

IBN SĪNĀ'S IDEA OF NATURE AND CHANGE*

By:
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Abstrak

Artikel ini mengupas pandangan Ibn Sīnā mengenai hakikat tabi'at, aneka ragam perubahan di alam ini, termasuk teori kejadian substansi, sambil diperbandingkan dengan pendapat Aristotles dan para filāsuf zaman sebelum Sokrates.

Katakunci: Falsafah Islam; konsep tabi'at; teori perubahan; kejadian substansi; teori keterkandungan; Ibn Sīnā; Aristotle; Parmenides; Melissus; ahli falsafah pra-Sokrates.

Abstract

This article discusses Ibn Sīnā's idea of 'nature' and his theory of change, including that of substantial change, in comparison with the views held by Aristotle and some Pre-socratic philosophers.

Keywords: Islamic philosophy; concept of nature; theory of change; substantial generation; theory of latency; Ibn Sīnā; Aristotle; Parmenides; Melissus; Pre-socratic philosophers.

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Introduction

The greatest Muslim philosopher Ibn Sīnā (d. 428 AH/1037 CE), also known as Avicenna in the West, made a lasting contribution to the study of nature. He investigated a variety of different topics, ranging from general issues like motion, causation, place and time, to systematic explorations and explanations of natural phenomena across various kinds of natural entities. What is interesting is that he integrated these different inquiries into the framework of a single enterprise which describes the universe as a system. Ibn Sīnā divides the universe into two domains: heaven and earth, a division apparently based on a general observation that heavenly phenomena differ significantly from earthly ones. Indeed, while celestial bodies are constantly in motion, they do appear to be stable and changeless, their circular motion displaying a combination of order and harmony, uniformity and regularity, permanence and continuity, reflected as it is in the alternations of day and night, the cycle of the seasons, and the changes in the phases of the moon, etc. All this, no doubt, stands in sharp contrast to the terrestrial things which keep changing, coming to be and passing away. In this article, we shall first look into Ibn Sīnā's idea of 'nature' and then examine his account of change in general and, finally, consider his explanation of substantial change, i.e., how individual things are generated or come into being.

Concept of Nature

Before analyzing Ibn Sīnā's idea of nature, we should consider the passage in the *Physics* part of the celebrated *al-Shifā'* where he tells us that the word *tabī'ah* ('nature' = Gr. *phusis*) has various meanings, sometimes referring to the efficient cause of motion in natural bodies, as will be explained below, but also signifying that which constitutes the substance of everything (*mā yataqawwamu bihi jawhar kulli shay'*). Furthermore, *tabī'ah* could also mean the essence of a thing (*dhāt kulli shay'*), or that which makes a thing

what it is.¹ As the four meanings of *tabī'ah* are somehow related, Ibn Sīnā remarks that one may therefore reduce them to one which is the primary and strict sense: nature as an active principle or source (*mabda'* = $\bar{n} \div \zeta$) of motion and rest in natural bodies. It is 'nature' understood in this strict sense that will concern us here. Ibn Sīnā highlights some common expressions employed in connection with the term 'nature'. One of these is the term 'natural' (*al-tabī'ī*), which generally means being 'associated with nature' and more specifically, 'possessed of nature' (*mā fihī al-tabī'ah*) or 'due to nature' (*'an al-tabī'ah*). The other terms mentioned include: 'that which has nature' (*mā lahu al-tabī'ah*); 'that which is by virtue of nature' (*mā bi al-tabī'ah*), by which he means natural individuals or (i.e. primary substances) and natural universals (i.e. secondary substances or essences); 'that which is by nature' (*mā bi al-tab'*) or that which is concomitant with nature, e.g. attributes; and finally 'that which conforms to the natural' (*mā yajrī majrā al-tabī'ī*), such as motion and rest.²

Now, according to Ibn Sīnā, the action, motion and change of natural bodies (as opposed to artefacts) are either due to some external cause, such as the heating of water and rising of a stone, or else originate in themselves, such as the cooling down of hot water and the falling down of a soaring stone, as well as the coming-to-be of tree out of seed and animal out of sperm, unless impeded or turned otherwise either by some foreign agent or external cause or by themselves, be it voluntarily (*bi irādah*) or involuntarily (*lā 'an irādah*).³ However, that the cause of motion may be intrinsic does not entail that a body can move itself, for a natural body insofar as it is a body cannot be the cause of its own motion (*al-muharrīk lā yasihhu an yakūn jisman bi mā huwa jism*). Rather, if it moves at all, a natural body moves by virtue of some inherent power or inner potency that it has (*innamā yuharrīk bi quwwah fihī*).⁴

¹ Ibn Sīnā (1985), *al-Shifā': al-Tabī'īyyāt: al-Samā' al-Tabī'ī*. Cairo, ed. Sa'īd Zāyid, 1983; repr. Qom, 1405/1985, 36 lines 3-5.

