is also a thread that connects discussions of generation across this tradition of texts.[100] It is worth quoting Saif's observation at length:

> "al-Qurṭubī defines *taʿfīn* as the creating of a 'moist material [as] the location of generation (*kawn)* and [utilizing] the receptivity of images and forms'. This is related to conception theory. Pseudo-Apollonius's *Sirr al-khalīqa* ('The secret of creation'), a work which influenced Jabir, is concerned with the secret workings of nature and the interconnection between the celestial and terrestrial worlds. It is explained in the *Sirr al-khaliqa* that following the moment of conception, when semen and blood congeal, the resulting embryo (*nuṭfa*) stays still for an hour, then it undergoes fermentation (*taʿfīn*). The heat of the fermentation initiates its development. In the *Ghāya,* al-Qurṭubī likens the process of artificial generation through *taʿfīn* to 'the ripening of the sperm in the womb until it develops to the point which nature and the planets gradually lead to with their actions."[101]

In all of these cases, *takwīn* as a typology of making shares key features: preexisting materials, assemblage and mixing, and fermentation. This resonates with Ibn Sina's description of *takwīn* as a type of production distinct from creation ex nihilo, with the interesting and added dimension of particular input from natural/astral forces vis-a-vis fermentation[102]. The lingering question, to my mind, is: does the necessity of fermentation in processes of *takwīn* re-impose a distinction between the making of talismans and the generation of new beings?

For al-Qurṭūbī and the *Ghāyat al-ḥakīm*, I would argue that the answer is no. Take the following two examples, in which the *Ghāya* discusses talismans that produce scorpions and snakes:

> "A talisman for crafting deadly green scorpions. One fasts for a day, and, at the end of the day, the leaves of wild basil are chewed, and what was chewed is put in a glass bottle. Its

[100] Ibid, 12.
[101] Ibid.
[102] One can translate *taʿfīn* as either 'fermentation' or 'putrefaction'. Neither is incorrect; I tend towards 'fermentation' because it carries with it more of a sense of making or crafting, while putrefaction communicates a phenomenon.

> mouth is sealed and hung in a dark humid house with no sun entering upon it. Then, after forty days, green scorpions generate in it."[103]
>
> "A talisman for crafting a red snake. Large spiders are to submerged in the milk of a she-ass inside a glass bottle and left for three days. Then, take the fat of a turtle and grind it with the spiders and the milk until it becomes like brain. Put it in a wool rag and bury it in manure for seven days. A wondrous red snake will be generated from it."[104]

Each is explicitly described as a talisman (*tillasm*) and each utilizes processes of fermentation. This is, I believe, a clear illustration of Saif's earlier point: the distinction between talismans and "natural magic" is, ironically enough, artificial.

As for Ibn Waḥshīyah, as Hämeen-Anttila notes, the invocation of celestial bodies in the generation of plants and humans is different from the invocation of celestial bodies in magical and talismanic creation, even as Ankabutha, the legendary operator described in his work, is both a magician and a talisman-maker. However, Ibn Waḥshīyah also writes,

> "...Ankabutha was able to do that because of his excessive dexterity in talismanic and magical operations (*al-ʿamal)* because the way of generating is quite similar to the way of producing talismans and magical (objects). Whosoever is able to make talismans may easily perform all kinds of *tawlīd*s and *takwīn*s."[105]

While talismanery and *takwīn* appear to be not the same for Ibn Waḥshīyah, they are similar in production, and the skill sets are complimentary. It seems to me, then, that, in Ibn Waḥshīyah's work, while the presence of fermentation may technically distinguish *takwīn* from talismanery, there are aspects of crafting to both categories of action that are indeed shared.

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[103] Ibid, 46. Translation mine.
"طلسم في صنعة عقارب خضر قتالة. يصام يوما وعند آخر النهار يمضغ ورق الباذورج البري ويصيّر الممضوغ في قنينة زجاج ويشد فمها وتعلّق في بيت مظلم ندي لا تدخله الشمس فبعد أربعين يوما يتولد فيه عقارب خضر.

[104] Ibid. Translation mine.
"طلسم في صنع حية حمراء. تغمر العناكب الكبار بلبن أتان في قنينة زجاج وتترك ثلاثة أيام ثم خذ شحم سلحفاة واسحقه مع العناكب واللبن حتى يصير كالدماغ وضعها في خرقة صوف وادفنها في الزبل سبعة إيام فإنه يتولد منه حية حمراء عجيبة.

[105] Hämeen-Anttila and Ibn Waḥshīyah, 292.

Lastly, it is also worth noting that, while this chapter is dedicated to non-Jābirian sources, a relationship between talismanery and craft is explicitly found in Jābirian texts. In the *k. ikhrāj*, Liana Saif aptly notes that Jābir is instructed by a master craftsman specifically on the making of talismans.[106] The text reads: "Here we shall explain why a talisman is called *ṭillasm*. For this is knowledge we have shared with no one but you. We have treated it as the core of wisdom. Its craftsman (*ṣāniʿuhu*) informed me thus…"[107] The text also describes a longstanding relationship of study between Jābir and this craftsperson in developing talismanic knowledge: "I pondered for a year, in vain…He said, 'If I hadn't raised you with my own hands and nurtured you from beginning to end, till this day, I'd say you were a fraud! Come on, figure it out!'"[108] Talismans are therefore situated in the *k. ikhrāj* as a variety of craft.

Furthermore, in the Jābirian *k. nukhab*, the author says: "A talisman is the likeness of artificial (*al-ṣināʿiyya)* actions to natural actions [...] Every talisman is a crafted thing that is like something natural yet not every artificial (*al-ṣināʿiyya)* likeness to something natural is a talisman. The meaning of talisman is distinguished by the celestial observation that characterizes it."[109] He goes on to add, "Natural bodies refer to independent bodies (*al-ajsām al-muṭlaqa*), and artificial bodies (*al-ajsam al-ṣināʿiyya*) refer to crafted bodies (*mihaniyya*)."[110] Therefore, in another Jābirian source, talismans are designated crafted things, twice over, and with a root (*m-h-n*) that refers to professional vocation.[111] They are also theorized as related to but distinct from "artificial" things and bodies: things that are made or devised (*al-ṣināʿiyya*), related to the *ṣ-n-ʿ* root and a broader theorization of artifice, may be talismans but are not always or

[106] Liana Saif, "The Jābirian *Kitāb al-Nukhab* and Teaching the Science of Talismans in the Abbasid Era," in *Journal of Abbasid Studies* 1, no. aop (2024): 10-11.
[107] Ibid, 10.
[108] Ibid.
[109] Ibid, 5.
[110] Ibid.
[111] Ibid.

exclusively so (astral influence/celestial observation is required). Finally, these passages offer another quick and insightful peek into a broader Jābirian theorization of artifice and artificiality: what is "artificial" is crafted **and** is made in the image of things that exist 'uncrafted' in the natural world–in other words, the principle of cosmological scalability and positive imitation applies here, and once again hinges upon craft discourse and theorizations.

Takwīn and Craft, *Takwīn* and Wonder

Inquiring after the relationship between *takwīn* and talismans returns us to the question I asked previously: does one engage in crafting when one produces a being through *takwīn*, analogous to the way one engages in crafting when one produces a talisman? In other words, is *takwīn* a craft, and what are the implications if so? How does *takwīn*'s status as craft or not impact our understanding of this kind of generation as 'artificial'?

I have argued in previous chapters that crafting in the Jabirian milieu is associated with artifice more so than artificiality, by way of theorizations of *ṣanʿa*. These theorizations, I have argued, routinely invoke an aesthetics of wonder (*ʿajab*) that complicate our use of the descriptor 'artificial' given their resonances across categories of the "natural", "artificial", and "divine". Instead, they draw upon a notion of artifice, or action across a cosmological scale that is invested positively in analogizing divine creation, and as one that participates in a large and cross-generic discourse around both craft and *ʿajab.* In this section, therefore, I explore if *takwīn* in non-Jabirian sources relates to *ṣanʿa* and *'ajab*, or to craft, artifice, and wonder, as other crafting in the Jabirian milieu does.

The previously-marshaled sources of this chapter relate *takwīn*, *tawlīd, taʿfīn,* and talismans to ideas of craft. This is done in two ways, or through two words: *sanʿa*, as has been previously discussed, and also *ḥiyal*. *Ḥiyal* refers to "ingenious contrivances, automata, various pieces of machinery, and finally, the science of mechanics"[112], as well as stratagems in war, tricks of conjurers and forgers, and legal devices that enabled the achievement of ends not otherwise possible within the frame of *shariʿa*, whether legal or illegal.[113] For our purposes, we will consider the mechanical meaning of the word, which extends to cover everything from small toys to large machines, including trick vessels, water locks, and fountains. From the Jābirian milieu, scholars know of the *K. al-ḥiyal* of the Banu Mūsā written in c. 850 CE; quite famous also is the 13th c. treatise of al-Jazārī on the topic, *K. fi-maʿrifāt al-ḥiyal al-handasiyya*.[114] Scholar of Islamic technology Donald Hill writes that, "Often a variety of *harakat* [automata] is described for the more complex devices, and the craftsman is instructed to select those that suit his tastes and purposes."[115] Thus craft and *ḥiyal* are linked insofar as *ḥiyal* are made and used within the domain of craft. Indeed, in al-Jazārī's text, individual treatises are titled typically as "the making/crafting (*ṣanʿa*) of a particular device".

Furthermore, if we consider *ḥiyal* as "tricks, and witty solutions of difficulties of all kinds"[116], as al-Jāhiẓ does, we have a further conceptual link to artifice, rather akin to the way we have discussed craft and poetry in a previous chapter. Not only are these tricks (of conjurers or foragers) complicated and premeditated artifices that provoke wonder, surprise, and delight, but,

[112] D. R. Hill, "Ḥiyal," in P. Bearman (ed.), *Encyclopaedia of Islam New Edition Online (EI-2 English)*, (Brill, 2012) doi: https://doi-org.proxy.uchicago.edu/10.1163/1573-3912_islam_SIM_8624
[113] J Schacht, "Ḥiyal," in P. Bearman (ed.), *Encyclopaedia of Islam New Edition Online (EI-2 English)*, (Brill, 2012) doi: https://doi-org.proxy.uchicago.edu/10.1163/1573-3912_islam_SIM_2913
[114] Hill, "Ḥiyal".
[115] Ibid.
[116] Schacht, "Ḥiyal".

featuring prominently as they do in *adab*, *ḥiyal* are crafted literary contrivances that stimulate pleasure in a reader or listener. Here, then, we can bind not only *ḥiyal* to craft, but also wonder.

Take the following examples that demonstrate the connections between craft and varieties of generation:

> "In a chapter concerned with the properties of the 'Abraham tree', Ibn Waḥshīyah gives instructions for artificially generating an extraordinary creature, described as having the form of a winged, two-handed fish. Maslama al-Qurṭubī copied this account verbatim in the *Ghāyat al-ḥakīm*, citing Ibn Waḥshīyah's *al-filāḥa al-nabaṭiyya*. The generated animal in the experiment has many occult properties which are employed to fill the day-time sky with planets and stars. **Ibn Waḥshīyah refers to this kind of experiment as one of the 'secret operations' (*ḥiyal namūsiyya*)**…(emphasis mine)."[117]

Experiments in generation are explicitly *ḥiyal* in both Ibn Waḥshīyah's work and the *Ghāyat al-ḥakīm*.

> "...Ankabutha was able to do that because of his excessive dexterity in talismanic and magical operations (*al-ʿamal*) because the way of generating is quite similar to the way of **producing** talismans and magical (objects). Whosoever is able to **make** talismans may easily perform all kinds of *tawlīd*s and *takwīn*s."[118]

Furthermore, the making and production of talismans goes hand in hand with the performance of *takwīn, tawlīd*, and more.

The al-*Filāḥa al-Nabaṭiyya* also relates craft and generation in its discussion of the things which Adam taught humankind. In a chapter on date palms, the author writes,

> "The truth is that Adam invented many useful things for people…He also taught them divisions and measures and the basics of mathematics by which they became wise in their trades…He also taught them the art of generation (*takwīnāt*) and useful talismans which they had not earlier known before his time…In addition to these sciences he taught him

[117] Saif, "Cows and Bees", 6.
[118] Hämeen-Anttila and Ibn Waḥshīyah, 292.

> various professions and manual skills, the knowledge and understanding of which benefits them greatly. Moreover, he showed them how to invented (further) sciences and professions. Thus, they derived from him noble teachings and numerous benefits…."[119]

Here, generations, talismans, manual skills, professions, and mathematics are all categorized together as things which Adam taught. The text therefore posits a relationship between these categories of action, which extend from *takwīn* to a type of professional, scientific making that I would argue is included in the auspices of 'craft' writ large, perhaps even by way of talismans.

As for *ʻajab* (wonder), *takwīn*, *tawlīd*, and *taʿfīn* are explicitly connected to notions of *ʻajab*. The *al-Filāḥa al-Nabaṭiyya* first ties wonder to the sorcerer who (in)famously effected numerous varieties of generations. Ibn Waḥshīyah writes,

> "...through this man he [Ankabutha] taught us **wonderful [*ʿajīb*] special properties**, which he did or which were generated from the man and which the messenger of the Sun had not mentioned (separately) in the Book of the Secrets of the Sun, like also other **wonderful [*ʿajīb*] curiosities**, although this is not the right place to mention them (emphasis mine)."[120]

Furthermore, that curiosities and special properties are described in terms of *ʻajab*—as we have seen in previous chapters from both Jābirian and non-Jābirian texts—serves to remind us that sciences in the broadest sense (i.e. occult sciences, natural sciences, etc) and wonder have a consistent and acknowledged relationship.

Ibn Waḥshīyah also connects generation and wonder when noting how some plants which are generated (*mutawallad*) produce wonderful actions, much like animals which are generated. He says,

> "Now we shall return to the generation of plants which have **wonderful** actions, similar to those of the generated animals except that they are not quite like them…The book of

[119] Ibid, 297-98.
[120] Ibid, 292-93.

> Adam is the basis because he was the first to open this (branch of wisdom) to people and it was he who (originally) guided them to it. As far as we know, this did not happen before Adam to any human being and no thinker had arrived at it through his thought and no inventor had invented it by himself. Thus, it was Adam who opened this branch of generating plants. Before him the messenger of the Sun had opened to people the (branch of) generating animals (*takwīn wa-tawlīd al-hayāwanāt*) and people had done this successfully—I mean both kinds of *tawlīd*, that of animals and plants. But do not think that any of those who claim wisdom and sagacity have ever been able to do this (on their own). It has never even crossed their minds. Not only this but all kinds of actions with talismans and germination of trees and others, (is our invention)."[121]

Here, not only are generated beings associated with the potential for wondrous action, but also with talismanery. Furthermore, with Adam described as the thinker and inventor of this "branch of wisdom", there is a link drawn between makings of this variety—talismans, generations, and so forth—and wonder specifically. I would argue that here is a clear connection between the notion of artifice and wonder that imbricates talismanery and generations of plants and animals all at once.

The *Ghāyat al-ḥakīm* and Ibn Waḥshīyah's *K. al-sumūm* also relate wonder to generations. The following is an experiment described in the *Ghāya*:

> "They have, with regards to human semen, operations, among them [include] taking the semen of a human, perfect of form, and putting it in an egg. Put with it into the egg is semen of any animal, which is mixed well with it. Then, one closes that egg and secures it and brings it to ferment in fire, like incubation. After three days, they extrude from that egg [what is inside it] and in it, what resembles an animal has been generated, so then it comes out from the egg and is left for three days in the oil of vinegar, where it lives and thrives throughout these days. Then, they tear it apart alive in this oil. That oil is not rubbed or lit upon the face of a human except to transform to the form of the animal whose semen was joined with the semen of the human the generation. **This is a great wonder** and they conceal that well and only tell it to those they approve of.[122]

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[121] Ibid, 293.

[122] Saif, "Cows and Bees", 43. Translation mine.

ولهم في مني الإنسان أعمال فمنها أن يؤخذ من مني الإنسان كامل الخلق وبودع في بيضة ويودع معه في البيضة مني أي الحيوان كان يمزج به مزجا جيدا ثم يطبق على تلك البيضة ويستوثق وتدخل التعفين في نار كحضانة فانهم بعد ثلاثة أيام يخرجون تلك البيضة وقد تكوّن فيها شبه حيوان فيخرج عن البيضة ويترك أياما ثلاثة في دهن الخل فإن ذلك الحيوان يعيش فيه ويحيي هذه الأيام ثن انهم يفسخونه حيا في ذلك الذهن فلا يسرج بذلك الذهن ولا يدهن

Here, the generation of a being leads to the creation of a substance whose effects are termed a "great wonder". This is quite similar to what is found in a different experiment in the *K. al-sumūm*:

> "Take some of the cow's blood and smear her womb and insides with it, then clear from the area all dirt and sweep thoroughly the location where ejaculation took place. Make sure that she is in a place where the sun does not enter. Know that the oil made bitter with Cypress is what prevents the ejection of that which you pushed in the cow's womb. Give her some fodder every day as you used to feed her; furthermore, mix a reasonable amount of good wine with the water she drinks. Wait until she gives birth, having taken before giving birth some zinc and the same amount of red soil, pulverized earthenware, and silver cadmium, half a pound each, and pulverize it till it becomes like powder, and put it away. Once the cow gives birth, sprinkle this powder that you have pulverized over that which was delivered by the cow, and fan it [the powder] as you sprinkle it over it until its entire body is covered with this powder. As a result of this, you will see an animal of **wondrous** composite appearance; his head is like the head of a human but it is tall, big and wild. It has two feet like a cow's feet with [hoofs like] a cow's hooves, and two feet as a cow's without hooves but one flesh part only. It has a delicate tail as if on the rump of a sheep, but this tail is on its face as the extremity of a sheep's rump. It eats and lives…This [animal] kills by being looked at but only after seven days of its birth and emergence"[123]

Here as well, a being that is explicitly described as wondrous is the product of a complex generation process. It is worth noting that, in previous chapters, I have discussed craft as a category of action which invokes an ambient sense of preconception, purposefulness, planning, time, intellection, complexity, well-wroughtedness, fineness, delicacy, modification, excellence, subtleties, and pleasure. Carefully wrought work, well-laid plans, and intricate design consistently produce a sense of wonder and wonderment. These experiments in generation and

به وجه إنسان إلا تحول لصورة ذلك الحيوان الذي يشارك منيته مني الإنسان في الكون وهذا عجيب جدا وهم يكتمون ذلك جيدا ولا يطلعون عليه إلا من ارتضوه

[123] Ibid, 39.

their myriad complexities certainly partake in this sense. Furthermore, they are shown to also produce wonder by what they make.

Taken together, then, this data suggests two things. First, *takwīn* is understood across these texts as related to, if not a kind of, craft. Second, following from the first point, like other craft in the Jabirian milieu, *takwīn* participates in an aesthetic of *ʻajab*. This suggests that, while not explicitly stated in these texts, *takwīn* is for these authors something necessarily theorized in relation to artifice, like other discourses of craft that invoke an aesthetics of *ʻajab*.

Conclusion

This chapter has demonstrated how discourse on *takwīn* in the Jabirian milieu complicates a modern understanding of *takwīn* as 'artificial generation'. Lexically, the word *takwīn* itself calls to mind the *k-w-n* root of the Qur'ānic divine fiat, *kun fa-yakūn*. Creation described with the *k-w-n* root refers to creation *ex nihilo*; it is similar to the usage, especially in Shīʿī sources, of the root *b-d-ʿ*, which deals with creating something from nothing and doing so instantaneously. Turning to sources that discuss *takwīn* as a process taking place in the sublunary realm, *takwīn* is linked to both the Greek pneuma and the Arabic *rūḥ*, furthering connecting a sense of divine making and the practice of *takwīn*. In discussions of spontaneous generation within the natural-philosophical tradition, *takwīn* too refers to the bringing forth of a creation not from a parent animal, and processes of reproduction and generation are shown to be analogous across cosmological scales. In these sources, *takwīn* also consistently acquires a material association. Thus, *takwīn* is theorized in non-Jabirian sources as a type of making parallel to divine creation that relies simultaneously on natural operations (both in that pre-made materials

are required and in that fermentation is often needed) as well as human intervention (the placing of these materials in the right place with the right procedure).

Furthermore, as my study of *takwīn*'s use a technical term in non-Jābirian occult-scientific discourse shows, *takwīn* is a type of making that is associated with the crafting of talismans and with certain modes of production (*ṣanʿa*). The idea is discussed in very similar terms as is craft in other sources of the Jābirian milieu, invoking senses of complexity, forethought, and careful making. Explicit connections between craft and *takwīn* are drawn through descriptions of *takwīn* that use terms such as *ḥiyāl* and *ṣanʿa*. This links *takwīn* with the same broader theorization of artifice found throughout cross-generic sources in the Jābirian milieu, including Jābirian treatises themselves.

Finally, *takwīn* is shown to participate in an aesthetics of *ʿajab* (wonder), wherein the things crafted produce a sense of wonderment. This further serves to situate *takwīn* within the same theorization of artifice that I have shown to thus far be structured by *ṣanʿa* in previous chapters. On this basis, I argue that *takwīn* in the 8th-10th centuries was understood not as 'artificial generation', but '*artificed* generation'. To prioritize a human provenance in *takwīn*—to understand *takwīn* as 'artificial generation'—is, I believe, to miss that *takwīn*, itself a type of generation that sits on a cosmological sliding scale of making (artifice), makes imitation of the divine something positive by way of its association with wonder and an aesthetic of *ʿajab*. It neglects the perspective and theorizations of the Jabirian corpus on its own ideation, and squanders the opportunity to see a broad, 8th-10th century cultural theory of making that uses wonder to connect human activity with divine creation.

Chapter Four

The *Takwīn*-Machine: Artifice, Artificiality, Imitation, and Wonder in Jābirian Instructions for the Alchemical Creation of New Life

Introduction

Takwīn is a term central to the alchemical, philosophical, and occult-scientific corpus of Jābir ibn Ḥayyān, representing the furthest end of Jābirian cosmological potentiality, talismanic construction, and natural philosophy. It is, in short, the crafting of new and unique lifeforms in an alchemical laboratory. One of the better known discussions of *takwīn* comes from the Jābirian *k. al-tajmīʿ*, which features the construction of what is best termed a machine for procedures of this process. In this treatise, the apparatus or apparatuses necessary for conducting *takwīn* are described and detailed. Furthermore, numerous typologies and methods of generation–including *tawallud*, which some would translate as spontaneous generation, and *taʿfīn*, or putrefaction, alongside *takwīn*–are discussed at length.

Takwīn has traditionally been examined in scholarship with eyes to natural philosophy–and this is understandable, given that it is often discussed in the Jābirian context in the background of natural philosophical debates. Prioritized in these conversations is the idea of a distinction between the divine, the natural, and the manmade and a reading of the Jabirian corpus and its ideas with these distinctions and subsequent valuations in mind. However, given that the work of this dissertation has been to show that there exists a paradigm of artifice in 8th-10th century Arabo-Islamic discourse around making and crafting that complicates a clean division of categories such as the natural, divine, and manmade, I think it is appropriate to ask if

an understanding of *takwīn* that reifies these distinctions—that operates within a paradigm of artificiality, we could say—is anachronistic. How are we to interpret and understand *takwīn* based on this intellectual history of artifice?

The way in which *takwīn* is customarily translated serves well here as a window into the question I am asking: *takwīn* is customarily rendered as "artificial generation" in 20th century and contemporary scholarly studies of both the Jābirian corpus (e.g. Kraus, Ullmann, Sezgin) and related occult scientific sources (e.g. see work by both scholars Remke Kruk and Jaakko Hämeen-Anttila). For example, Kraus begins his discussion of *takwīn* within his 1942-43 opus by establishing distinctions between "création divine et création humaine". More specifically, Kraus says that the Jābirian alchemist imitates divine creation through an application of natural science: the human artisan (*ṣāniʿ*) mimics *al-Bāri'* (translated as the Demiurge)--a similar idea as found in the writings of the Ikhwān al-Ṣāfa' on craft and artisanship–in the creation of artificial life. While this act of translation may seem entirely innocuous, to interpret and define *takwīn* is a meaningful theorization of *takwīn* itself. Therefore, I ask again, is it accurate to use the term 'artificial' to translate the creations borne of *takwīn*? Or, to give the most specific example: if the Jābirian author suggests the construction of a mechanical womb for the process of *takwīn*, as is done in the *k. al-tajmīʿ*, is the process of generation conducted within it fairly termed 'artificial' when read atop the backdrop of this collection of 8th-10th century theorizations about artifice and making?

When I speak of theorizing by medieval authors and the Jābirian author/s, I am referring to the conceptualization, systematization, application, and suffusion of ideas. This is to say, to theorize artifice is not just to think through what a particular kind of making or crafting is, but to conceptualize what making or crafting is, to incorporate that understanding into one's practice,

and to systematize the results of such thinking and practice such that a theorization of artifice becomes a part of a tradition or field that undergirds other developments of thinking, experimentation, and practice. Theorization therefore does not, in this context, suggest thinking separate from practice. Rather, it is the ways of thinking and modes of action that underlie and inform further practice, following from material and technological components.

In this chapter, I suggest that, first, the Jābirian corpus prioritizes theorizing artifice, theorizing *making*, as an action across a cosmological scale that is invested positively in analogizing divine creation. To understand the products of *takwīn* as 'artificial' misses the way the corpus itself theorizes making and the results of making, which is in a paradigm of artifice, not artificiality. Following from that, I argue that the theories and practices found in *k. al-tajmīʿ* and its *takwīn*-machine should be understood as part of wondrous creative actions that take place in parallel across a cosmological scale, just as artifice more broadly is understood and theorized within the Jābirian corpus.

This builds directly upon the previous argumentation of my dissertation. In the Introduction, I lay out new methods of studying the Jābirian corpus that prioritize placing a broader swath of Jābirian treatises in conversation with one another and simultaneously with texts from a broader array of genres across a broader period of time. These methods are intended as an antidote for the orientalist holdovers and preoccupations present in many of the foundational studies of the Jābirian corpus, which prioritize solutions to the "Jābir problem" and ossify certain understandings of the corpus. I apply these methods to my historical and textual work in the next four chapters, which focus upon two types of making: *ṣanʿa* and *takwīn*.

In Chapter One, I show how, in cross-generic texts of the Jābirian milieu, a theory and practice of artifice is developed through and in relation to the Arabic trilateral root cluster *ṣ-n-ʿ*

and terms derived from it, such as *ṣanʿa*, *ṣunʿ*, and *ṣināʿa*. This root refers to handiwork, craft, manufacture, creation, and art. It features extensively in discourse on crafts, in the material/artisanal and literary senses, and appears routinely in religious works. The derived term *ṣanʿa* is also used in texts on alchemy (both within and without the Jābirian corpus) to refer to the entire alchemical enterprise. I show through an examination the *ṣad-nun-ʿayn* root in these texts that artifice, as cosmologically-scalable fine making or crafting, is a type of making undertaken with similar attributes and features, such as fineness and planning, by what a contemporary audience would term human, natural, and divine actors. It is not the exclusive province of either the divine, the natural world, or human action. Instead, there are distinct modes and methods of artifice based on the actor, and it is a category of action that operates on all three (human, natural, divine) levels. Furthermore, these discourses on artifice consistently make reference to an aesthetic of wonder (*ʿajab*). I am borrowing this phrase "aesthetics of *ʿajab*" from art historian Matthew Saba, who developed this notion in regards to lusterware in Abbasid Iraq. In considering *abu qalamūn*-like surfaces (iridescent and perpetually changing color), Saba argues for the participation of lusterware in a broader "'aesthetics of *ʿajab*'--a set of expectations, informed by contemporary interest, to which [in his case] Abbasid lusterware could be held." Importantly, Saba suggests that, "the 'aesthetics of *ʿajab*,' if fleshed out further, could be a productive framework for understanding broader developments…not limited to one medium or type of object."[1] Within these cross-generic discourses on making, artifice is modeled as a devotional imitative process that harkens back to the wonders of divine creation. I then show in Chapter Two that the Jābirian corpus participates in this theorization of artifice, including its aesthetic of *ʿajab*.

[1] Matthew D. Saba, "Abbasid Lusterware and the Aesthetics of ʿAjab," *Muqarnas* 29 (2012): 207.

In Chapter Three, I turn from *ṣanʿa* to *takwīn*, asking if the kind of making that is *takwīn* should be understood as a craft that fits within the paradigm of artifice theorized through *ṣanʿa* and *ʿajab*. Outside of the Jābirian corpus, *takwīn* is theorized in contemporaneous sources as a type of making that relies simultaneously on natural operations (both in that pre-made materials are required and in that fermentation is often needed) as well as human intervention (the placing of these materials in the right place with the right procedure). *Takwīn* is additionally presented as a type of making that is associated with talisman crafting and production (*ṣanʿa*), harnessing the same notions of complexity, forethought, and careful making as other Jābirian milieu sources that discussed *ṣanʿa*. Furthermore, *takwīn* is shown to participate in an aesthetics of *ʻajab* (wonder), wherein the things crafted produce a sense of wonderment. As such, I argue that *takwīn* in the 8th-10th centuries was understood through a lens of artifice as opposed to artificiality, where artifice indicates participation in a universal system of making shared across cosmological levels and actors, in contradistinction to artificiality which indicates a uniquely human province and a radical break from other systems of creation.

This chapter builds upon Chapter Three's examination of contemporaneous, non-Jābirian sources, looking to Jābirian *takwīn* directly to consider if the concept is theorized in the same way within and without the Jābirian corpus, and compares those readings with previous secondary scholarship on Jābirian *takwīn*. I begin by summarizing previous understandings and interpretations of *takwīn* in Jābirian studies as a field. I then turn to the Jābirian corpus and examine how both the *k. al-tajmīʿ* and the *k. ikhrāj* theorize *takwīn* as one of their central topics of discussion. In particular, I closely examine the description of the *takwīn*-machine, often termed an "artificial womb", found in the *k. al-tajmīʿ*. I argue that *takwīn* in the Jābirian corpus should be read with the same sense of artifice found in other cosmologically-scalable,

well-wrought crafts that invoke an aesthetics of *ʻajab*, drawing on relevant material from the Jābirian *k. al-saʿbīn* and *k. al-ḥajar* where appropriate. This relocates *takwīn* more squarely within the frame of devotional imitation and encourages scholarship towards a less anachronistic understanding of what human creation meant in relation to the natural world or divinity. It also highlights the value of a de-ghettoization of alchemical, magical and/or occult-scientific texts in comparative and cultural studies: Jābirian discourse is participating in a larger cultural conversation about artifice and its relationship to wonder. These texts should therefore not be read solely with and against other alchemical works or exclusively in the frame of natural philosophy. Finally, reading *takwīn* within a paradigm of artifice challenges what we understand to be meant by terms and ideas such as 'artificial', 'natural', 'divine', and even 'making'.

Building upon my examination of the *takwīn*-machine, I discuss the value of intratextuality when reading *takwīn* in a paradigm of artifice more broadly, showing how a reading of the *k al-tajmīʿ* alongside the Jābirian *k. al-sifwa* provides even greater insight into questions and theorizations of both technology and virtue within the Jābirian corpus. Specifically, I show how parallels between these Jābirian treatises suggest that prayers within the *k. al-sifwa* and other treatises are operating as material, technological components in the recipes, experiments, and practices that the corpus details. In so doing, I emphasize the importance of engaging the Jābirian corpus with the methodological principles I have established throughout this dissertation, which include intertextual and comparative readings of Jābirian treatises, as well as the application of contemporaneous frames of interpretation.

Finally, I discuss some of the contemporary stakes of understanding and translating Jābirian *takwīn* as a matter of artifice and not artificiality. Reading Jābirian *takwīn* as artifice challenges a commonplace contemporary coupling of notions of the 'natural' with the

'unmodified'. It also challenges a contemporary decoupling of scientific pursuit from wonder, as well as the idea that scientific and natural-philosophical works do not make use of literary, rhetorical, or aesthetic strategies. Lastly, reading *takwīn* in this way continues to push the boundaries of the discipline of the history of science: including both Islamic texts and occult-scientific materials not only makes the discipline more capacious, but also opens us to new understandings and nuances in how we understand the category of the 'natural' itself.

Previous Theorizations of Jābirian Generation / Takwīn *in Jābirian Studies*

In the Jābirian context, reference to *takwīn* is found in the *k. al-tajmīʿ*, the *k. ikhrāj*, the *k. al-taṣrīf*, the *k. al-mīzān al-ṣaghīr*, the *k. usṭuqus al-uṣṣ*, the *k. al-sabʿīn*, and the *k. al-nukhab*.[2] Partial translations of some of these texts are found in Berthelot, Kraus, Holmyard, Zirnis, and O'Connor.[3]

Both the 20th century orientalist and Arabist Paul Kraus and the scholar of Jābirian alchemy Kathleen Malone O'Connor address the topic of Jābirian *takwīn* in their research. As stated before, Part III of Kraus' *Jābir et la science grecque* is dedicated to the topic of "La Génération Artificielle" and relies extensively on his reading of the *k. al-tajmīʿ*. Kraus focuses on differences between human and divine creation, on summarizing the process of generating humans in the *k. al-tajmīʿ*, and on Hellenic sources whose influences he locates in the Jābirian text. Kraus summarizes the *k. al-tajmīʿ* as follows:

[2] The edited Arabic text of these treatises are found as follows: *k. al-tajmīʿ*, Kraus' *Mukhtār* 341-392; *k. ikhrāj*, *Mukhtār* 1-97; a portion of the *k. al-taṣrīf*, *Mukhtār* 392-425; *k. al-mīzān al-ṣaghīr*, *Mukhtār* 425-460; *k. usṭuqus al-uṣṣ*, Holmyard's *Arabic Works of Jābir ibn Ḥayyān*, 99-112 and Peter Zirnis' "The Kitāb Usṭuqus al-Uṣṣ of Jābir ibn Ḥayyān", 25-92; *k. al-sabʿīn*, *Mukhtār* 460-489; *k. al-nukhab,* MS 418276, Dār al-Kutub; MS Arabe 5321, Bibliothèque Nationale de France; MS 1721, Carullah

[3] Translations are found into French (Berthelot and Kraus) and English (Holmyard, Zirnis, O'Connor). Berthelot's translation is based off a manuscript, MS 1265, in Leiden, different from Kraus' manuscript in Cairo. Liana Saif is producing the first edition and translation of the *k. Al-nukhb* presently.

> "The point of this first production is the artificial generation of man and of every other animal organism, as they exist in nature and are imitated by the Art."[4]

As said, Kraus is interested in Greek sources in Jābirian material.[5] He discusses bougonia—the beating to death of a cow in a closed room and its following production of spontaneously generated bugs—and summarizes Jabir as extensively reproducing the work of Alexandrian Greek sources, evoking antique legends to prove the existence of spontaneous generation.[6]

Kraus glosses the more obscure details of Jābirian generation,[7] turning his attention instead to the devices used for *takwīn*. He writes,

> "The presentation becomes even bolder when Jabir extends artificial generation to the entire animal kingdom, including man, and gives a detailed description of the devices used for it. These devices are constructed in the image of the celestial spheres, thus strikingly illustrating the main idea of the science of generation, which consists of imitating the processes of nature. The author does not even hesitate to want to produce kinds of animals that do not exist in nature."[8]

With regards to the first, and perhaps most famous, Jābirian device for generation—what I term the *takwīn*-machine—Kraus says that, "The Greek inspiration and the relationship of this description with the ancient technique is apparent in almost every detail, and the curious reference (unfortunately too corrupted) to an Egyptian perpetuum mobile allows us to the place

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[4] Paul Kraus, *Jābir ibn Ḥayyān, Contribution à l'histoire des idées scientifiques dans l'Islam* (Cairo, Imprimerie d l'Institut français d'archéologie orientale, 1942-43), vol 1: 103. "Le but de cette premiere production, c'est la generation artificielle de l'homme et de tout autre animal organism, tels qu'ils existent dans la nature et sont imites par l'Art."

[5] He is also invested in linking the Jābirian corpus to an Isma'ili tradition, which is most apparent in his discussion of "production que nous voulons appeler celle des legislatures (Kraus, *Jābir ibn Ḥayyān*, 104)" which in fact links these two interests, as he ties aspects of Jābirian generation to a magical Platonic tradition as well as the notion of "legislatures" to an Isma'ili religio-political structure.

[6] Ibid, 106.

[7] Ibid, 108. "After studying the different modes of putrefaction (5), Jabir prepares to explain the artificial generation of snakes and other animals (6). We will not dwell on the details, which are too obscure, of this presentation. Let us just note that in these speculations, the number, color (7) and arrangement of hairs capable of reproducing snakes play a big role. There are twenty-two different possible combinations that correspond to the letters of the Abjad (s) alphabet. Certain geometric figures are also called into question."

[8] Ibid, 109.

the device in the history of oriental hermeticism."[9] Kraus does not dismiss the *takwīn*-machine as exclusively a Greek reproduction, writing, "This does not mean that the entire presentation must be brought back to an ancient source".[10] However, he does opt to study *takwīn* by tracing the development of ideas which comprise "artificial generation" over time. In his own words, he follows "...the paths by which the ideas on artificial generation took place to arrive at the form that presents itself to us in the *kitāb al-tajmīʿ*."[11] Kraus locates an origin of the *takwīn*-machine in the ancient past and works to connect Greek past and Jābirian present, prioritizing the relationship between these sources and the exchange of knowledge from Greece to the Islamic alchemical context. In addition to this all, Kraus unpacks the difficult discussion on the third variety of *takwīn* that is presented in the *k. al-tajmīʿ*, noting especially the debates on the origin of knowledge in intelligent beings produced through *takwīn*. Here, intelligence is manifested in both knowledge (*ʿilm*) and speech (*nuṭq*), but it is debated which part of the brain most suited to the production of intelligence: the seat of imagination (*ḥayal*), of memory (*dhikr*), and of thought (*fikr*). Three differing opinions are also given on the origins of knowledge in a being produced by *takwīn*: the operator of the *takwīn*-machine teaches the sciences to the being as soon as it leaves the device, knowledge is either innate to the being or spontaneously arrives to it by nature in the same manner as great philosophers, or neither of the previous two options, because through a form of metempsychosis a soul enters the body prepared for it, and souls are by definition powerful, active, and ignorant.[12]

[9] Ibid, 110-111. This reflects very vague and orientalist conceptualizations of "hermeticism"; see Kevin van Bladel's *The Arabic Hermes* for more discussion on this topic.
[10] Ibid, 111.
[11] Ibid.
[12] See Kraus, *Jābir ibn Ḥayyān*, 116-119.