² *Ibid.*, 38 lines 4-15.

³ *Ibid.*, 29 lines 4-14.

⁴ *Ibid.*, 30 lines 5-6.

Now, when such a power is found within a body, causing the body to move, change or act in one and the same manner (*'alā nahj wāhid*), invariably and involuntarily, then it is called 'nature' (*tabī'ah*), as is the case with the falling of a stone to or its rest at the centre of the universe. And when it causes the body to move voluntarily albeit unidirectionally, it is termed 'celestial soul' (*nafs falakiyyah*). Furthermore when it leads to various kinds of motion, change and act (*mutafanninat al-tahrik wa l-fi'l*) involuntarily, it is called 'vegetative soul' (*nafs nabātiyyah*). Finally, when it produces multifarious act, motion and change in a body voluntarily, it is called 'animal soul' (*nafs hayawāniyyah*). The same applies when such a power serves as the principle of being at rest.⁵

It is important to note that Ibn Sīnā considers the existence of such inherent, motion-producing power of natural bodies to be self-evident (*wujūd hādhihi al-quwwah bayyin bi-nafsihi*), since for him as for Aristotle, "everything in motion is moved by something" (*anna li-kulli mutaharrikin muharrikan*).⁶ That is to say, nothing is, strictly speaking, self-moved. Rather, its motion must be either due to nature or soul (as its intrinsic cause) or due to some violent force (external factor). This having been said, Ibn Sīnā proceeds to define 'nature' as 'the primary principle (*mabda' awwal*) [that is responsible for the] motion and rest of that in which it inheres, essentially, not accidentally.' While he admits that such a principle or source of 'being moved' and 'being at rest' are not always present in everything, Ibn Sīnā insists that nature constitutes the principle for any property essential to a body, be it motion or rest.⁷

Ibn Sīnā rejects the Stoic definition of nature as the power which permeates a body (*quwwah sāriyah fī al-ajsām*) and gives it form and figure, and which serves as a principle for various things (literally: "this and that"). Dismissing such a statement as flawed and gratuitous, he explains that in his own definition of nature, the so-called

⁵ *Ibid.*, 30 lines 7-12.

⁶ *Ibid.*, 31 lines 2-3.

⁷ *Ibid.*, 31 lines 6-8.

'principle of motion' refers to the efficient agent which causes the motion of something else, namely the moving body, whereas 'primary' means 'proximate' in the sense that there exists no intermediate between such a principle and the motion it produces. For it is possible that something be a remote or indirect principle of motion,⁸ as is the case with the soul moving the body by means of natures and qualities (*bī istikhdām al-tabā'i' wa al-kayfiyyāt*).⁹ Moreover, Ibn Sīnā asserts that by the phrase 'essentially' he means 'not by violent force' (*lā 'an taskhīr qāsir*) as far as the mover is concerned, and 'not from outside' (*lā 'an khārij*) as far as the moved is concerned. He offers as an example of such movement by accident the motion of passengers at rest (*harakat al-sākin*) on a sailing ship.¹⁰

The characterization of nature as a source or cause of being moved and being at rest essentially and not accidentally is also followed by the rejection of an apparent case of self-motion: a doctor who cures himself. Ibn Sīnā argues that this case merely appears to be self-motion (motion being understood in its broadest sense so as to mean change of all sorts) but, strictly speaking, cannot be considered natural because the doctor cures himself only accidentally. That is to say, the doctor does not cure himself insofar as he is a doctor, but because the man who happens to be sick also happens to be a doctor: the two are combined only by accident, with the result that the doctor cures himself, so to speak. However, since it happens that the sick man is cured by the doctor, so this motion too is, properly speaking, produced by another, even though the mover and the moved are both contained 'accidentally' within the same individual. For the man insofar as he is a doctor is one thing, but insofar as he is a sick person is something else (*fa innahu min haythu huwa mu'ālij shay' wa min hayth huwa muta'ālij shay' ... min hayth huwa muta'ālij qābil li l-'ilāj marīd*).¹¹ Consequently, even apparent self-motion is nothing other than being moved by another.