On the topic of artificiality, Kraus simply states at the outset of his section that, "*Takwīn*, the causative of [the verb] *kawn*, means generation, and more precisely artificial generation."[13] He does mark technical differences between divine and human creation, writing that, "The difference between divine creation and the human act consists in the fact that in the first case the Natures apply to the Substance at once, while in the second they only unite with the Substance successively."[14]

Kraus' theorization of artificiality as a concept occurs in a single paragraph. He writes,

> "The starting point for all the development that follows is the very ancient idea that art imitates nature. But Jābir offers a bolder formula, at least for the Muslim reader. According to the ancient definition, inspired by a formula from Plato, philosophy consists of assimilating oneself to God, of imitating God as much as this imitation is possible for man. This definition, Jābir applies to natural science: the human artisan (*sāniʿ*) imitates the Demiurge (*bāriʾ*), creator of the universe, by also exercising a creative power."[15]

In other words, imitation necessitates artificiality. Kraus argues that Jābir simply uses natural science as his tool, much as a human artisan would use any other tool, to make art imitate nature—to make something artificial.

As for O'Connor, her 1994 dissertation, "The alchemical creation of life (*takwīn*) and other concepts of Genesis in medieval Islam", is dedicated to the topic of *takwīn*. It seems to me to be the most thorough examination of the topic to date. She explores theorizations and necessary prerequisites for *takwīn* across the Jābirian *k. ikhrāj, k. al-mīzān al-ṣaghīr, k. al-idāḥ,*

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[13] Ibid, 97. "*Takwin*, causatif de *kawn*, signifie generation, et plus precisement la generation artificielle."
[14] Ibid, 101. "La difference entre la creation divine et l'acte humain consiste en ce que dans le premier cas les Natures s'appliquent a la Substance d'un soul coup, tandis que dans le second elles ne s'unissent avec la Substance que successivement."

[15] Ibid, 99. "Le point de depart de tout le development qui suit est l'idee bien antique que l'art imite la nature. Mais Jabir anime a lui dinner une formule plus hardie, du moins pour le lecteur musulman. Selon la definition antique, s'inspirant d'une formule de Platon, la philosophie consiste a s'assimilier a Dieu, a miter Dieu autant que cette imitation est possible a l'homme. Cette definition, Jabir l'applique a la science naturelle: l'artisan humain (sani) imite le Demiurge (bari'), createur de l'univers, en exercant, lui aussi, une puissance creatrice."

k. al-ḥajar, k. al-sabʿīn, k. al-taṣrīf, k. al-tajmīʿ, and *k. al-usṭuqus al-uṣṣ*. She then discusses the alchemical influence and hermetic resonances found in Islamic cosmogonic and creative contexts, and explores genesis and resurrection in sacred sources of divine speech.

O'Connor pushes against the disciplinary biases of the history of science that reduce Islamic alchemy to "pseudo-science" and certain areas of religious studies where magic is equated with "religious failings".[16] She writes,

> "Akin to Islamic magic, or *siḥr*…the discipline, art, and science of alchemy represented the union of nature and artifice. Alchemy operated from a positional and interrelational stance; it was an intermediary between above and below, between the primordial realm of creation and the apocalyptic world to come. Further, alchemy, like other types of 'licit' magic in Islam, was both healing and restorative, in fact, a salvific pursuit."[17]

As such, O'Connor understands *takwīn* fundamentally as magic, which she loosely defines as a wide set of broadly religiously-licit, occult-scientific, theurgic and/or divinatory practices, pulling from the semantic fields of both Arabic terms *ʿilm al-siḥr* and *al-ʿulūm al-ghaybiyya*.[18] She locates *takwīn*, which she does translate as both 'the alchemical generation of life' and 'the artificial creation of life', within an environment of Islamic Hermeticism across levels of medieval Muslim society. I personally appreciate that O'Connor refuses to excise magical elements of alchemy (unlike many scholars of Kraus' milieu who refuse the presence of the magical within the history of science). However, "Islamic Hermeticism" is a contested term, and I prefer to use not a Hermetic framework but instead one of the occult sciences, wherein occult is an ontological category indicating sciences and practices whose causes are hidden from the

[16] Kathleen Malone O'Connor, "The alchemical creation of life (takwīn) and other concepts of Genesis in medieval Islam" (PhD diss., University of Pennsylvania, 1994), 335-7.
[17] Ibid, 334.
[18] Ibid, 21-24 and 338-341.

immediate senses (as opposed to 'esoteric', which is an epistemological category referring to the intellectual or revelatory means of attaining hidden divine truths or sublimation of the soul).[19]

Both Kraus and O'Connor have valuable interpretations of *takwīn* that contribute to our understanding of the term, prioritizing paradigms of natural science and magic, respectively. However, I feel both interpretations are thin with regards to theorizing *takwīn* and its relationship to ideas of artificiality and technology. Kraus insists that *takwīn* is a technological imitation, and to imitate is to make something ontologically distinct, separate, and (perhaps most importantly) lesser than the original. O'Connor, in reclaiming magic for the history of science, does not challenge the notion that *takwīn* is artificial but focuses instead on the fact that it is a licit, healing, and salvific pursuit–what it is for *takwīn* to be a type of technology is not plumbed. Additionally, that there are boundaries–and the same boundaries we hold–between the natural, divine, and artificial is an assumption left untouched, even if, as in O'Connor's work, alchemy joins the edges of those boundaries together.

I offer here a third interpretation with a particular eye to the question of technology and artificiality in/and *takwīn*. We can understand *takwīn* through a paradigm of artifice, wherein *takwīn* is emblematic of a human version of a certain kind of making or creation (artifice), recognizable by particular qualities that are used to theorize the idea through the term *ṣanʿa*, that scales across numerous cosmological levels through its participation in an aesthetics of *ʿajab* that relates making of this sort to the wonders of divine creation.

[19] See van Bladel's *The Arabic Hermes* and Liana Saif, "A Preliminary Study of the Pseudo-Aristotelian Hermetica: Texts, Context, and Doctrines," in *Al-ʿUsur al-Wusta* 29 (2021): 20-80.

Takwin in the Jābirian Corpus

Takwīn has most readily been read and interpreted, as I have described, through a lens of artificiality–thus the translation, "artificial generation". I argue here, however, that *takwīn* in the Jābirian corpus, like *takwīn* outside of it, would be better understood through a paradigm of artifice. *Takwīn* in the Jābirian corpus is carefully considered, cosmologically scalable, and in perpetual reference to notions of wonder (*ʿajab*). I am going to focus here on two instances wherein the Jābirian corpus theorizes *takwīn*. The first is in the *k. al-tajmīʿ*; the second is the *k. ikhrāj*.

k. al-tajmīʿ

While the *k al-tajmīʿ* does not, obviously, constitute the Jābirian corpus' sole discussion of the concept of *takwīn*, it is the treatise in the corpus where the idea is most extensively discussed. It is also the place where *takwīn* is discussed most in relation to other ideas, to "sister-terms" like those found in Chapter Three, thereby pointing us not only to how the term is used by a Jābirian author, but also to what exactly it refers, and how it is different from other and often similar concepts, as well. In other words, the *k al-tajmīʿ* is the place wherein the Jābirian corpus theorizes *takwīn* most clearly.

In many ways, the *k. al-tajmīʿ* is a treatise about exactly that—about theorizing *takwīn*. However, it becomes clear even in the title of the work that *takwīn* is part of a whole, not the whole itself. *Takwīn* in the *k. al-tajmīʿ* is one kind of generation or making of life, situated under a broader umbrella of *tajmīʿ*—though this is never stated explicitly. *Tajmīʿ* itself means gathering

or concentration, or, even more literally, 'making gathered'. The numerous varieties of generation discussed throughout the treatise are different aspects of or meditations on this theme. They are ways in which elements or materials or body parts are collected and solidified together into new forms.

Other scholars have summarized the contents of the *k. al-tajmīʿ*; I am not going to repeat their work, but instead provide the necessary overview of the treatise that will also orient the reader to considerations of artifice. The *k al-tajmīʿ* begins with a brief discourse on the relationships between animals, plants, and stones: specifically, how they are and are not transmutable across their categories of being. The focus of the *k al-tajmīʿ* is the *takwīn* of animals, in three types: the "first type" (*al-'awwal*), the "stupid" type (*al-ablah*), and the "intelligent" type (*al-dhakī)*.[20] *Takwīn* of plants is also discussed in detail at the end of the treatise, though it is comparatively a much shorter section of the work.

The device needed for the first type of *takwīn* is described thoroughly. The qualities of the *takwīn*-machine and the process for making it are described as follows:

> It is known that the model [*mithāl*] is indispensable, and that is our saying: [the model can be for] either a human or an animal. Let us establish first that we can change its states, [the knowledge of which] results from a book in which this is said <...> and is exposed degree by degree. Then, a vessel of glass, or crystal, or stone, or some other type of material, is constructed—and glass is the best of things from which the model could be made— having the thickness of a finger. And if you wish to decrease or increase in length or width, it can be done. Likewise, if you want the transposition [*bi-naql*] of the body of a young girl with the face of a man, or the intelligence of a man with the body of an adolescent, or if other variations are preferred, it is possible, and the vessel is made in the shape which is desired. Then, after that, a sphere is constructed, whose dimensions are the length of that model times one and a half of the entirety of its sides, in order that it [the model] be in its [the sphere's] middle, as a circle within a circle. Then, an addition in the glass is made at the top of the mold and at its bottom, so that the sphere may be sealed. Then, it [the model] is covered with smooth clay without hair and without straw,

[20] Jābir ibn Ḥayyān, *Mukhtār rasā'il Jābir ibn Ḥayyān*, ed. Paul Kraus (al-Qāhirah: al-Khānjī, 1935): 343.

which is therefore smooth, known as *ṭīn ḥurrī*[21]—and certainly we arrived to that in the *Book of Clays*, so seek it out. Cover it [the sphere] with thick clay, and leave it to dry and harden. When it has become dry, polish its surface until it becomes like a mirror. Then cut it with a thin, flexible, sharp saw, so that there are no ripples in the halves [344]. Take one of the two halves and polish its interior just as you polished its exterior. Then do likewise to the other half...The model is totally hollow, and each part of it separated from the other parts, so that there is a section for the head, and another section for its two shoulders, its chest, and its belly, and its extremities, its two arms, and its hands. Each of those are separated in order that when it is separated, it is separate, and when it is recomposed, it recomposes. Then some sperm is taken, which has not been touched by cold, and which is not from the soil of the mountains, which we have certainly made known to you, from the land of Mukran or Kirman. Alternatively, take a piece of flesh from that animal which the generation of its like is desired, and likewise regarding the sperm. Know that and preserve these principles, else neither this nor any other thing will come from it. Take from the organs of the animal and the flesh and the remedies and the medicaments and the likes of that according to the method of the science of Balance. Then combine everything in its place— and begin with placing the bones, then the flesh, the nerves, the veins, the arteries, the cartilage, and all of its nails—and cover the model bit by bit as you prefer, and finally raise it by what holds it fast.

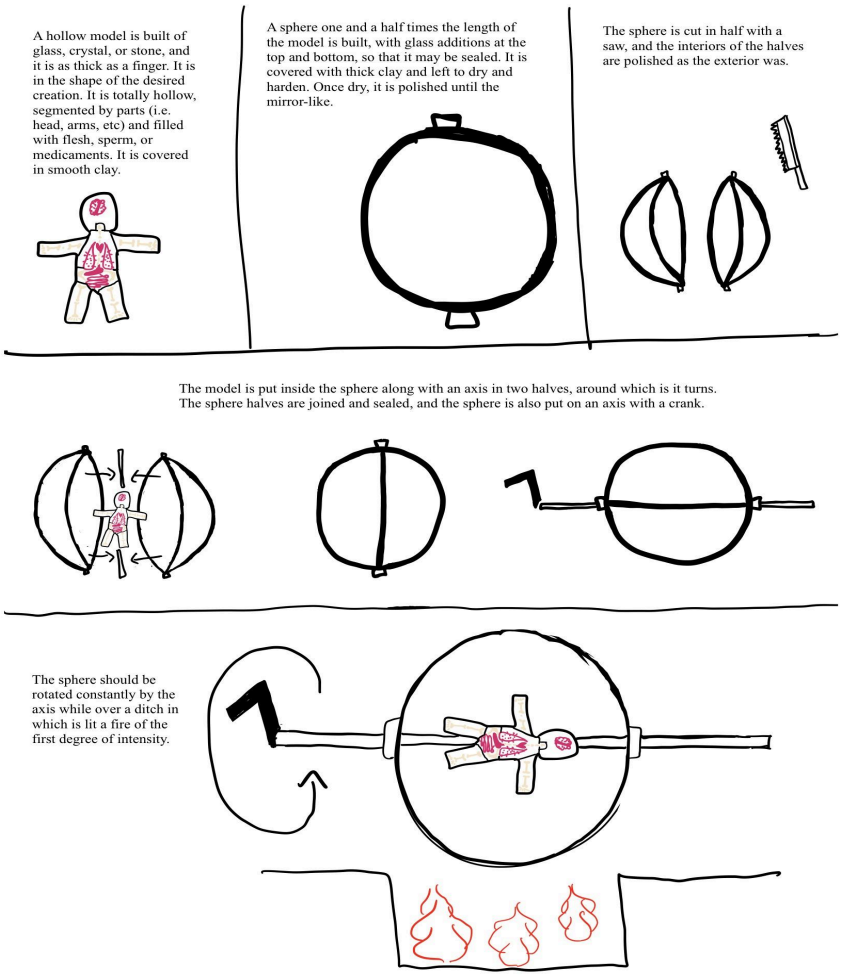
Then, you will have also made an axis inside of that sphere, split into two halves. This axis has a pivot around which the effigy turns. So join the half of the sphere to its [other] half and seal up the crack. And the sphere [345] also has an axis and a crank which turns over a ditch, such as a canal. Surely we have exacted for you the whole of this model regarding the making of bodies and the dismantling of them and restoring them in the book known in the passage of the *Book of the One Hundred and Twelve* as the *Book of Knowledge*. Then, set one part of the sphere upon the other on its axis, which is what turns it constantly. There should be ignited under it one fire at the first degree of intensity--and the balance of the fire we made as our object in a book known to us as the *Kitab al-Sifwa* and in what we showed in the *Kitab al-Tasrif*--and its movement is constant in its existence <...> or like a millstone or another thing that moves on its own, such as the two statues from the land of Egypt, moving perpetually. Indeed, they are placed on iron columns, under which is a polished mirror. It is not the nature of the column, nor the mirror, to ever stop. The column is rounded like a sphere and the mirror is concave. The top of the column is fixed and the rounded and smooth shape is not fixed to the other rounded smooth parts, so its movement is perpetual throughout the passage of time. The maker of this movement modeled it upon the movement of the celestial sphere—and certainly I established that in the *Book of Natural Forms*—and its intention is not anything other than the imitation of the celestial sphere and its movement, and that

[21] This may be related to *ṭīn ḥarārī*, but further research will be needed to confirm this.

> works perpetually until the end of days. And beware that if you have little knowledge regarding the completion of days, and you over- or underestimate it, then the thing generated will be influenced by that. Indeed, perhaps--by the truth of my master--the best of every person in the world will go out and bring it forth.[22]

This passage presents the means and methods for a specific kind of creation: the careful construction of a "*tawkīn*-machine". Below, I have attempted to illustrate the machine based upon the description provided.

Image 1: The "*takwīn*-machine"



[22] Jābir ibn Ḥayyān, *Mukhtār*, 344-345. All translations are my own.

Following the description of the "*tawkīn*-machine" the text turns to describing the opinions and ideas of numerous groups on what is then termed "…this type of *tawlīdāt* according to what Furfūrīūs recounted."[23] Furfūrīūs is the Arabic name for Porphyry, the 3rd century Neoplatonic philosopher and commentator and his Arabic pseudepigraphers who sought a reconciliation of Aristotelian thinking with Neoplatonism and whose project was strongly adopted in the Arabic philosophical tradition of the 8th-10th centuries.[24] Increasingly as these groups and opinions are discussed, *takwīn* and *tawlīd* are used with a great degree of interchangeability; however, *taʿfīn*, or putrefaction, seems to be understood as a separate thing from *al-takwīn al-awwal*. The author discusses how there are those who say that this type of *takwīn* is just *taʿfīn*,[25] those who distinguish it from *taʿfīn* on the basis of humidity and fire, those who say the soul is not generated (*yatawalud*) except from air,[26] those who say *tawlīd* does not need medicaments or balance but only blood,[27] and so forth. After describing numerous opinions, the author says, "You, oh learner, should know that all of these aspects are true, whichever one is acted upon/made in it (*ʿumila bihi*), so know that."[28] This type of *takwīn* is also stated explicitly to be the author's preference: "We indeed prefer it for these reasons."[29] Furthermore, "…they are sure the books and the notebooks and these wonders make a reminder for their souls, like the pyramids and the wonders of talismans and their workings (*ḥulūlihā*)."[30] While the referent—the "they" who is sure—is a bit unclear, what is important to underscore here is that *takwīn* is

[23] Ibid, 347. "*Fa-hadha mā fī <hadtha> al-nawʿ min al-tawlīdāt ʿalā mā dhakarahu fīrfūrīūs."*
[24] Peter Adamson, "'Porphyrius Arabus' on Nature and Art: 463F Smith in Context," in *Bulletin of the Institute of Classical Studies. Supplement*, 2007, No. 98, *Studies on Porphyry* (2007): 142. See also Eyjólfur Emilsson, "Porphyry", in *The Stanford Encyclopedia of Philosophy* (Summer 2024 Edition), Edward N. Zalta & Uri Nodelman (eds.), URL = <https://plato.stanford.edu/archives/sum2024/entries/porphyry/>.
[25] Ibid, 347. "*ama…bi-l-taʿfīn*."
[26] Ibid, 348. "*wa-laysa li-l-tawlīdāt mā huwa ashad min hadtha <fī> jamīʿ al-aʿmāl li-annahu al-ghāya k-ma qulnā fīmā salafa in waqaʿta ʿala dhalik."*
[27] Ibid, 349. "*laysa yaḥtāj al-tawlīd ilā ʿaqqār wa-law dawā' wa-la mīzān bal yanbaghī an yumʿil min dam dhalik al-jins l-kul jins, fa-innahu yakun minhu al-jins al-ladhi yurād."*
[28] Ibid, 350.
[29] Ibid, 352.
[30] Ibid.

considered a wonder, akin to other wonders, like those of talismans. This immediately draws a connection both between *takwīn* and artifice, by way of talismanic making (see Chapter Three), and between *takwīn* and an aesthetics of *ʿajab*.

The text here offers a brief interlude about the nature of motion and rest in the generative act. The author writes:

> "A group asserts that the soul of perpetual motion in the world <…> is that which it is in, so indeed the womb is named the world and the biggest world encompasses it, and indeed the motion of the stars is perpetual just as we compared it in what we presented…"[31]

The idea of the uterus as a world unto itself, encompassed by the biggest world, in which motion takes place, resonates with the way in which the Jābirian corpus discusses *ṣanʿa* as both artifice and alchemy depending on the micro/meso/macrocosmic scale on which the action takes place.

The text then turns fully to the "second kind" of *takwīn*, also termed *tawlīd* as in the first section. The Jābirian author writes,

> "You should know that we have exacted everything said about the first [type of] *tawlīd*, so let us now take up the second *tawlīd* which they name 'For the Stupid'…know is that this first cooking (*ṭabākh*) is a specific thing that many among the owners of *tawlīd* know and that it is a natural process (*tadbīr tabīʿiyyi*) and it is taken to the extent of it."[32]

This is the only variety of *takwīn* explicitly termed a "natural process", even as the temperaments of things (*al-ṭabʿ*, often translated as 'nature') and the impact of those temperaments on *takwīn* are later taken up. In fact, discussion of this second kind of *tawlīd* is structured according to its relationship with *taʿfīn*; this is to say, the Jābirian author discusses four varieties of putrefacted things, including those that are deemed "natural" (*tabīʿiyyia*) and those that are "manufactured" (*maʿmūl*). These types need be discussed in order to reach a section about "*takwīn al-ḥayawān*

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[31] Ibid.

[32] Ibid, 353. وينبغي أن تعلم أنّ الكلام على التوليد الأوّل وقد استوفينا جميع ما فيه، فليكن الآن حين نأخذ في التوليد الثاني الذي وسموه بالبَلَه وأنه المتكوّن الذي وقع كيف اتّفق…تعلم أنّ هذا الطباخ الأوّل شيء خاصّيّ يعرفه كثير من أصحاب التوليد وذلك أنه تدبير طبيعيّ وهو مأخوذ للأخير منها

fi-l-arḍ",[33] or *takwīn* of animals in the earth, also described as animals "*mutawalada fi-l-arḍ*".[34] The Jābirian author says, "Did we not say that animals generated (*mutawallad*) in the earth are slower and stupider on account of coldness?"[35] In other words, the second kind of *takwīn/tawlīd* seems to in fact be *taʿfīn*.

Following this, examples of the generation (*yatawallad*) of snakes and scorpions are given, with extensive discussion on the correlation of elements and temperaments of creatures vis-a-vis the efficacy of the process.[36] The building of a machine in which one "*taʿfināt*" can be conducted is also discussed, in parallel to the device described at the start of the treatise for the "first *takwīn*". On this, the author writes,

> "If the image which is composed and undertaken in it is made from the elements which the philosophers sometimes call an 'element' (*ʿunṣur*) and sometimes 'material' and sometimes 'essence' (*dhāt*) of a thing and a time for its body and time (*miniyya*)…then take for it a perforated vessel just as we said and the image which is the model is placed on its axis in the perforated vessel with the condition that it is round—and certainly the great Furfūrīūs recounted that this vessel is permitted to be pine—then it is placed in a hollow wide jug then that jug is made empty of water which floods it and is cooked over a flexible fire then indeed it is made rich with every kind of *taʿfīnāt*."[37]

This second section presents a fascinating counterpoint to the first type of *takwīn*. To begin, the *takwīn* described in section two is *taʿfīn*, which is explicitly distinguished from the first kind of *takwīn* as a different process entirely. The second *takwīn* is also explicitly termed a 'natural process'. The second *takwīn* seems to have more of a relationship to a notion of "natural" creation writ large, being termed the "*takwīn* of the earth."[38]

[33] Ibid, 355.
[34] Ibid, 356.
[35] Ibid.
[36] Ibid, 358-59.
[37] Ibid, 362-63.
[38] Ibid, 363.

Finally, after a lengthy discourse about letters in relationship to *tawlid*, the author says, "Let us return to the words of its master, so that it be known from its start and the speech of others is not listened to, thus invalidating its doing and calling it wonders." In other words, *taʿfīn* or the second *takwīn* is not presented as part of an aesthetics of *ʿajab*—understanding it as 'wonders' is explicitly discouraged here. Yet, immediately following this declaration is a list of generated creatures, among which there are some described as "*tarā'if*" (rarities), such as a hornet *yatakawwan* from earth and dead blood.[39] It is here, too, that the Jābirian bougounia description is given. This complicates the prohibition just given to not understand *taʿfīn* through an aesthetics of *ʿajab*, as the lists of rare and exotic creatures serve to stimulate the reader's imagination and provoke a sense of wonderment. Even as the term *ʿajab* is not used, the aesthetic persists; literarily, the reader of the text is encouraged to feel wonder and to relate these processes to the wondrous and the strange.

The text then discusses a third kind of *takwīn*, *al-dhakī* or the intelligent variety. This type of *takwīn* is for the production of intelligent or rational creatures and so it is contrasted with the *takwīn* of *al-ablah* or the stupid. It begins with discourse on the vessel, citing back to the machine described at the beginning of the *k. al-tajmīʿ*, and the author notes that there is no conflict about the machine because it is perfectly engineered.[40] The person conducting this type of *takwīn* is termed the "Do-er", the *fāʿil,* and that is defined as "the generator (*mukawwin*) of one of these intelligent beings (*al-ashkhāṣ al-dhakiyya*)."[41] Most of this section is dedicated to details surrounding from whence intelligence in *takwīn* is derived: how an intelligent or rational creature is able to procure its intelligence when it is the product of *takwīn*. The debate is

[39] Ibid, 367-68.
[40] Ibid, 369.
[41] Ibid, 369-70.

extensive, and it is material rife for follow-up study on the relationship proposed by Jābir between mind and matter.

Finally, the treatise turns to the *takwīn* of plants. In this section of the *k. al-tajmīʿ*, the Jābirian author discusses the analogous relationship of plants and animals in *takwīn*. For example, he writes, "Plants need leaves and fruit and bark just as animals need bones and veins and flesh and so forth…."[42] In other words, the procedure for the *takwīn* of animals is the same as that for plants, because plants and animals exist on a continuum of composition with different parts but the same structuring relationships between those parts. Vessels for these procedures are described, and all of this is often referred to with the verb *ʿamala*, or 'making', as in "*al-qawl fi-l-ʿamal lil-nabaṭ*".[43] The treatise continues its discussion of different opinions on necessary aspects of or underlying theories regarding the success of *takwīn*, taking the reader through how different groups value heat, or humidity, or the type of water used, and so forth.

It is towards the end of the text, amidst these discussions, that the Jābirian author specifically refers to a *mukawwan*, a generated being, as a wonder. He says, "Then, that generation being is cooked with this water, so indeed it is a wonder."[44] The text then concludes by noting that the best student of these books takes from them both *'ulūm* and *funūn*, or sciences and arts.[45] *Takwīn* thus participates explicitly in an aesthetic of *ʿajab*, and there is both intellectual and aesthetic value for the student in these processes.

[42] Ibid, 380-381.
[43] Ibid, 382.
[44] Ibid, 390. "*thuma uṭbakh bi-hadha al-ma' dhalik al-mukawwan fa-innahu yakun ʿajaban."*
[45] Ibid, 391.

k. ikhrāj

I discussed the Jābirian *k. ikhrāj* in Chapter Two. To provide a refresher, within this treatise, crucial theories underlying the Jābirian philosophical and cosmological system are presented for the reader. The Jābirian author then details the seven sciences that sit within the system previously described. The seventh of the collection is *takwīn* itself. These seven sciences build upon each other, such that they point like an arrow towards *takwīn*, which is not extensively discussed but indeed presented as the highest aim of this Jābirian system. This text, then, makes an interesting point of comparison with the *k. al-tajmīʿ*, which provides a "deep dive" into methods and procedures of *takwīn* but does not situate it more broadly within an epistemological scheme.

Since the discussion is not too lengthy, I present here my translation of the entire *qawl al-takwīn*, or the *Discourse on Takwīn*:

> *Takwīn* is the seventh section, and it is the result of the science of balance and talismans and the use of spirits (*rūḥāniyyāt*) and medicine (*ṭibb*) and alchemy/craft (*ṣanʿa*). These are the sciences of the world in entirety. And by my master, I have recounted of them in this book of mine what is in them of sufficiency and [necessary] communication, and I will speak about this seventh art, and divide the speech in these books of mine, and go out from it to the remaining of these books, *insha'allāh ʿuzza wa jalla*.
>
> So we say that which one should, for the arrangement, put into motion/action with regards to the science of *takwīn* is the science of its truths in proportion. So one does not add a thing and does not subtract a thing, unless there was corruption by it and one gives the things their truths in degrees, so what the first degree needs is not given to the second degree, and not the second to the third, and not the third to the fourth, nor to the lowest, also, an example being needing a degree, and then giving less than it in proportion. This is the most corrupt and most wholly insane thing of what is in this science. Understanding the first form and its weight, and composing its form, is the best knowledge (*maʿrifa*) of the arrangement of parts and their placing, their placements. When one brings into being these roots, one reaches the level which one desires of true *takwīn* which we have presented in the *k. al-tajmīʿ*. So know that and build your matter upon it…

> As for what we are frightened by regarding fault in the work, [so there is] the apparatus which gathers the form and awakens it and the apparatus which is for what is cooked, I mean the glass. The glass, whenever its essence is pure, is the best (*ablagh*) for generation and the most excellent for it. The location of putrefaction (*al-taʿfīn*) must be safe from the breeze of the wind and its intensity <for preservation/safeguarding> from all of it. It is said that fresh air is good for it, but I do not choose that at all. So know that and work it, and be righteous *insha'allāh taʿālā*.
>
> And among them is the water which cooks under the generation. The philosophers are very much divided regarding that. Some of them say: it is rainwater. Some of them say, it is sea water. Some of them say, it is salt water, distilled and heated…As for the proportion in the whole, this is what is not. That is because clear water is necessary for people and good fish and pleasant animals, like the monkey and fox and what is like that. As for rain <water>, it is for the creation of the huge, like elephants and camels and buffaloes and cows and donkeys and so forth. As for sea water <…> and turtles and crabs and scorpions and malignant snakes and predators and the like. As for the heated and distilled salt water, it is for invented animals, thought-up, which do not have forms, such as a flying person and what is like that, or what has two heads or has a head divergent from its form and the like. So know that and work it, you will find it easy, *insha'allāh taʿālā*.[46]

Takwīn in the *k. ikhrāj* is theorized as the synthesis of the science of balance, talismanic theory and practice, the use of spirits, medicine, and alchemy/craft. Notably, this section references the major debates and technical descriptions given in the *k al-tajmīʿ* ("...it is the result of the science of balance and talismans and the use of spirits (*rūḥāniyyāt*) and medicine (*ṭibb*) and alchemy/craft (*ṣanʿa*)"). The proper proportioning of weights and forms in degrees and then their appropriate arrangement is what results in the type of *takwīn* discussed within the *k al-tajmīʿ* ("Understanding the first form and its weight, and composing its form, is the best gnostic knowledge (*maʿrifa*) of the arrangement of parts and their placing, their placements. When one brings into being these roots, one reaches the level which one desires of true *takwīn* which we have presented in the *k. al-tajmīʿ*"). Even through—or perhaps in part because of—the text's

[46] Ibid, 93-95.

crypticism, a sense of careful consideration and intellection is given. *Takwīn* is a planned, well-thought out process, and it requires specific expertise in numerous subjects.

Two technical aspects of the procedure are elaborated upon: concerns regarding errors in the apparatuses—what I usually term together as the "*takwīn*-machine" of the *k al-tajmīʿ*—and the type of water used in generations. In the discussion of the apparatuses, *takwīn*, or at least a portion of the process of *takwīn*, is explicitly termed 'putrefaction' (*taʿfīn*) ("The location of putrefaction must be safe from the breeze of the wind"). On the one hand, this complicates a broader Jābirian understanding of *takwīn*: in some instances, *takwīn* is *taʿfīn* and in others, it is crucial that it is a distinct process, as discussed in the *k. al-tajmīʿ*. On the other hand, the rejoinder of *takwīn* to a type of generation that is explicitly termed elsewhere as a 'natural process' pushes against the ingrained notion of artificiality and ideas of the process of *takwīn* as being against or outside of nature.

In the brief consideration of water, a rather clever solution to the debates of what kind of water to use is found: it depends on what kind of creature one would like to generate. These creatures range from existing small and large animals, to people, to "invented animals, thought-up, which do not have forms". The scale of making ranges wildly, but the process of *takwīn* remains the same.

Takwin, Artifice, *'Ajab*

I am arguing that *takwīn* in the Jābirian corpus is better understood through a paradigm of artifice than a paradigm of artificiality, presenting the generation of life (*takwīn*) as part of a carefully wrought, cosmologically-scalable act of making or crafting that makes reference to an

aesthetics of ʿ*ajab*. We see this in the way *takwīn* is both theorized and rhetorically presented across the *k. al-tajmīʿ* and the *k. ikhrāj*.

First, not only does *takwīn* require the construction of numerous vessels and devices—linking it immediately to craft discourse and the idea even of *ḥiyāl*—and not only is it often referred to as a 'making', with the verb ʿ*amala*, but *takwīn* is also presented as incredibly carefully wrought and highly intellected. This presentation is accomplished largely through the rhetorical presentation of the idea across the whole of the *k. al-tajmīʿ*. *Takwīn* is extensively debated and detailed. The overall impression a reader has of *takwīn* from the text is that it is tremendously complicated. The majority of the text, in truth, is dedicated to understanding the "construction" of *takwīn*—I mean, how *takwīn* works, its underlying processes, and so forth—and I argue that this focus necessarily presents *takwīn* as a careful, intense, fine craft, especially when taken alongside the more explicit elements of crafting and making brought forth. Similarly, in the *k. ikhrāj*, the description of *takwīn* as the synthesis of numerous disciplines, craft included, and the highly complex proportions cited as necessary for its success give *takwīn* a sense of wroughtedness and careful assembly.

Second, *takwīn* scales cosmologically. In the *k. al-tajmīʿ*, vessels are analogous to one another—see the description of the *taʿfīn* vessel, which is quite similar to the machine described at the start of the text (*Mukhtār,* 362-3); furthermore, the machine needed for the first and third types of *takwīn* are described as effectively the same (*Muhktār,* 369)—as are plants and animals (i.e. *Mukhtār,* 380-381) and their associated procedures of *takwīn*. Furthermore, the womb and the world are explicitly placed in analogy by way of perpetual motion (*Mukhtār*, 352), creating a cosmological through-line between hollow vessels for *takwīn*, uteruses, and the universe. O'Connor notes in her dissertation, as well, that "Each process of creation or generation requires

the technologies and processes of the others," and this is an astute observation.[47] Technologies and processes are transferable because the action scales.

Taking a closer look at the *takwīn*-machine constructed at the start of the *k. al-tajmīʿ* emphasizes this point. The device is structured analogously to the human body. This becomes clear when we read Jābir alongside contemporaneous medical texts that describe the uterus. Descriptions of the uterus in medical texts come from the medieval Persian physician al-Majūsī (d. 982-994), from al-Rāzī, echoing the scholar al-Ṭabarī, and from the Hippocratic corpus, which is a collection of early ancient Greek medical texts associated with the physician Hippocrates. al-Majūsī's description is perhaps the most useful when considering analogues between uteri and Jābirian vessels. He writes, "The uterus is similar in its creation to the creation of the bladder, especially at its base. However it differs from [the bladder] in that it has two appendages on its sides that resemble two horns."[48] The bladder is described as, "La vessie est située chez le mâle sur l'intestin droit et elle possède une seule tunique dure. Il est nécessaire qu'elle soit dure, pour pouvoir supporter Pâcreté de la bile mêlée à l'urine 1). Sur l'orifice de la vessie se trouve un muscle qui la ferme et qui empêche la sortie involontaire de urine."[49] al-Razi describes the uterus as an inversion of the male reproductive system: "...It is similar in the woman to the [penile] meatus [*al-iḥlīl*] in the man."[50] Lastly, the Hippocratic description features a mobile womb, an "... independent creature inside the female body. When the womb was not fixed in place by pregnancy or moistened by sexual intercourse, the womb, which craved moisture, moved to moist body organs, such as the liver, heart, and brain."[51]

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[47] O'Connor, 150.
[48] Ahmed Ragab, "One, Two, or Many Sexes: Sex Differentiation in Medieval Islamicate Medical Thought," in *Journal of the History of Sexuality* 24, no. 3 (2015): 444.
[49] Abū Bakr Muhammad ibn Zakarīyā Rāzī, fl. 940-980 'Alī ibn al-'Abbās al-Majūsī, Avicenna, and P. de (Pieter) Koning, *Trois Traités D'anatomie Arabes (*Leide: Brill, 1903), 385.
[50] Ragab, 443.
[51]Sherry Sayed Gadelrab, "Discourses on Sex Differences in Medieval Scholarly Islamic Thought" in *Journal of the History of Medicine and Allied Sciences* 66, no. 1 (2011): 47.

It is also worth noting al-Majūsī's description of the embryo itself. He writes,

> "When the two seeds mix with one another, bubbles form from the heat of the blood [in the utrine wall] similar to the bubbles that occur in thick viscid things when they boil, if they are cooked on fire. The spirit, which is mixed with the seed, gathers in these bubbles. [The bubbles] gather with each other, creating a great hollow in the seed, [where] a large quantity of spirit is collected. The outside of the seed hardens so that the spirit cannot be disintegrated."[52]

There seems to be no fixed, prescribed shape for the uterus according to the medical tradition: it is bladder-shaped, or the inversion of the male organ, and perhaps it has horn-like appendages. However, it is always hollow. Additionally, al-Majūsī has described the embryo as a hollow seed with a hard exterior.

Compare these descriptions to the Jābirian: the hollow vessel in which biological material is placed is shaped like the creation desired from it with appropriate segments and sealed with a hard shell of clay. It sits within a larger spherical vessel, which cradles the seed of material as heat is applied. The *mithāl* is an embryo; the larger sphere, a womb.

That this machine is structured like a womb is not, in fact, surprising. Recall the parallel the Jābirian author draws between the universe and the womb ("So indeed the womb is named the world and the biggest world encompasses it, and indeed the motion of the stars is perpetual just as we compared it in what we presented…"[53]). This is also supported by Liana Saif's work. Saif demonstrates in "The Universe and the Womb" how,

> "Texts like the *Sirr al-haliqa* by pseudo-Apollonius, *Masqat al-nufta* by the Ikhwan al-Sara, and astrological works such as Abu Ma'shar's *Kitab al-madhal al-kabir…*accede that the womb is the microcosmic counterpart of the universe; it is receptive to the same astral influences that actualise the generation of species, except that they are now the

[52] Ragab, 437.
[53] Jābir ibn Ḥayyān, *Mukhtār*, 352.

> astral causes of conception and fetus development. Through their description of astral causality in conception, they elucidate the unity of the universe…."[54]

In other words, that *takwīn* would take place in a machine that is meant to be analogous to a uterus is in keeping with the principles of analogy extending from the womb through the universe.

That the Jābirian *takwīn*-machine is analogous to the human body takes on new importance when read through a lens of artifice. As I have extensively discussed, theorizations of artifice in Jābirian works take the enterprise of making to be a cosmologically-scalable craft action. Recall the Jābirian author saying, "The belief of the practitioners of alchemy is that the world is a big person, and alchemy is a mid-sized person, and that human beings are a small person."[55] We can read the Jābirian corpus on whole as a body of work which is, at its core, discussing varieties of artifice, the component pieces of a crafting enterprise that make up how the world functions and how power is channeled, step by step, within that world. Thus, as it is explicitly stated in the *k. ikhrāj*, artifice (*ṣanʿa*) is a category of action and/or knowledge that comprises work including the manifestation of the elixir from potential into actuality. At the level of the human, this is specifically alchemy– "alchemy is a mid-sized person"--and thus the technical use of *ṣanʿa* to mean that specific science, but *ṣanʿa* is also a process of making, ordering, and therefore seamlessly channeling forces from potential to actuality. This resonates, of course, with the parallels between universe and womb that are also explicitly called out in the *k. al-tajmīʿ*.

Applying this to the construction of the "*takwīn*-machine" of the *k. al-tajmīʿ*, we can read the machine's analogous construction as a means of participating in cosmologically-scaled craft.

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[54] Liana Saif, "The Universe and the Womb: Generation, Conception, and the Stars in Islamic Medieval Astrological and Medical Texts." *Journal of Arabic and Islamic Studies* 16 (2016): 196.
[55] Jābir ibn Ḥayyān, *Mukhtār*, 71.