⁸ *Ibid.*, 31 lines 9-15.

⁹ *Ibid.*, 32 lines 3-4.

¹⁰ *Ibid.*, 32 lines 5-11.

¹¹ *Ibid.*, 32 lines 12-15.

Ibn Sīnā's conception of nature must be understood in contrast to art (*sinā'ah*), compulsion (*qāsirāt*), and chance (*ittifāq*). By 'art' he seems to mean any production by human intelligence, anything produced by the human mind acting upon things, such as the motion and change observable in statues, machines, and other works of craftsmanship, whereas by compulsion is meant all kinds of interference by some external factor, such as pushing, pulling, throwing, holding, and so forth. Thus, for instance, a stone which is thrown into the air would not be considered to move upward naturally but would be considered to be the result of some violent force. Furthermore, while there are phenomena in the world which can be accounted for as the work of human intelligence and activity, there exist many phenomena which are the result of mere chance and coincidence, even though in reality a chance happening is, according to Ibn Sīnā, not something without a cause and may always be explained rationally, since for him chance is also a cause albeit not manifest to human reason.¹²

It is on the basis of the foregoing concept of nature that Ibn Sīnā classifies bodies into natural and artificial, which differ not only in the manner in which they are generated or produced, but also in terms of their relation with motion. Natural bodies, which could be either simple (such as the four elements) or composite (e.g. animals, plants and minerals), come into being through natural agencies and are moved by nature, whereas artificial bodies or things are produced and moved or, rather, subject to manipulation by an intelligent agent, i.e. man. However, the essential difference between them is that natural bodies do something and manifest activities, so to speak, thanks to their nature or soul: they come to be, grow and decay—in short, move and change in one way or another; whereas artefacts merely exist as an expression of an idea. That is to say, whatever motion, change or activity there is in an artificial body is the result of the natural elements of which it is composed, or the result of compulsion by some violent force. For

¹² *Ibid.*, 63-5.

example, a building collapses, burns, or decays, not because it is a building as such, but because of the materials of which it is made and composed. In short, the difference between things that are by nature and things that are by art lies essentially in the fact that natural things have within themselves an intrinsic source of motion, change, activity and rest, by virtue of themselves and not accidentally—a characteristic which is definitely lacking in artificial things.

Having declared that every body is possessed of nature, matter, form, and accidents (*a'rād*), Ibn Sīnā explores the relation (*nisbah*) of nature to matter, form, and motion (i.e. change). He asks whether nature is more properly identified with matter or with form. Some ancient philosophers claim, he says, that nature is the matter, that is, the underlying constituent which is formless. On this view, nature resembles art, persisting throughout change (*al-mahfūj dhātuha fī kulli taghayyur*) as the underlying reality of a thing while various forms, shapes or arrangements come and go and so are accidental to it. The identification of nature with matter—a view which Ibn Sīnā attributes, on the authority of Aristotle, to Antiphon—takes matter to be prior to form. He contends that to entertain such a view is to blur the distinction between artificial form or shape (*sūrah sinā'iyah*) and natural form or essence (*sūrah tabī'iyah; tabī'ah*), and even to confuse that which is accidental (*al-'ārid*) with that which is essential: form.¹³ Further, referring to those like Antiphon who identify nature with matter, Ibn Sīnā argues that:

he [i.e. Antiphon] fails to realize that the main constituent (*muqawwim*) of a thing is that which must be always there whenever the thing exists (*yajibu an lā yakūna minhu budd 'inda wujūd al-shay'*), and not that which should be there when the thing loses its existence (*laysa annahu alladhī lā budda minhu 'inda 'adam al-shay'*) or that which persists (*thābitan*) when the thing passes into non-existence. For whether or not the thing remains as it is throughout [different]

¹³ *Ibid.*, 36 lines 11-16.

states does not concern us here. Instead, [our position is that] for the thing to exist in actuality matter alone is not sufficient, because something like matter (*hayūlā*) cannot bring the thing into actual existence (*lā tufīdu wujūd al-shay' bi al-fi'l*), but rather it simply gives it [i.e. the thing] the potentiality for [coming into actual] existence (*bal innamā tufīdu quwwata wujūdihi*). Rather, it is the form that renders it actual. As you can figure out, as soon as some wood and bricks are there, potentiality is there for a house to exist [i.e. to be built] (*li al-bayt kawm bi al-quwwah*). However, its actual existence would depend upon [its receiving] its form. Indeed, if it were possible for its form to stand alone without matter it would do so. This man [i.e. Antiphon] too asserts that being-wood is form, and that it is preserved throughout. But if the criterion we use to define nature is that it is that which renders a thing substance (*an takūna mufīdah li al-shay' jawhariyyatahu*), then form is most appropriate to qualify [as nature].¹⁴