There are necessary differences between the generation of life in a *takwīn*-machine and the human body, but the processes must be similar because they are the same process occurring at different scales. This is not a statement of artificiality–what is relevant is not who started the process of generation–but an expression of the theorization of artifice within the Jābirian corpus.

This sense of scaling across levels of being and existence grows when we consider the technological components of the artifice presented to us in the *k. al-tajmīʿ*. Take, as an example, clay. The Jābirian author advises the alchemist to cover his model with smooth clay, called *ṭīn ḥurrī*, discussed in the *Book of Clays*. The uterine sphere is then also covered in clay, though the type of clay is not specified, and once dried, it is polished until it is "like a mirror".[56] Clay features in the Qur'ān as the material used to divinely mold humans. Scholar of theology Kathryn Kueny notes on the topic, "...the Qur'anic God prefers clay (*ṭīn*) in his moulding of humanity...Other verses mention God's use of potter's clay (*ṣalāāl*), mud (*ḥamā*), sticky clay (*ṭīn lāzib*), and dust (*ṭurāb*)."[57] Kueny additionally makes note of how medieval Islamic discussions of human reproduction, while generally modeled off of Hippocratic models, often incorporated clay. She writes,

> "Including clay in the Hippocratic stages of human reproduction has significant theological consequences…it affirms that the divine creation of the first man and subsequent acts of human reproduction are, in essence, indistinguishable. Because human sexuality and reproduction mirror God's initial creative acts...[God] remains an intimate partner within it as he navigates the entire course of sperm generation, conception, fetal development, birth, and life itself from both inside and outside the womb."[58]

[56] Ibid, 459.
[57] Kathryn Kueny, *Conceiving Identities: Maternity in Medieval Muslim Discourse and Practice*, (Albany: State University of New York Press, 2013), 21.
[58] Ibid, 29.

The use of clay in the context of *takwīn* draws the reader both to a religious referent and deeper into a sense of analogy between *takwīn* and other varieties of generation. One is encouraged to think of this kind of generation as parallel and related to God's creation and to human creation.

It is not only the material components of *takwīn* that resonate across cosmological levels, but also what is produced. In the *k. ikhrāj*, the process of *takwīn* remains unchanged regardless of the type of creature being created: to make a bug and to make an invented, new life-form are both part of the same process of *takwīn*. In other words, the product of *takwīn* scales cosmologically, just as the idea of *takwīn* as a process of generation that occurs in micro-, meso-, and macro-levels of the universe across analogous vessels does. Furthermore, as I discussed in the previous section, in the *k. ikhrāj*, *takwīn* is at times equated with other varieties of generation, such as *taʿfīn*. This places *takwīn* in parallel with processes of generation that occur at the "hands" of other actors throughout a medieval Islamic cosmology, suggesting that the making one undertakes when performing *takwīn* is the same kind of making done in the natural world or by the divine, done here by human hands. This makes an understanding of *takwīn* as 'artificial', in the sense of being ontologically distinct from the natural or divine by virtue of its actor or maker, less accurate.

Finally, *takwīn* in the *k. al-tajmīʿ* makes reference to an aesthetics of *ʿajab*. The most notable examples are when, as previously discussed, the Jābirian author calls *takwīn* a wonder akin to the wonders of talismans[59] and when he terms a *mutakawwan* (generated being) a wonder.[60] As also mentioned, there is further reference to the idea of wonder harnessed through the descriptions of rare and exotic generated beings. Rhetorically and literarily, these stimulate wonder and curiosity, further drawing *takwīn* into an aesthetics of *ʿajab*. This is similar to the

[59] I direct the reader to Chapter Three for a note on Jābirian theorizations of talismans as craft and their relationship to broader Jābirian theorizations of artifice and artificiality.
[60] Jābir ibn Ḥayyān, *Mukhtār*, 352 and 390, respectively.

notion of wonder harnessed in the *k. ikhrāj*: while the term *ʿajab* is not explicitly mentioned, the idea is rhetorically presented through the content discussed and the structure of the treatise (see Chapter Two for arguments on the structure of the *k. ikhrāj* and its relationship to both *ṣanʿa* and *ʿajab*). To cite the making of entirely new and imagined life-forms as the seventh science and pinnacle of Jābirian alchemy almost necessarily gives *takwīn* in the *k. ikhrāj* and its readers a wondrous feeling.

While *k. al-tajmīʿ* and the *k. ikhrāj* feature the most notable and well-known discussions of *takwīn* within the Jābirian corpus, these treatises are not the sole places in which *takwīn* is mentioned, nor are they the only texts that contribute to theorizing *takwīn*, either. As O'Connor demonstrates in her dissertation, *takwīn* rests on theoretical bases that are more extensively discussed elsewhere in the Jābirian corpus. Most notably, O'Connor highlights the *k. al-sabʿīn* and the *k. usṭuqus al-uṣṣ*. There are a few key points that I want to draw out from these texts without reproducing O'Connor's work, as they provide evidence for the relationship between *takwīn*, artifice, and *ʿajab*.

The *k al-sabʿīn*, and specifically its 18th treatise, discusses the parallelism of the universe, in so far as macrocosmic and microcosmic generations mimic one another. This text makes regular use of the term *ṣanʿa* to describe its operations of mixing and combining fundamental elemental qualities to enact transmutations. It goes as far to term the one who conducts these operations the "*ṣāniʿ*", the 'maker' or 'crafter'.[61] This text also describes human operations as capable of being parallel to natural operations: "He told us that, regarding the power/potential of man, it works as the workings of nature."[62] This statement has a similar effect to the relationship drawn between *taʿfīn* and *takwīn* found in the *k. ikhrāj*, insofar as it

[61] Ibid, 464.
[62] Ibid, 463. "*Akhbara anna fi quwwat al-insān an yaʿmil ka-ʿamal al-tabīʿyia.*"

destabilizes the notion of human creation as something outside of a paradigm of creation in the natural world. It also emphasizes the cosmological scalability and analogy across cosmological levels of methods and means of making, including generation.

The *k. al-ḥajar* (*Book of the Stone*) provides information on the relationship between alchemy, the elixir, the stone, and *takwīn*.[63] This text highlights the sense of analogy found especially in the *k al-tajmīʿ*. In it, the generation of the stones is explicitly analogized to humanity's generation from sperm and egg: first, the author says, "...thus, the stone is called macrocosm (*ʿālaman kabīran*, 'great world'). And it is called microcosm (*ʿālaman ṣaghīran*, 'lesser world') because the stone resembles humanity (*insān*) since its generation (*takwīn*) is like humanity's generation (*takwīn*)."[64] Notably, *takwīn* here is a type of generation that encompasses so-called "natural" human generation as well as the alchemical generation of minerals/stones, challenging its designation as 'artificial' in translation.

A bit later in the text, the author returns to this analogy of egg and sperm: "So, as for our naming it [the stone] 'the egg' (*al-bayd*), this is because it is white and yellow and hot and cold in nature, **and the genesis (*takawwun*) of animate creation is from it as human genesis is from the sperm and egg**. As for our naming it [the stone] 'the sperm' (*al-minan*), that is because its odor at the beginning of its development and its conjoining with the female **is like the genesis of the living creature from it according to the limit of the development of humankind from sperm** (emphasis mine)."[65] Alchemical genesis is explicitly understood to be the same as human genesis. These two passages support a reading of alchemical products as artificed, but not artificial, products.

[63] O'Connor, 101. See both O'Connor and S. N. Haq for more detailed work on this Jābirian treatise specifically.
[64] Jābir ibn Ḥayyān, *Mukhtār*, 32; also see O'Connor, 111.
[65] Jābir ibn Ḥayyān, *Mukhtār*, 38 and O'Connor, 114.

Furthermore, the *k al-sabʿīn* explicitly connects alchemical transmutative processes with wonder. The Jābirian author writes:

> "Then indeed it [the quality/accident] is absent and another emergent [quality] appears in it with wondrous potential (*quwwa ʿajība*) so the great elixir is made with materials far from the first."[66]

In sum, there is substantial support intratextually for reading processes of generation (*takwīn*) discussed in the *k al-tajmīʿ* and the *k. ikhrāj* as aspects of artifice, a concept theorized across genres in the Jābirian milieu as careful makings across a cosmological scale of actors that are situated within an aesthetic of *ʿajab*.

Takwīn and Virtue

Takwīn is an example of medieval technology that relies upon particular notions of craft and making, as well as natural-philosophical ways of understanding the workings of the world. In addition, as I have discussed especially in Chapter Three, *takwīn* carries a religious sensibility, both through its lexical root, its ideation of creation, and its reference to an aesthetics of *ʿajab* that extends across an Islamic cosmology and provides a positive, imitative link between human and divine creative action.

Thus far, I have discussed *takwīn* within the Jābirian corpus based upon fairly explicit theorizations of the term. Even as I have built upon a broader theorization of an idea of artifice/*ṣanʿa*, this has been the case: in the *k. ikhrāj* and the *k. al-tajmīʿ*, *takwīn* is at least a, if not the sole, subject of the text's discourse. Yet I want now to consider what shoulders of other ideas within the Jābirian corpus *takwīn* might stand upon or which might inform the notion of

[66] Jābir ibn Ḥayyān, *Mukhtār,* 464.

takwīn, even if those theorizations do not touch *takwīn* explicitly. I am going to take this question up specifically with regards to production and religiosity. So often are magical, occult-scientific, and alchemical materials of the early medieval Islamic milieu interpreted outside of more normative, contemporaneous religious and cultural frameworks; *takwīn* being understood as an "artificial" process frankly encourages this ghettoization of sources.

As such, here I discuss the *k. al-tajmīʿ* and its theorization of *takwīn* alongside a Jābirian treatise titled the *k. al-mīzān al-ṣaghīr,* the 'Small Book of Balance'. I argue that *takwīn* as theorized in the *k. al-tajmīʿ* also relies upon an intratextual incorporation of what I will term 'religious technology' from the *k. al-mīzān al-ṣaghīr*, and this intertextual incorporation can inform our understandings of both *takwīn* in the Jābirian corpus writ large and also how *takwīn* was theorized by Jābirian authors and in the Jābirian milieu. In positing this, I discuss the importance of intratextuality in the Jābirian corpus, the alchemist's prayer found within the *k. al-mīzān al-ṣaghīr*, why this prayer can be read as technology, and what that contributes to our understanding of the process of *takwīn*.

The intratextuality of the Jābirian corpus is well-established: see my arguments in the introduction regarding the reading of the Jābirian corpus as a whole unit in conversation with itself. Even, however, if one prefers not to take up quite as capacious a view on the corpus, intratextuality is still a key fact of Jābirian reading within a more traditional scheme of the corpus' organization based around our ability to date individual treatises.[67]

The *k. al-tajmīʿ* and the *k. al-mīzān al-saghīr* are located within the collection known as the *Kutub al-Mawāzin*, or the Books of Balance. The "Books of Balance" are 144 works on a wide range of topics, from alchemy to music to prosody to medicine. Taken together, these treatises contribute to the reader's understanding of the 'science of balance', as each individual

[67] I refer the reader to the Introduction and Chapter One of my dissertation for more discussion on intertextuality.

work focuses upon a different element of the 'science of balance', be that specifications or definitions or natures. Thus using ideas described in the *k. al-mīzān al-ṣaghīr* to interpret the *k. al-tajmīʿ* is not unintuitive or anachronistic.

O'Connor categorizes the *K. al-mīzān al-ṣaghīr* as the Book of Balance which "...describes the prayerful attitude and ritual preparation necessary to the alchemical work which unquestionably places such work in the category of religious as well as magics-scientific experience."[68] A unique prayer features in the book, on whose basis O'Connor comments, "The proper preparation for the alchemical operation is not technical but spiritual in nature. The transformation of substances rests upon the alchemist's personal purity, clarity of intention, and submission to God in prayer...prayer itself may be seen as a technique of the alchemy of self-transformation."[69]

I would here update O'Connor's understanding: it is not that the alchemical operation is spiritual instead of technical, but rather that the spiritual *is* technical, and vice-versa. To understand this prayer as technological requires an acknowledgement of the shifting notions of craft within the Jābirian corpus and the *Kutub al-Mawāzin* specifically. As I argued in Chapter One, *ṣanʿa* is a theorization of craft indigenous to the medieval Arabo-Islamic context of the Jābirian milieu. I also argued there against understanding *ṣanʿa* purely as a translation of antique Greek and specifically Aristotelian craft theory. This is not to say, however, that the Jābirian corpus is not in some ways informed by Aristotelian theorization of craft (*technē*), just as the Jābirian corpus is informed by Aristotelian thinking broadly but is not reducible solely to repetitions or even re-interpretations of Aristotelian ideas.

[68] O'Connor, 82.
[69] Ibid, 90.

Aristotelian *technē* is a virtue of thought, usually translated as art or craft. It is paired with *epistēmē*, meaning knowledge, and in particular scientific knowledge —scientific in the sense of not experimentation or methodology, but of certainty. *Technē* is also distinguished from *aretē*, virtue*,* because the value of *technē* is in its works, whereas the value of virtue, or more specifically, virtuous action, is contingent upon the actor who chose the virtuous action. In an Aristotelian frame, therefore, the value of craft (*technē*) is in what is made, whereas the value of virtue (*aretē*) is in not what it produces, but in the activity itself.

Just as one can say the alchemist conducting *takwīn* is engaged in artifice, in *ṣanʿa*, and therefore the finely-wrought cosmological scaling of creative production, one could also interpret the alchemist in the process of constructing a mechanical womb as being engaged in artifice, in *technē*, in a production that is valued due to *what* it produces. However, a close look at the materials involved in *takwīn* suggests that the virtue of *technē* in the *k. al-tajmīʿ* is shifted from not only what the craft produces but also to the activity of production itself. The shift in the meaning of the category is exemplified by the materials needed, which identify the process of *takwīn* as a religious and divinely-sanctioned process, and thus a locus of virtue unto itself. When the utilization of prayer in the *k. al-mīzān al-ṣaghīr* is read next to the utilization of materials and material technology in the *k. al-tajmīʿ*, the parallels between the two indicate that prayer in the text should itself be understood as a material, technological component.

The use of clay in artificial womb construction serves as a good example: clay specifically marks the process of *takwīn* as a process submerged in piety, therefore making the activity (the process, *technē*) a virtue, not only its production. As noted in the previous section, the use of clay in the context of *takwīn* draws the reader to the religious referent: once again, the text is situated as distinctly Islamic in the inclusion of this material. One could argue, then, that

the inclusion of clay serves as a means to make licit the alchemist's practice of *takwīn*. It binds the alchemical enterprise to God in the same manner as human sexuality and reproduction is bound to God. This shifts the locus of virtue from the product alone onto the process, and this is accomplished by linking alchemical process to Islamic discourse.

Turning to the prayer of the *k. al-mīzān al-saghīr*, it is introduced when the author's master teaches him an invocation that combines the teachings of the philosophers and better or more potent religiosity. The master explains to his disciple regarding the prayer:

> "And he said to me: no matter will conclude for you except by it, and I took this to mean, no effect will occur for one who reads my books until he has removed the image of the devil from his heart, and left from stubbornly persisting in wrong, and employed pure submission (*maḥḍ al-islām*) and religion (*al-dīn*) and beautiful intention (*al-niyyah al-jamilah*). As for Satan, as long as Satan plays with him and makes him err in intention, nothing will benefit him. And that is because the abyss is not from Satan alone, but rather it is from the corruption of intention. So honor God, O reader, in your soul, and intend what I advise you. Indeed, it—by my master—is more praiseworthy for you, even if it delays what you are trying to do. Do not despair at the spirit of God and his removal of suffering lest you are among those whom the Fashioner (*al-bārī'*) condemns as acting unjustly and charges with wrongdoing in his justice, glorified and sublime be He. And leave your waiting regarding what you desire to learn. Indeed, when the removal of suffering reaches you, you will repent what you did before, and the repentance will not benefit you anything."[70]

This prayer is identified as part of the alchemical process in a number of instances, most strikingly in the beginning anecdote, "No matter will conclude for you except by it." The prayer coincides and coexists with the removal of: "...the image of the devil from one's heart, the leaving of stubbornly persisting in wrong, and the employment of pure submission (*maḥḍ al-islām*) and religion (*al-dīn*) and beautiful intention (*al- niyyah al-jamīlah*)." Alchemical success and proper spirituality are here tethered together. Engagement with proper reading practices is meaningless without the appropriate religious sentiment and action.

[70] Jābir ibn Ḥayyān, *Mukhtār*, 455-56.

The active ritual components of the prayer are then detailed:

> "This is the injunction: first, purify and clean yourself with clean water in a clean place, then don a pure, clean garment which a menstruating woman has not touched. Then, seek the favor of Allah one thousand times, saying in your seeking: "O Allah, indeed, I seek your favor in my intention, so aid me and turn Satan from me. Indeed, you have power over him, and he does not have power over you." When you have said that one thousand times, direct yourself to a pure, clean place and begin. Magnify Allah and recite the *ḥamdulillāh* and the first verse of the *Ṣūrat al-Ikhlāṣ* ("Say: indeed God is one") one hundred times, and bow and prostrate yourself. Then, you rise and pray like the above, and then you say the *shahāda* and submit. Then, recite during the second two genuflections one hundred times a portion of the first verse of the *Ṣūrat al-Naṣr* ("When the victory of God has come") and the *Fātiḥa*, and when you submit, do again as you did with the first two genuflections but you recite "Say: indeed God is one" one hundred times, and then you add another two [genuflections] along with "When the victory of Allah has come" and the *Fātiḥa*. Then, you pray two other genuflections, which are completing ten total, and you recite *ṣūra* after *ṣūra*, and then you have completed your prayer. And beware talking to anyone during that lest you become preoccupied. The best of places for you to be are empty deserts in order that you do not talk to anyone."[71]

The alchemist's prayer requires ritual processes that *ṣalāt*, regular ritual prayer, requires: physical cleanliness and ritual purity. A statement not identical in language to the Qur'anic *aʿūdhu bi'l-lāhi min al-shayṭān al-rajīm*—often included in ritual prayer—but not dissimilar in its request or invocation is offered one thousand times. A clean and pure location is also sought. Then, the first *rakʿa*, a specific pattern of prostration, genuflection, and rising, is coupled with recitations from five portions of the Qur'an: the *ḥamdulillah*, the *shahāda*, a line of the *ṣūrat al-naṣr*, a line from the *ṣūrat al-ikhlaṣ*, and the *fātiḥa*. The instructions given are as detailed as those regarding the construction and assembly of the mechanical womb vessel.

The prayer then provides a script for the alchemist by which to address and beseech God, including a "fill in the blank" section for describing what product one seeks.

[71] Ibid, 457.

> "Blessings upon Muhammad, your servant and your messenger, and upon his family and his companions, the Chosen Ones. Guide my intellectual soul to what is intended from it, which you are most knowledgeable of, and cause my animal soul to attain the utmost of its hopes from you, so it is near you. When you cause my animal soul to attain that, you make it attain the lower world and the hereafter—surely this is easy for you, Oh Allah. I know that you do not fear fault nor imperfection, which is made weak by you, by your mercy and your generosity. Grant me what I ask from the lower world and the hereafter, Oh Allah, Oh giver of everything. Do that for your pleasure and do not do it for what displeases you, O Allah. Give what sustains me as an aid for the fulfillment of your laws and as a witness of my proximity to you, and do not make it as a witness against me nor as an aid for seeking what might turn you away from me, Oh Allah. Oh creator of everything, you created my heart, and you created Satan and cursed him by what was deemed fit for him, and you commanded us that we curse him, so repel him from the heart of your friend, and support me in what I seek regarding such-and-such."[72]

Following that is another series of required ritual processes:

> "And recount your need in this place. When you are empty of all which you desire, rub your cheeks with dust from the earth, and say while you rub: "The mortal servant becomes humble and collapses before Your everlasting, powerful face," ten times. Then sit for a long while, then rise, and show honor and magnify [Allah] by reciting the *ḥamdulillah* and the *ṣūra* "Did We not expand for you your breast?" and recite these in the second genuflection."[73]

Yet another script follows, whereby the alchemist humbles himself before both God and master, and declares himself patient in the light of God, striving and learning only on His account:

> "When you submit, say, "O my master, I am only guided by you and I do now only learn by you and I do only strive to you. I do not seek or hope for anything other than you, Oh Allah. Do not destroy what binds my intention and my hopes for you. You do not destroy the recompense of those who do good. Indeed, you determine everything and nothing is determined upon you. Certainly you promised the patient ones the best of your reward and verily I am patient for you, during what you make light for me and during the tests for which you require my patience, O Allah. Certainly you have promised ease after difficulty, O Allah. Eradicate the times of difficulty and make them as but an addendum to times of ease, and make that as a lot from the lower world and as shares from the

[72] Ibid, 457-58.
[73] Ibid, 458.

> hereafter, O Allah. Indeed, my path to you is through Muhammad and the best of the family of his house, amen, amen, amen."[74]

Just as with clay, specific prayer practices draw Islamic ideals and virtues into *takwīn*. Both serve a similar technological function: the cultivation of a pious pure selfhood and the analogous relationship drawn between self and God through Qur'anic resonance forces the virtue in *takwīn* to be found not in what it makes but in how one does it: process, not product. Another way to say this would be: understanding both clay and prayer as material technology in alchemy highlights a shift in the location of virtue, or even value, in the alchemist's craft. Virtue, which here includes a particular religious sensibility and licitness, is found in enacting the process, in the craft of the alchemical enterprise itself, not solely in the product that alchemy can bring forth. It is also worth mentioning, as O'Connor has, as well, that the practitioner, the alchemist, also retains a degree of technological function. One who has kept the devil in some aspect of his heart, for example, is a flawed component of the process.

With the prayer components of the *k. al-mīzān al-ṣaghīr* understood as an aspect of the material technology of *takwīn*, this technology can now be incorporated into our understanding of the operationality of the *takwīn-machine* of the *k. al-tajmīʿ*. As stated before, the *takwīn-machine* operates largely in the framework of the natural-philosophical principles that inform similar processes like *tawlīd* and *taʿfīn* throughout the Jābirian milieu. However, what is emphasized in the alchemist's prayer is, first, God as the Creator, Fashioner, and Shaper, the one who can grant what the alchemist seeks, and second, spiritual purity as the prerequisite for God's grace and blessings. "Grant me what I ask from the lower world and the hereafter, Oh Allah, Oh giver of everything...Give what sustains me as an aid for the fulfillment of your laws and as a witness of my proximity to you...Indeed, you determine everything and nothing is determined

[74] Ibid.

upon you. Certainly you promised the patient ones the best of your reward and verily I am patient for you, during what you make light for me and during the tests for which you require my patience, O Allah," the alchemist prays.[75]

The alchemist, by utilizing prayer technology, enables and conducts divine power, which is notably different from the alchemist generating creative power himself. What "fertilizes" the *takwīn*-machine, then, is not just the biological material placed inside of the machine and the natural principles that encourage its development, but also divinity, called forth by prayer. The biological material and the *mithāl* together--the whole machine--provide a blueprint for the generated being's shape (the *mithāl*) and nature (the flesh determining the biological kingdom to which the artificial being belongs). All of this–the process and the product–are framed within a notion of craft or artifice that takes the entire activity to be a devotional wonder.

Conclusion

Discourses of modernity necessarily encourage contemporary readers to interpret Jābir in a particular way, with particular historical assumptions about divine and human creation. This, I believe, we see clearly in Paul Kraus' work. Kraus understood Jabir to be using natural science as a tool for imitating the divine as an extension of the Platonic idea of art imitating nature. Imitation necessitates artificiality, in his view. There is something real and there is a 'fake' version of it. Even if natural science is the tool used in the construction of that version, it is still 'fake', or at least 'distinct'.

The beauty of historical texts is the way in which they disrupt these assumptions. In my readings of Jābirian texts, it doesn't seem to me that imitation actually implies or necessitates

[75] Ibid, 358.

artificiality. Rather, as I have shown, a concept like artifice allows imitation to be a participation in a kind of careful, thoughtful making across a cosmological scale. The point is not to make a perfect, indistinguishable copy, but rather to participate in the making itself. I would suggest that this is because of the wonder associated with artifice, as we have so consistently seen. To make in this way is to feel wonder, to be a part of something bigger than oneself. It shifts the prerogative of alchemical creation from product to process.

I don't find a *meaningful* distinction in the Jābirian corpus between what is made by different hands at different levels of being. Things are made by different hands at different levels of being—that is artifice—and that concept is extensively theorized by the corpus—how do different actors at different levels of being participate in makings is a central question and pursuit of the Jābirian corpus, I believe. But I don't find that the corpus theorizes artificiality, as we understand it, alongside this theorization of artifice.

O'Connor would say that artificial creation is unique from other forms of creation because of its salvific potential. She reflects,

> "Alchemy operated within a firm conviction of the perfectability of the mundane world through progressive acts of purification, conceived as sublimating or 'raising up' essence, separating the dross from the pure, and distilling the essential from the accidental. In this sense the alchemical products, the elixir of life and the living beings which arose out of *takwīn*, are considered medicinal agents and instruments of salvation…Materially, alchemy, and within it the process of *takwīn*, replicated the primal forces of nature in the generation of a purified product, a sample of living creaturely creation. Spiritually, it engaged the individual in purified re-creation of the self, the living soul. And ritually, it allowed the alchemist to reenact the drama of divine creation as a form of worship and to reproduce in miniature, the living cosmos."[76]

O'Connor prioritizes the value of alchemical production being located in the perfection of what is produced. In contrast, I understand the Jābirian author to be saying that the wonder that

[76] O'Connor, 334-35.

emerges from or subsists in relation to *takwīn* because something made by *takwīn* was artificed, because it participates in a kind of wonderful making that suffuses the entire universe.

Regardless, utilizing a different paradigm in *takwīn*'s interpretation, foregrounding a notion of artifice over that of artificiality, we perhaps have the sense that translating *takwīn* as 'artificial generation' carries its own interpretive foibles. Kraus and others have defined and thus reified these terms, therefore determining the discourse on this topic, but in reproducing these reifications and attached discourses, we miss crucial aspects of the worldview underlying the process itself. Furthermore, it encourages us to continue to do so, almost without thinking about it—so thoroughly naturalized is the translation that rarely does one question if our contemporary term 'artificial' is appropriate, and in what ways, for a medieval term. The translation fronts ideas important in the 20th and 21st centuries about scientific creation and about the field of the history of science at that time. These ideas include the distinction between humans and nature, or the secularity of the natural world itself.

In so doing, however, the translation of *takwīn* as 'artificial life' neglects the subtleties that reveal how *takwīn* relates to a broader discourse of crafting and making–how alchemy is in dialogue with other disciplines and participatory in a cultural conversation about wonder, religion, and cosmological participation. To translate *takwīn* beyond artificiality, to prioritize artifice, is to deconstruct the ghetto around alchemy as a discipline in the medieval Muslim world, and to provide an opportunity to spot a related cluster of ideas that subsist across numerous disciplines at the particular cultural moment of the 8th-10th centuries.

Epilogue: Thinking with *Takwīn*

In this dissertation, I have argue that a translation of *takwīn* as "artificial generation" misunderstands how *takwīn* was actually theorized within the Jābirian corpus, and within an 8th-10th century discourse on making, creation, and creative action more broadly. *Takwīn* is better understood as something 'artificed', not something 'artificial', for it is a type of wondrous, creative making related closely to crafting that sits alongside numerous other forms of creation, making, and crafting in an interdisciplinary, 8th-10th century theorization of artifice (*ṣanʿa*). Artifice is a type of careful, cosmologically-scalable making that imitates divine creation by way of an aesthetics of wonder (*ʿajab*). In steadfastly reproducing early-mid 20th century translations of *takwīn* as "artificial generation", Jābirian studies and its related fields today have glossed over an understanding of human creative artifice as part of a larger and universal system of devotional making and inaccurately represented an idea fundamental to the Jābirian corpus. These insights emerge when we study Jābirian texts with an eye to new methodological principles, moving away from the 20th century methods of its study that have become hegemonic to the field and that focus primarily on dating, provenance, individual treatises, and a limited set of textual and theoretical interlocutors.

I am of the belief that a valid question to pose at the end of any academic work is: so what? Scholarship for scholarship's sake is well and good, but in holding onto the belief that academic work that inquires into the niche, the esoteric, the minute–and especially the *historical* niche, esoteric, and minute–is of great value to our present existence, and that what is learned through this work can and even should influence how we make sense of our contemporary lives,

I think the reader is fairly entitled, and even wise, to peruse these sorts of materials with questions of relevance and stakes in mind.

So: so what? How does *takwīn* speak to the contemporary world? A Jābirian alchemist may have understood their work as participating in a broader cultural conversation about wonder, craft, and devotion–but what does that matter for the 21st century? Why is the modern translation of *takwīn* as 'artificial generation' so terrible, aside from the fact that it is effectively anachronistic? Why should anyone beyond historians of medieval Islamic alchemy and occult sciences care for this insistence on accuracy? I won't hamper the reader with a long excursus about the necessity of accurately representing the historical because my thoughts on the subject can be summed up quite simply: a quick look at the way misrepresentations of history have been marshalled in the service of all sorts of injustices across time and space can confirm that historical accuracy matters for anyone who seeks a more just world. Instead, I want to call attention to two ways that *takwīn* speaks to the contemporary moment.

A careful reader will fairly ask if, in drawing these connections, I am not projecting the assumptions of my own century onto Jābir, just as the 20th century scholars I have critiqued did when they translated *takwīn* as "artificial life". I would offer instead that I am thinking "with" Jābir in relation to my own times. To think with the Jābirian corpus or with *takwīn* is to, in some ways, forgo the attempts of historical scholarship to maintain fixed interpretive boundaries between text and self. This dissertation has attempted to be rigorous in not reproducing anachronistic categories and imposing them upon the understandings of the Jābirian corpus, for example, but my study only has meaningful stakes in conversation with those who read it and the ideas, issues, and understandings they bring to its reading (which includes problems with and critiques of past scholarship). This is not entirely different from what Ruska, Holmyard, and

Kraus did, except for that they presumed their interpretations of the Jābirian corpus to be reflective of an objective truth about the past. They were not "methodologically indifferent", as Syed Nomanul Haq described himself.[1] In contradistinction, I am comfortable with the fact that my reading of Jābir is one interpretation of many. I believe it to be a historically valid, methodologically rigorous reading, but this is where my approach is perhaps better described as growing out from religious studies methods than purely historical ones. To ask how *takwīn* speaks to the contemporary world–clearly the fixation of this epilogue–is to bring the contemporary world to the Jābirian, and to ask how we might view our world and our questions about it through a Jābirian lens. We can also reframe the question like so: what does thinking with *takwīn* offer to the concerns of the 21st century, and more specifically, to the concerns of the year 2025?

The first offering picks up where the previous chapter (Chapter Four) left off, with notions of virtue. In the United States in 2025, the 'natural' is often correlated with the 'unmodified'. This sentiment runs through a gamut of controversial topics, ranging from the idea that genetically-modified organisms are "bad" because they are not "pure" to the notion that trans-people are "unnatural" because they have modified their "natural" or original sex. Understanding Jābirian alchemy with a paradigm of artifice instead of artificiality fundamentally challenges that way of thinking. By my reading, the Jābirian alchemist at no point suggests the 'natural' is solely the 'unmodified', or rather, that the 'modified' is necessarily 'unnatural'. It also does not suggest that modification (or imitation) is illicit, or even unvirtuous. Foregrounding artifice suggests a Jābirian way of understanding human will and agency in the world as something special, surely, but not something separate or outside of the natural workings of the

[1] Haq, 30-32.

cosmos. It reintegrates the human into a cosmological scheme, even while giving the human priority of place.

Second, *takwīn* also inspires wonder, not only, I believe, for the contemporaneous practitioner, but also for the contemporary reader. We are taken aback by what the Jābirian author often suggests; we do feel the effects of a cocktail of marvel and horror at some of the more grotesque elements. One is asked to suspend some of their disbelief in considering these theories, these processes. The same affective and literary strategies for promoting wonder that I have discussed as evidence for Jābirian participation in an aesthetics of *ʿajab* throughout this dissertation also stimulate our own sense of wonder. We are not really outside of these texts when we read. Thinking with *takwīn* reminds us that there are ways of conducting structured and rigorous inquiries into the workings of the world that are not devoid of emotion or affect. Scientific or philosophical pursuit need not be cynical; academic pursuits can be a joy. In thinking with *takwīn*, I find myself contemplating what could be different in contemporary society if wonder infused more of our experiences with learning and if we were encouraged to take (and teach) more seriously how what we read makes us feel.

To think with *takwīn*–intertextual and interdisciplinary as I hope I have shown it is– in an academic context is to necessarily push against classificatory silos created by modern scholarship while attempting to order epistemologies of the past. I am often asked if my medieval Muslim interlocutors believed in the "truth" of *takwīn* or if they believed it really worked; thinking with *takwīn* promotes the response that there are richer, more meaningful questions to be asked of *takwīn* than that. The "point" isn't to determine if *takwīn* worked or didn't work or was thought to work or thought not to work; the point is that *takwīn* and its study encompasses the term, the corpus (and corpuses) in which it is housed, and the ways that it is theorized with reference to

numerous perspectives and across a number of genres. *Takwīn* sits at the intersections of theology, science, philosophy, art, and engineering; it makes interlocutors of cross-continental ancestors, of differing groups of believers, of disciplines and methodologies. To think with *takwīn* in the academy is to be open to that. In a more personal context, thinking with *takwīn* also provides a framework through which one can challenge contemporary ellisions, including the correlation between unnaturalness and modification, and between study and cynicism. When we elide the process of *takwīn* into "artificial generation", we lose the ability to think with it most fully: as a Jābirian alchemist might say, we leave *takwīn* as merely potential, and never pass it into actuality.

Appendix A: the *k. al-mīzān al-saghīr*, Jābirian intratextuality, and alchemical tropes

The *k. al-mīzān al-ṣaghīr* says,

> "If the reader desires it, we remind him that information on this topic can be found in the treatises in which I recounted the science of the Balance, and there are fifteen of them. [450] I made these two treatises—I mean, what came before this here and then this treatise itself—and together they are one book, which I titled *The Balance*, but I have nicknamed the first *Purity* and this one *Balance*. I made the two of them from the first of what a person should learn, in the same way as a child first learns the alphabet (*abjad*). I followed that with a treatise called the *Book of What is Sought*, which means what is sought of training in the teachings of the principles of the science of Balance. He who has knowledge of that book is fitting for the knowledge of the science of the Balance, as the people who have knowledge of this book are fitting for knowledge of Balance! So these secrets are understood, by the truth of my Master, and were there not knowledge of these secrets in my teaching, then I would not have enumerated them, for my aim in the books of balance is a summary in order to pare away what has no merit. And if it were not that, then I would display them greatly, making all people know the nature of all things. But you know that there is too much corruption in the world for that."[1]

It is important to note two points in the above text. First, the fifteen treatise doctrinal unit within the *Books of Balance* represents the best and most concise information about the science of Balance. Second, the knowledge offered by the corpus is offered only to the worthy initiate. The author notes that the world is too corrupt to teach everyone the nature of all things; instead, knowledge must be limited to those with the proper training and the proper framework of knowledge, which is described here as other books within the Jābirian corpus. This is not an uncommon theme within the Jābirian corpus, nor alchemical and other esoteric material generally.

The *k. al-mīzān al-ṣaghīr* continues,

> "Then indeed, I followed *The Book of What is Sought* with *The Book of Principles*, which ought to be read in the footsteps of the two other treatises, as it is the third of the series. Then, I composed a fourth treatise and called it *The Greater Book of the Full*

[1] Jābir ibn Ḥayyān, *Mukhtār rasā'il Jābir ibn Ḥayyān*, ed. Paul Kraus (al-Qāhirah: al-Khānjī, 1935): 449-450.

> *Moon*, and in that treatise, I collected everything regarding the science of the Balance in *The Book of Principles* that I have found to be true and verifiable. And I composed a fifth treatise called *The Greater Book of the Sun*, which is another traveler upon that road. Then, I composed a sixth, seventh, eighth, ninth, tenth, and eleventh treatise about the science of the Balance, which are the aggregate of my books regarding the stones. I told you about what is in the treatises, and the first epistle, the tenth, the two hundredth, the hundred and fiftieth, and the three hundredth [451] which traverse this path. Then, after that I composed a treatise known as *The Book of the Utmost*; much knowledge is contained within it on the topic of the science of the Balance, and that is twelve volumes. And after that, I composed three treatises together called *The Exegesis of Hidden Secret*—and I certainly mentioned the aggregate of these works in the third catalogue—and these three treatises are among the works of the philosophers. One of them is called *Prophetic Medicine According to the Ahl al-Bayt*. And the meaning of "Exegesis of Hidden Secrets" is not that there is exegesis in these books; rather, it is that in this book is the remainder of what completes all of these books, and some information presenting an explanation of it all. So know that, if God wills it. And we have no other design in this, just what is in these books word-for-word, nor any other thing with additional requirements, so know that Inshallah (may He be exalted)."[2]

The knowledge of some of these books completes the collection's knowledge, which is to say, no book contains complete or perfect knowledge of the 'science of balance'. Rather, the books must be read together, in sequential order, to be properly understood. Here, the Jābirian corpus showcases an awareness of its own methodology.

> The treatise continues,
>
> "So know also that, in this book of mine, there are two injunctions. The first injunction is regarding the teaching of the reading of the *Books of Balance*, and the second injunction is that by which the completion of your knowledge of balance and other things exists, if God, may He be exalted, wills it. So as for the first injunction, gather all of the books first—I mean the fifteen books—and then select a teacher whom you respect and whose knowledge of logic and geometry and philosophy and the science of nature you trust. Begin reading the books from the first of them to the last, and indeed the truth will become clear to you, if God wills it."[3]

[2] Ibid, 450-451.
[3] Ibid, 451.

The reader is given instructions for proper reading methods of the text. As mentioned previously, all of the treatises are required to have access to complete knowledge. They must be read in order, and only then will the truth become clear.

Furthermore, a teacher is required in order to instruct the initiate. This is yet another common trope in alchemical literature. Much of the early work on the Jābirian corpus and around Jābirian historicity and identity has inquired after the relationship between Jābir and Jaʿfar al-Ṣādiq, the sixth Imām. According to Kraus and Plessner, the Jābirian author self-describes as a mere compiler, with all this knowledge being handed down him by the "mine of wisdom" that is Jaʿfar al-Ṣādiq, though Kraus sees this as pure invention of a later Jābirian author who sought to attach authority to the works by association with Jaʿfar, representative of Greek learning and occult sciences.[4] Historian of alchemy Regula Forster also discusses this in "Auf der Suche nach Gold und Gott. Alchemisten und Fromme im arabischen Mittelalter," in which she compares Sufi master-disciple relationships and their associated notions of authority and expertise to alchemical master-disciple relationships. Forster does not try to reconstruct an accurate picture of master-student relationships in alchemy or Sufism, but instead tries to describe how these relationships are staged in certain texts. In the alchemical discipline, which she understands as a new natural philosophy wherein the search for gold is akin to the search for God, masters use different strategies to stage their authority and competence. Relying on legends, such as stories of finding a book in a remote location that reveals all alchemical secrets, are especially popular. Authority is structured in analogy to the earliest community of Muslims, wherein the master is treated by his students the way the Prophet was treated by his companions. Forster notes, "Master-student relationships are central to both Arabic alchemy and also Sufism: neither the teachings of the Sufis nor those of the alchemists, neither the search for God nor those for gold,

[4] Paul Kraus and Martin Plessner, "Djābir b. Ḥayyān" in *Encyclopaedia of Islam: Second Edition*

can be learned from books. Those who strive for one or the other or even for both, therefore do well to seek a reliable master."[5]

[5] Regula Forster, "Auf der Suche nach Gold und Gott. Alchemisten und Fromme im arabischen Mittelalter," in *Meister und Schüler in Geschichte und Gegenwart: von Religionen der Antike bis zur modernen Esoterik*, ed. Almut-Barbara Renger (Göttingen : V&R Unipress, 2012): 225.

Appendix B: Dictionary Definitions of *ṣanʿa*

Table 8: *Ṣanʿa* from the *Kitāb al-ʿAin*[6] (8th c.) (translations are my own):

Ṣ-n-ʿ: *ṣanaʿa*, *yaṣnaʿu*, *ṣūnʿan*. How excellent is the work/creation of Allah to him, and to his creation. And *al-ṣunnāʿ*: those who work with their hands. You say: *ṣānʿatuhu*, "I made it," therefore it is of my making. And a woman is *ṣanāʿ*, skillful (*al-ṣannāʿa*) and delicate in the working of her hands, and *ṣawāniʿ* is the plural form. And a man is *ṣanaʿu al-yadayn* and *ṣinʿ al-yadayn*, skillful/delicate in the work of the hands. And *al-ṣanīʿa*: is what good you have done for somebody else. He says, "*Al-ṣanīʿa* [deed, action, workmanship] is not a deed/benefit…until it undergoes the methods of the maker" [i.e. a good deed isn't a good deed until it's actually been done] And so-and-so is my disciple/creation (*ṣanīʿatī*), e.g.: I reared him and brought him up. And affectedness (*al-taṣannuʿ*): the beauty/goodness of the demeanor and the opinion, of which the private [appearance] contradicts the public. And a trained/well-tended horse, e.g.: his family made him by taking good care of him. You say: he trained the horse, and he nourished the housemaid/young woman well, because it [the tending] exists only by many things and treatment. And *al-maṣnuʿa* (cistern): like a deep reservoir/cistern made for water, and *muṣāniʿ* is how it is made plural. And *al-maṣāniʿ* (constructions): what God's speakers make in terms of buildings and wells and things. Labīd said: "We are worn out and the rising stars are never worn out…and the mountains and the edifices remain after us" Allah, may He be glorified and exalted, said: "And you build edifices that you might immortalize yourself." And *al-ṣannāʿ* and *al-ṣannāʿa* also: wood taken/placed in water in order to obstruct the water by it, or settle/equalize it, in order that it hold it for a time, Abu Layla did not know it nor ʿArrām. And *al-'aṣnāʿ*: the plural of *ṣinʿ* is like *al-ṣannāʿ*: the wood used to contain water.	صنع: صَنَعَ يَـصْنَعُ صُنْعـاً. وما أحسن صُنْعَ الله عنده وصنيعه. والصُنّاع: الذين يعملون بأيديهم. تقول: صنعـتُه فهو صِناعتي. وامرأة صَناع، وهي الصّنّاعة الرقيقة بعمل يديها، ويجمع صوانع. ورجل صَنَعُ اليدين وصِنْع اليدين. والصنيعة: ما اصطنعت من خير إلى غيرك. قال :. إنّ الصنيعة لا تكون صنيعة ... حتى يصاب بها طريق المـصنع وفلان صنيعتي، أي: اصطنعته وخرّجته. والتّـصنّع: حسن السّمت والرأي سّره يخالف جهره. وفرس صَنيع، أي: قد صَنَعـه أهلُه بحسن القيام عليه. تقول: صَنَعَ الفرسَ، وصنّع الجارية تصنيعاً، لأنّه لا يكون إلاّ بأشياء كثيرة وعلاج. والمـصنعـة: شبه صهريج عميق تتخذ للماء، وتجمع مصانع. والمصانع: ما يَـصْنَعُـه العباد من الأبنية والآبار والأشياء. قال لبيد: بلينا وما تبلى النجوم الطوالع ... وتبقى الجبال بعدنا والمصانع وقال الله عزّ وجلّ: وَتَتَّخِذُونَ مَصانِعَ لَعَلَّكُمْ تَخْلُدُونَ . والصَّنّاعُ والصَّنَّاعةُ أيضاً: خشب يتّخذ في الماء ليحبس به الماء، أو يسوّى به، ليمسكه حيناً، لم يعرفه أبو ليلى ولا عرّام. والأصْناعُ: جمع الـصِّنْع [وهو مثل الصَّنَّاع أيضاً: خشب] يتخذ لمستنقع الماء.

[6] Ibn Aḥmad, al-Khalīl and al-Layth b. al-Muẓaffar. "ṣ-n-ʿ," in *Kitāb al-ʿAyn*. 2023, The Arabic Lexicon (http://arabiclexicon.hawramani.com/al-khalil-b-ahmad-al-farahidi-kitab-al-ain/#).

Table 9: *Ṣanʿa* in *al-Muḥīṭ fi-l-lugha*[7] (10th c.) (translations are my own):

Ṣ-n-ʿ *Al-'aṣnāʿu*: markets. And it has been said: cities and every place in which [things have been] built. And it refers to swamps of water also, the singular: *ṣin*ʿ–with a *kasra* on the *ṣād*–and like them are cisterns: the singular is *maṣnaʿa*. And *al-maṣāni*ʿ also: the remains of edifices/buildings. And *al-ṣanā*ʿ and *al-ṣannā*ʿ*a*: wood placed in water in order to retain and settle it. And likewise *al-'aṣnā*ʿ–plural *ṣin*ʿ: like the wood taken to contain water. And a man "*ṣanaʿu al-yadayn*" and "*ṣinʿu al-yadayn*": dextrous/skillful of hand; that is among those who are '*ṣunuʿ al-'aydī'*. And a woman as "*ṣanāʿ al-yad*": the same. Yaʿqūb said: a man is *ṣanaʿun* (skillful), but if you add/include the hands, you say: *ṣinʿu l-yadayn* (skillful), so you use the *sukun*. And *al-ṣan*ʿ: an iron spit, and [refers to] the garment, also. It is also said: "I saw upon him a good [meaning high quality] *ṣin*ʿ (garment). And *al-ṣanīʿa* (action, deed): what you've done of good. And it is *ṣanīʿatuhu*, that is if he makes and produces it. And *al-ṣinnā*ʿ: those who work with their hands. And the act: *al-ṣanāʿa*. And *al-muṣānʿa*: from the bribes. And *al-taṣanū*ʿ: the affectation And I reared (*ṣanaʿtu*) a horse so he is trained *(ṣanīʿun*): I took care of him well. Or I *ṣanaʿa* (treated) the housemaid well: i.e. I did well by her and fattened her. And I *ṣannaʿa* (treated, fattened) the housemaid well: because it is by long treatments and many things. Or the man *aṣnaʿa* (supported/maintained): when he aids another. Or the clumsy *aṣnaʿa*: learn and become expert.	صنع الأصنَاعُ: الأسْواق. وقيل: المَدائنُ وكُل مَوْضِع صُنِعَ فيه. وهي مَنَاقِعُ الماء ايضاً، الواحِدُ: صِنْعٌ - بكَسْر الصاد -، ومِثْلُها المَصَانِعُ: الواحِدُ مَـصْنعَـة. والمَصَانِعُ - أيضاً -: الآثارُ الأبْنِيَة. والصَناعُ والصِنَّاعَةُ: خَشب يُتَّخَذُ في الماء لِيُحْبَسَ به ويُسَوّى. وكذلك الأصْنَاعُ - جَمَاعَةُ صِنْع -: مِثْل الخَشَب يُتخَذُ لمسْتَنْقَع الماء. ورَجُلٌ صَنَعُ اليَدَيْن وصِنْعُ اليَدَيْن: رفيْق،، من قوم صُنُع الأيدي. وامْرأةٌ صَنَاعٌ اليَد: كذلك. قال يعقوب: رَجُل صَنَعٌ، فإذا أضَفْتَ إلى اليدَيْن قُلتَ: صِنْعُ اليَدَين؛ فَسَكنْتَ. والـصِنْعُ: السَّفُّوْدُ. والثوْبُ أيضاً، يُقال: رأيْتُ عليه صِنْعـاً جيداً. والصنِيْعَةُ: ما اصْطَنَعْتَ من خَيْرٍ. وهو صَنِيْعَتُه: إذا اصْطَنَعَه وخَرجَه. والصِّناعُ: الذين يَعْملون بأيديهم. والفِعْلُ: الصَنَاعَة. والمُصَانعَةُ: من الرشا. والتَّـصَنُّعُ: التَّرائي. وصَنَعْـتُ الفَرَسَ فهو صَنِيْعٌ: أحْسَنْت القِيامَ عليه. أو صَنَعَ الجاريةَ تصنيعاً: أي أحْسَنَ اليها وسَمّنَها. وصَنِّع الجاريةَ تَصْنِيعاً: لأنَّه يكونُ بِعِلاجٍ طويل وأشْياءَ كثيرة. أو أصْنَعَ الرجُلُ: إذا أعَانَ آخر. أو أصْنَعَ الأخْرقُ: تَعَلَّمَ وأحْكَمَ

[7] Ibn ʿAbbad. "ṣ-n-ʿ," in *al-Muḥīṭ fi-l-lugha*. 2023, The Arabic Lexicon (http://arabiclexicon.hawramani.com/al-sahib-bin-abbad-al-muhit-fi-l-lugha/).

Works Cited

Introduction

Artun, Tuna. “Hearts of Silver and Gold: The Production of Alchemical Knowledge in the Early Modern Ottoman World.” PhD diss., Princeton University, 2013.

Berthelot, M., Rubens Duval, and Octave Victor Houdas. *Histoire Des Sciences: La Chimie Au Moyen Âge*. Osnabrück: O. Zeller, 1967.

Daston, Lorraine. "The nature of nature in early modern Europe." *Configurations* 6, no. 2 (1998): 149-172.

Ebstein, Michael. *Mysticism and Philosophy in al-Andalus: Ibn Masarra, Ibn al-ʿArabi, and the Ismāʿili Tradition*. Leiden: Brill, 2014.

Forster, Regula. “Auf der Suche nach Gold und Gott. Alchemisten und Fromme im arabischen Mittelalter.” In *Meister und Schüler in Geschichte und Gegenwart: von Religionen der Antike bis zur modernen Esoterik*. Edited by Almut-Barbara Renger. V&R Unipress, 2012.

Forster, Regula. "Jābir b. Ḥayyān". In K. Fleet, G. Krämer, D. Matringe, J. Nawas and D. J. Stewart (eds.), *Encyclopaedia of Islam Three Online*, (Brill, 2018) doi: https://doi-org.proxy.uchicago.edu/10.1163/1573-3912_ei3_COM_32665

Gardiner, Noah. “Esotericism in a Manuscript Culture: Ahmad al-Buni and His Readers Through the Mamluk Period.” PhD diss., University of Michigan, 2014.

Geber and William R. Newman. *The Summa Perfectionis of Pseudo-Geber: A Critical Edition, Translation and Study*. Leiden ; New York: Brill, 1991.

Gril, Denis. “The Science of the Letters.” In *The Meccan Revelations: Selected Texts of* al-Futūhāt al-Makkiyya*,* vol 2, edited by Michel Chodkiewicz. Pir Press, 2004.

Hämeen-Anttila, Jaakko. "Artificial man and spontaneous generation in Ibn Waḥshiyya's al-Filāḥa an-Nabaṭiyya." *Zeitschrift der Deutschen Morgenländischen Gesellschaft* 153, no. 1 (2003): 37-49.

Ḥasan, Aḥmad Yūsuf, and Donald R. Hill. *Islamic Technology: An Illustrated History*. Cambridge ; New York : Paris: Cambridge University Press ; Unesco, 1986.

Haq, Syed Nomanul. *Names, Natures and Things: The Alchemist Jābir ibn Ḥayyān and His Kitāb Al-Aḥjār (Book of Stones)*. Dordrecht: Kluwer Academic Publishers, 1994.

Holmyard, E.J. “A critical examination of Berthelot’s work upon Arabic chemistry.” *Chemistry and Industry Review* 42 (1923): 479-499.

Holmyard, E.J. "An Essay on Jābir ibn Ḥayyān." *Studien Zur Geschichte Der Chemie: Festgabe Edmund O. V. Lippmann Zum Siebzigsten Geburtstage Dargebracht Aus Nah Und Fern Und Im Auftrage Der Deutschen Gesellschaft Für Geschichte Der Medizin Und Der Naturwissenschaften*, edited by Julius Ruska. Berlin: J. Springer, 1927.

Holmyard, E.J. "Arabic chemistry." *Nature* 110, no. 2765 (October 1922): 573-574.

Holmyard, E.J. "Jābir ibn Ḥayyān." *Proceedings of the Royal Society of Medicine* 16, Section of the History of Medicine (May 1923): 46-57. doi:10.1177/003591572301601606

Holmyard, E.J. *Makers of Chemistry*. Oxford: The Clarendon Press, 1931.

Horta, Paulo Lemos. "Introduction." In *The Annotated Arabian Nights*. Edited by Paulo Lemos Horta. Translated by Yasmine Seal. WW Norton & Company, 2021.

Ibn al-Nadīm. *The Fihrist of al-Nadīm*, volume II. Edited and translated by Bayard Dodge. Columbia University Press, 1970.

Jābir ibn Ḥayyān. *Mukhtār rasā'il Jābir ibn Ḥayyān*. Edited by Paul Kraus. al-Khānjī, 1935.

Jābir ibn Ḥayyān and Eric John Holmyard. *The Arabic Works of Jābir ibn Ḥayyān*. Paris: P. Geuthner, 1928.

Kraus, Paul. "Dschabir ibn Hajjan und die Isma'ilijja." *Jābir ibn Ḥayyān: Texts and Studies*. Edited by Fuat Sezgin. Institute for the History of Arabic-Islamic Science at the Johann Wolfgang Goethe University Frankfurt am Main, 2002.

Kraus, Paul. *Jābir ibn Ḥayyān, Contribution à l'histoire des idées scientifiques dans l'Islam*. Cairo: Imprimerie d l'Institut français d'archéologie orientale, 1942-43.

Kraus, P., and M. Plessner. "Djābir b. Ḥayyān". In P. Bearman (ed.), Encyclopaedia of Islam New Edition Online (EI-2 English), (Brill, 2012) doi: https://doi-org.proxy.uchicago.edu/10.1163/1573-3912_islam_SIM_1898

Kruk, Remke. "A frothy bubble: spontaneous generation in the medieval Islamic tradition." *Journal of Semitic Studies* 35, no. 2 (1990): 265-282.

Mavhunga, Clapperton Chakanetsa. "Introduction." In *What Do Science, Technology, and Innovation Mean from Africa?*, edited by Clapperton Chakanetsa Mavhunga. The MIT Press, 2017.

Melvin-Koushki, Matthew. "Introduction: De-orienting the study of Islamicate occultism." *Arabica* 64, no. 3-4 (2017): 287-295.

Munslow, Alan. *Deconstructing History*. New York: Routledge, 2006.

O'Connor, Kathleen Malone. "The alchemical creation of life (takwīn) and other concepts of Genesis in medieval Islam." PhD diss., University of Pennsylvania, 1994.

Riskin, Jessica. *The restless clock: A history of the centuries-long argument over what makes living things tick*. Chicago: University of Chicago Press, 2020.

Ruska, Julius. "Die bisherigen Versuche, das Dschâbirproblem zu lösen." *Chemistry and Alchemy: Texts and Studies, Collected and Reprinted*, vol. 2. Edited by Fuat Sezgin. Institute for the History of Arabic-Islamic Science at the Johann Wolfgang Goethe University Frankfurt am Main, 2002.

Ruska, Julius. "History and Present Status of the Jabir Problem." *Journal of Chemical Education* 6, no. 7 and 8 (July-August 1929): 1266-1276.

Ruska, Julius. "Methods of Research in the History of Chemistry." *Ambix* 1 (1937), 21-29. Reprinted in *Alchemy and Early Modern Chemistry: Papers from Ambix*. Edited by Allen G. Debus. Jeremy Mills Publishing for The Society for the History of Alchemy and Chemistry, 2004.

Ruska, Julius. "Probleme der Jābir-Forschung." *Der Islam* 14, 1925: 100-104.

Saif, Liana. "From Ġāyat al-ḥakīm to Šams al-maʿārif: Ways of Knowing and Paths of Power in Medieval Islam." *Arabica* 64, no. 3-4 (2017): 297-345.

Saif, Liana. "The past and future of the study of Islamic esotericism." *Religion Compass* 18, no. 7 (2024): e12494.

Saif, Liana. "What is Islamic Esotericism?" *Correspondances* 7, 1 (2019): 1-59.

Saif, Liana, Francesca Leoni, Matthew Melvin-Koushki, and Farouk Yahya. *Islamicate Occult Sciences in Theory and Practice*. Vol. 140. Leiden: Brill, 2021.

Shapin, Steven. *The Scientific Revolution*. Chicago: University of Chicago Press, 2018.

Sharrock, Alison. "Intratextuality." *Oxford Classical Dictionary.* 26 Mar. 2019; Accessed 12 May. 2025. https://oxfordre.com/classics/view/10.1093/acrefore/9780199381135.001.0001/acrefore-9780199381135-e-8281.

Smith, Pamela H. "Science on the move: Recent trends in the history of early modern science." *Renaissance Quarterly* 62, no. 2 (2009): 345-375.

Ullmann, M. "al-Kīmiyāʾ". In P. Bearman (ed.), *Encyclopaedia of Islam New Edition Online*

(EI-2 English), (Brill, 2012) doi: https://doi-org.proxy.uchicago.edu/10.1163/1573-3912_islam_SIM_4374

van Bladel, Kevin. “al-Birūnī on Hermetic Forgery.” *Gnosis* 3, no. 1 (2018): 54-66.

van Bladel, Kevin. *The Arabic Hermes: From Pagan Sage to Prophet of Science.* Oxford: Oxford UP, 2009.

Watanabe, Masayo. “Nature in the Books of Seven Metals – Ǧābirian Corpus in Dialogue with Ancient Greek Philosophy and Byzantine Alchemy.” PhD diss., University of Bologna, 2023.

Zirnis, Peter. “The Kitāb Usṭuqus al-Uss of Jābir ibn Ḥayyān.” PhD diss., New York University, 1979.

Chapter One

Adamson, Peter. "Abu Bakr al-Razi." In *The Stanford Encyclopedia of Philosophy* (Summer 2021 Edition). Edited by Edward N. Zalta. https://plato.stanford.edu/archives/sum2021/entries/abu-bakr-al-razi/>.

Adamson, Peter. “‘Porphyrius Arabus’ On Nature and Art: 463F Smith In Context.” *Bulletin of the Institute of Classical Studies. Supplement*, no. 98 (2007): 141–63. http://www.jstor.org/stable/43767977.

Ajami, Mansour. *The Neckveins of Winter: The Controversy over Natural and Artificial Poetry in Medieval Arabic Literary Criticism*. Leiden: E.J. Brill, 1984.

al-Khwārizmī. *Mafātīḥ Al-ʻulūm*. S.l.: s.n., Maṭbaʻat al-Sharq, 1970.

al-Sharīf al-Raḍī, *Nahj al-balāghah*. Edited by Qays Bahjat al-ʿAṭṭār. Mu’assasat al-Rāfid li-l-Maṭbuʿāt, 2010.

Bouyahia, Ch. "Ibn Rashīḳ". In P. Bearman (ed.), *Encyclopaedia of Islam New Edition Online (EI-2 English)*, (Brill, 2012) doi: https://doi-org.proxy.uchicago.edu/10.1163/1573-3912_islam_SIM_3332

Bosworth, C. E. “A Pioneer Arabic Encyclopedia of the Sciences: Al Khwarizmi’s Keys of the Sciences.” *Isis* 54, no. 1 (1963): 97–111. http://www.jstor.org/stable/228730.

Canavas, Constantin. "Automata". In K. Fleet, G. Krämer, D. Matringe, J. Nawas and D. J. Stewart (eds.), *Encyclopaedia of Islam Three Online*, (Brill, 2009) doi: https://doi-org.proxy.uchicago.edu/10.1163/1573-3912_ei3_COM_23013

de Callataÿ, Godefroid. “Introduction to Epistle 7.” In *Epistles of the Brethren of Purity: On*

Composition and the Arts, edited by Nader El-Bizri and Godefroid de Callataÿ. Oxford University Press, in association with the Institute of Ismaili Studies, 2018.

El-Bizri, Nader. "Introduction to Epistle 8." In *Epistles of the Brethren of Purity: On Composition and the Arts*. Ikhwān al-Ṣafā'. Edited and translated by Nader El-Bizri and Godefroid de Callataÿ. Oxford University Press, in association with the Institute of Ismaili Studies, 2018.

Forster, Regula. "Alchemy". In K. Fleet, G. Krämer, D. Matringe, J. Nawas and D. J. Stewart (eds.), *Encyclopaedia of Islam Three Online*, (Brill, 2016) doi: https://doi-org.proxy.uchicago.edu/10.1163/1573-3912_ei3_COM_23831

Grabar, Oleg and Annemarie Schimmel --, Aḥmad ibn al-Rashīd Ibn al-Zubayr, and Ghādah Ḥijjāwī Qaddūmī. *Book of Gifts and Rarities : Kitab Al-hadāyā Wa Al-tuḥaf : Selections Compiled in the Fifteenth Century from an Eleventh-century Manuscript on Gifts and Treasures*. Cambridge, Mass.: Distributed for the Center for Middle Eastern Studies of Harvard University by Harvard University Press, 1996.

Harb, Lara. "*Poetic Marvels: Wonder and Aesthetic Experience in Medieval Arabic Literary Theory*." PhD diss., New York University, 2013.

Haq, S. Nomanul. and D.E. Pingree. "Ṭabīʿa". In P. Bearman (ed.), *Encyclopaedia of Islam New Edition Online (EI-2 English)*, (Brill, 2012) doi: https://doi-org.proxy.uchicago.edu/10.1163/1573-3912_islam_COM_1135

Ibn ʿAbbad. "ṣ-n-ʿ". In *al-Muḥīṭ fi-l-lugha*. 2023, The Arabic Lexicon (http://arabiclexicon.hawramani.com/al-sahib-bin-abbad-al-muhit-fi-l-lugha/).

Ibn Aḥmad, al-Khalīl and al-Layth b. al-Muẓaffar. "ṣ-n-ʿ". In *Kitāb al-ʿAyn*. 2023, The Arabic Lexicon (http://arabiclexicon.hawramani.com/al-khalil-b-ahmad-al-farahidi-kitab-al-ain/#)

Ibn Shākir, Muḥammad ibn Mūsá, Aḥmad ibn Mūsá Ibn Shākir, Ḥasan ibn Mūsá Ibn Shākir, and Donald R. Hill. *The Book of Ingenious Devices (Kitāb Al-ḥiyal)*. Dordrecht ; Boston: D. Reidel Pub. Co., 1979.

Ikhwān al-Ṣafā' and Nader El-Bizri. "*al-risāla al-thāmina min al-qism al-'awwal fi-l-ʿulūm al-riyāḍiyya al-taʿlīmiyya fi-l-ṣanā'iʿ al-ʿamaliyya.*" In *Epistles of the Brethren of Purity: On Composition and the Arts*, edited by Nader El-Bizri and Godefroid de Callataÿ. Oxford University Press, in association with the Institute of Ismaili Studies, 2018.

Inoue, Takatomo, and Yaʿqūb b. Isḥāq al- Kindī. 2017. "Al-Kindī's Attack on Alchemy and His Perfume Making." *Orient (Society for Near Eastern Studies in Japan)* 52 (January): 79–92. https://research-ebsco-com.proxy.uchicago.edu/linkprocessor/plink?id=e6b6d28f-b072-3955-b8cb-fe3e57943efc.

Marquet, Yves. “Quelles Furent Les Relations Entre ‘Jâbir Ibn Ḥayyân’ et Les Iḫwân Aṣ-Ṣafâ’?” *Studia Islamica*, no. 64 (1986): 39–51. https://doi.org/10.2307/1596045.

Mavhunga, Clapperton Chakanetsa. “Introduction.” In *What Do Science, Technology, and Innovation Mean from Africa?*, edited by Clapperton Chakanetsa Mavhunga. The MIT Press, 2017.

McGinnis, Jon. "Natural Knowledge in the Arabic Middle Ages" In *Wrestling with Nature: From Omens to Science.* Edited by Peter Harrison, Ronald L. Numbers and Michael H. Shank. University of Chicago Press, 2011. https://doi.org/10.7208/9780226318035-005

Qanāzi‘, Jūrj. *Studies in the Kitāb Aṣ-Ṣinā‘atayn of Abū Hilāl Al-‘Askari*. Leiden ; New York: E.J. Brill, 1989.

Saba, Matthew D. “Abbasid Lusterware and the Aesthetics of ʿAjab.” *Muqarnas* 29 (2012): 187–212. http://www.jstor.org/stable/23350366.

Sabra, A.I. "al-Ḵẖwārazmī". In P. Bearman (ed.), *Encyclopaedia of Islam New Edition Online (EI-2 English)*, (Brill, 2012) doi: https://doi-org.proxy.uchicago.edu/10.1163/1573-3912_islam_SIM_4207

Sellheim, R. "al-Ḵẖalīl b. Aḥmad". In P. Bearman (ed.), *Encyclopaedia of Islam New Edition Online (EI-2 English)*, (Brill, 2012) doi: https://doi-org.proxy.uchicago.edu/10.1163/1573-3912_islam_SIM_4161

Sells, Michael Anthony. *Approaching the Qur’án: The Early Revelations*. 2nd ed. Ashland, Or.: White Cloud Press, 2007.

Ullmann, M. "al-Kīmiyāʾ". In P. Bearman (ed.), *Encyclopaedia of Islam New Edition Online (EI-2 English)*, (Brill, 2012) doi: https://doi-org.proxy.uchicago.edu/10.1163/1573-3912_islam_SIM_4374

van Gelder, Geert Jan. “The Neckveins of Winter: The Controversy over Natural and Artificial Poetry in Medieval Arabic Literary Criticism Mansour Ajami.” Review of *The Neckveins of Winter: The Controversy over Natural and Artificial Poetry in Medieval Arabic Literary Criticism* by Mansour Ajami. *Die Welt des Islams*, Vol 26, 1986. doi:10.2307/1570768.

Chapter Two

Abdel Haleem, M.A.S.. “Early Islamic Theological and Juristic Terminology: ‘Kitāb al-ḥudūd fi ‘l-uṣūl,’ by Ibn Fūrak.” *Bulletin of the School of Oriental and African Studies, University of London* 54, no. 1 (1991): 5-41.

Al-Hassan, Ahmad Y. “Iron and Steel Technology in Medieval Arabic Sources.” *Journal for the*

History of Arabic Science, Vol. 2, Number 1 (May 1978): 31-43. Accessed online: http://www.history-science-technology.com/articles/articles%205.html

Artun, Tuna. “Hearts of Silver and Gold: The Production of Alchemical Knowledge in the Early Modern Ottoman World.” PhD diss., Princeton University, 2013.

Carusi, Paola. "Elixir". In K. Fleet, G. Krämer, D. Matringe, J. Nawas and D. J. Stewart (eds.), *Encyclopaedia of Islam Three Online*, (Brill, 2013) doi: https://doi-org.proxy.uchicago.edu/10.1163/1573-3912_ei3_COM_26171

Forster, Regula. "Alchemy". In K. Fleet, G. Krämer, D. Matringe, J. Nawas and D. J. Stewart (eds.), *Encyclopaedia of Islam Three Online*, (Brill, 2016) doi: https://doi-org.proxy.uchicago.edu/10.1163/1573-3912_ei3_COM_23831

Ibn al-Nadīm. *The Fihrist of al-Nadīm*, volume II. Edited and translated by Bayard Dodge. Columbia University Press, 1970.

Jābir ibn Ḥayyān. *Mukhtār rasā’il Jābir ibn Ḥayyān*. Edited by Paul Kraus. al-Khānjī, 1935.

Kennedy-Day, Kiki. *Books of Definition in Islamic Philosophy: The Limits of Words*. London; New York: RoutledgeCurzon, 2003.

Kraus, Paul. *Jābir ibn Ḥayyān, Contribution à l’histoire des idées scientifiques dans l’Islam*. Cairo: Imprimerie d l’Institut français d’archéologie orientale, 1942-43.

Kraus, Paul. "Studien zu Jābir ibn Hayyān." *Isis* 15, no. 1 (1931): 7-30.

O’Connor, Kathleen Malone. “The alchemical creation of life (takwīn) and other concepts of Genesis in medieval Islam.” PhD diss., University of Pennsylvania, 1994.

Saif, Liana. "The Jābirian Kitāb al-Nukhab and Teaching the Science of Talismans in the Abbasid Era." *Journal of Abbasid Studies* 1 (2024): 1-26.

Sezgin, Fuat. *Geschichte Des Arabischen Schrifttums*. Volume IX. Leiden: E.J. Brill, 1967.

Ullmann, M. "al-Kīmiyāʾ". In P. Bearman (ed.), *Encyclopaedia of Islam New Edition Online (EI-2 English)*, (Brill, 2012) doi: https://doi-org.proxy.uchicago.edu/10.1163/1573-3912_islam_SIM_4374

Ullmann, M. "Khāṣṣa". In P. Bearman (ed.), *Encyclopaedia of Islam New Edition Online (EI-2 English)*, (Brill, 2012) doi: https://doi-org.proxy.uchicago.edu/10.1163/1573-3912_islam_SIM_4227

Chapter Three

Adamson, Peter. "Abu Bakr al-Razi." In *The Stanford Encyclopedia of Philosophy* (Summer

2021 Edition). Edited by Edward N. Zalta. https://plato.stanford.edu/archives/sum2021/entries/abu-bakr-al-razi/>.

Arnaldez, R. "Khalḳ". In P. Bearman (ed.), *Encyclopaedia of Islam New Edition Online (EI-2 English)*, (Brill, 2012) doi: https://doi-org.proxy.uchicago.edu/10.1163/1573-3912_islam_COM_0488

Asatryan, Mushegh. "An Early Shi'i Cosmology; Kitab al-Ashbah wa l-Azilla and its Milieu." *Studia Islamica* 110 (2015): 1-80.

Avicenna and Shams Constantine Inati. *Ibn Sina's Remarks and Admonitions: Physics and Metaphysics : An Analysis and Annotated Translation*. New York: Columbia University Press, 2014.

Chase, Michael. "Creation in Islam from the Qur'ān to al-Farābī." In *Routledge Companion to Islamic Philosophy*. Edited by Richard C. Taylor and Luis Xavier López-Farjeat. London and New York: Routledge, 2016.

Gardet, L. "Ibdāʿ". In P. Bearman (ed.), *Encyclopaedia of Islam New Edition Online (EI-2 English)*, (Brill, 2012) doi: https://doi-org.proxy.uchicago.edu/10.1163/1573-3912_islam_COM_0308

Gardet, L. "Kawn wa-Fasād," in P. Bearman (ed.), *Encyclopaedia of Islam New Edition Online (EI-2 English)*, (Brill, 2012) doi: https://doi-org.proxy.uchicago.edu/10.1163/1573-3912_islam_SIM_4040

Grignaschi, M. "Remarques sur la formation et l'interprétation du Sirr al-asrâr." In *Pseudo-Aristotle's "The Secret of Secrets": Sources and Influences*. Edited by W. F. Ryan and C. B. Schmitt. London: Warburg Institute, 1982.

Hämeen-Anttila, Jaakko. "Artificial man and spontaneous generation in Ibn Waḥshiyya's al-Filāḥa an-Nabaṭiyya." *Zeitschrift der Deutschen Morgenländischen Gesellschaft* 153, no. 1 (2003): 37-49.

Hämeen-Anttila, Jaakko, and Aḥmad ibn ʿAlī Ibn Waḥshīyah. *The Last Pagans of Iraq: Ibn Waḥshiyya and His Nabatean Agriculture*. Leiden ; Boston: Brill, 2006.

Hill, D. R. "Ḥiyal". In P. Bearman (ed.), *Encyclopaedia of Islam New Edition Online (EI-2 English)*, (Brill, 2012) doi: https://doi-org.proxy.uchicago.edu/10.1163/1573-3912_islam_SIM_8624

Kraus, Paul. *Jābir ibn Ḥayyān, Contribution à l'histoire des idées scientifiques dans l'Islam*. Cairo: Imprimerie d l'Institut français d'archéologie orientale, 1942-43.

Kruk, Remke. "A frothy bubble: spontaneous generation in the medieval Islamic tradition." *Journal of Semitic Studies* 35, no. 2 (1990): 265-282.

Lane, Edward William, and Stanley Lane-Poole. *Arabic-English Lexicon*. New York: F. Ungar Pub. Co, 1955.

Mandeville, C. D., and J. E. Holmyard. 1927. "Avicennae De Congelatione Et Conglutinatione Lapidum Being Sections of the Kitâb Al-Shifâ' the Latin and Arabic Texts Edited with an English Translation of the Latter and with Critical Notes." RCP Library. Paul Geuthner. Wiley Digital Archives: The Royal College of Physicians. 1927. Accessed February 19, 2025.

McGinnis, Jon. "Natural Knowledge in the Arabic Middle Ages". In *Wrestling with Nature: From Omens to Science*. Edited by Peter Harrison, Ronald L. Numbers and Michael H. Shank, Chicago: University of Chicago Press, 2011. https://doi.org/10.7208/9780226318035-005

Nasr, Seyyed Hossein, Caner K. Dagli, Maria Massi Dakake, Joseph E. B. Lumbard, and Mohammad Rustom, eds. and trans. *The Study Qur'ān: a new translation and commentary*. New York: HarperOne, 2015.

Newman, William R. *Promethean ambitions: alchemy and the quest to perfect nature*. Chicago: University of Chicago Press, 2019.

Newman, William. "Technology and alchemical debate in the late Middle Ages." *Isis* 80, no. 3 (1989): 423-445.

Rinotas, Athanasios. "The Sciant Artifices in the Work of Albert the Great: Towards Two Kinds of Transmutation?" *Early Science & Medicine* 27, 1 (2022): 57–82. doi:10.1163/15733823-12340037

Saif, Liana. "The cows and the bees: Arabic sources and parallels for pseudo-Plato's Liber Vaccae (Kitāb al-Nawāmīs)." *Journal of the Warburg and Courtauld Institutes* 79, no. 1 (2016): 1-47.

Saif, Liana. "The Jābirian Kitāb al-Nukhab and Teaching the Science of Talismans in the Abbasid Era." *Journal of Abbasid Studies* 1 (2024): 1-26.

Saif, Lana. "The Universe and the Womb: Generation, Conception, and the Stars in Islamic Medieval Astrological and Medical Texts." *Journal of Arabic and Islamic Studies* 16 (2016): 181-198.

Schacht, J. "Ḥiyal". In P. Bearman (ed.), *Encyclopaedia of Islam New Edition Online (EI-2 English)*, (Brill, 2012) doi: https://doi-org.proxy.uchicago.edu/10.1163/1573-3912_islam_SIM_2913

Soucek, Priscilla P., L. M. Landau, and Silvia Naef. "Taṣwīr". In P. Bearman (ed.),

Encyclopaedia of Islam New Edition Online (EI-2 English), (Brill, 2012) doi: https://doi-org.proxy.uchicago.edu/10.1163/1573-3912_islam_COM_1195

Ullmann, Manfred. *Die Natur- und Geheimwissenschaften im Islam.* Leiden: Brill, 1972.

Walker, Paul E. "Intellectual Traditions." In *The Shiʿi world. Pathways in tradition and modernity.* Edited by Daftary, Farhad, Amyn B. Sajoo, Shainool Jiwas, and Institute of Ismaili Studies. London: I. B. Tauris, in association with The Institute of Ismaili Studies, 2015.

Chapter Four

Abū Bakr Muhammad ibn Zakarīyā Rāzī, 'Alī ibn al-'Abbās al-Majūsī, Avicenna, and P. de (Pieter) Koning. *Trois Traités D'anatomie Arabes.* Leiden: Brill, 1903.

Adamson, Peter. "'Porphyrius Arabus' On Nature and Art: 463F Smith In Context." *Bulletin of the Institute of Classical Studies. Supplement*, no. 98 (2007): 141–63. http://www.jstor.org/stable/43767977.

Emilsson, Eyjólfur, "Porphyry", *The Stanford Encyclopedia of Philosophy* (Summer 2024 Edition), Edward N. Zalta & Uri Nodelman (eds.), URL = <https://plato.stanford.edu/archives/sum2024/entries/porphyry/>.

Gadelrab, Sherry Sayed. "Discourses on Sex Differences in Medieval Scholarly Islamic Thought." *Journal of the History of Medicine and Allied Sciences* 66, no. 1 (2011): 40-81.

Jābir ibn Ḥayyān. *Mukhtār rasā'il Jābir ibn Ḥayyān*. Edited by Paul Kraus. al-Khānjī, 1935.

Kraus, Paul. *Jābir ibn Ḥayyān, Contribution à l'histoire des idées scientifiques dans l'Islam*. Cairo: Imprimerie d l'Institut français d'archéologie orientale, 1942-43.

Kueny, Kathryn. *Conceiving Identities: Maternity in Medieval Muslim Discourse and Practice*. Albany: State University of New York Press, 2013.

O'Connor, Kathleen Malone. "The alchemical creation of life (takwīn) and other concepts of Genesis in medieval Islam." PhD diss., University of Pennsylvania, 1994.

Ragab, Ahmed. "One, Two, or Many Sexes: Sex Differentiation in Medieval Islamicate Medical Thought." *Journal of the History of Sexuality* 24, no. 3 (2015): 428-454.

Saba, Matthew D. "Abbasid Lusterware and the Aesthetics of ʿAjab." *Muqarnas* 29 (2012): 187–212. http://www.jstor.org/stable/23350366.

Saif, Liana. "A Preliminary Study of the Pseudo-Aristotelian Hermetica: Texts, Context, and Doctrines." *Al-ʿUsur al-Wusta* 29 (2021): 20-80.

Saif, Lana. "The Universe and the Womb: Generation, Conception, and the Stars in Islamic Medieval Astrological and Medical Texts." *Journal of Arabic and Islamic Studies* 16 (2016): 181-198.

van Bladel, Kevin. *The Arabic Hermes: From Pagan Sage to Prophet of Science.* Oxford: Oxford UP, 2009.