This passage seems to suggest that Ibn Sīnā identifies nature with form, which is true in the case of simple bodies (*al-basā'it*). As he explains, the nature of water, for instance, is nothing but that which makes it water (*allatī bihā al-mā' huwa mā huwa*), and so is called 'nature' in one respect and 'form' in another respect. We call it 'nature' inasmuch as it is the source of various motions but call it 'form' inasmuch as it constitutes the essence of the thing. Thus the form of water is the power within it which turns the matter into waterness. Although such a power is not observable, its effects are, such as coldness, moisture, and gravity or tendency to move to and rest in its proper place if nothing hinders.¹⁵ Thus there are at least two reasons why nature is more properly identified with form than with matter: first, a thing is what it is more properly when it is actual than

¹⁴ *Ibid.*, 36 (line 17) and 37 lines 1-6.

¹⁵ *Ibid.*, 34 (lines 11-14) and 35 lines 1-5.

when it is potential—in this respect nature and art are alike in that there is nothing artistic about a potential house or natural about flesh, blood, and bones that are not yet specified by form. Second, form is that toward which a thing tends or grows—that is to say, form is something complete, as specified by the thing's definition, and not something derivative or accidental. And nature is just that.

However, Ibn Sīnā also remarks that it is not always the case that the nature of a thing is its very form (*wa rubbamā kānat tabī'at al-shay' hiya bi'aynihā sūratuhu wa rubbamā lam takun*).¹⁶ For in the case of composite bodies (*ajsām murakkabah*), their nature is not really identical with form, but is more like a part of it (*ka shay' min al-sūrah*). This is because composite bodies are what they are 'not by virtue of' the power that causes them to move in one way essentially, even though they cannot dispense with it (*lā budda min tilka al-quwwah*) so that such a power is almost like part of their form and their form consists of several things, so to speak. Thus, the form of man (*insāniyyah*), for example, comprises as it were natural powers (*quwā al-tabī'ah*) as well as capacities related to the vegetative, animal, and rational soul (*quwā al-nafs al-nabātiyyah wa al-hayawāniyyah wa al-nutq*); only when all these latter three components are present can one talk about the essence of man. But further discussion as to how they are united or relate to one another belongs to metaphysics, whereas our concern here is limited to the question whether or not the nature of something is its very form.¹⁷

Theory of Change and Matter

Let us turn now to the relation of nature to motion and change. As mentioned earlier, Ibn Sīnā takes nature to be the source of motion, change and rest. He disagrees with those like Parmenides and Melissus who attack the assumptions of natural philosophy and try show that both motion and change are impossible. Their argument may be

¹⁶ *Ibid.*, 34 lines 10-11.

¹⁷ *Ibid.*, 35 lines 7-14.

restated thus: what really *is* (= being = reality) is one, changeless and eternal; it alone *is*, whereas non-being *is* not. From these premises it is inferred that change in the sense of generation and destruction is simply impossible. To put it more clearly, since 'what is' is always there and cannot perish, while 'what is not' absolutely cannot give rise to 'what is', therefore there is no means whereby anything could come to be, neither out of what always is, nor out of what in no way is.¹⁸ A corollary of this thesis is the claim that all change is illusion. It is interesting to note that although he disagrees with their denial of change, Ibn Sīnā does not simply dismiss their argument but rather makes the following sympathetic remark:

With regard to Melissus' and Parmenides' doctrine, we do not quite understand it, nor can we pinpoint what exactly they mean. Yet we do not think they are as stupid as they might seem from their statements. They also talk about natural things as well as against the plurality of the principles, such as Parmenides' theory about the earth and fire, and [his view] concerning the composition of things out of them. So it seems likely that he was alluding to the necessarily existent being that truly *is* (*alladhī bi al-haqīqah mawjūd*)—as you will learn in the section dealing with it—and that it is infinite, unchanging, infinitely powerful (*ghayr mutanāhī al-quwwah*) or it is finite in the sense of being the aim or end of everything, while that of which it is the end (*alladhī yantahī ilayh*) is thought of as finite insofar as it is limited by it. Or perhaps they mean something else,

¹⁸ See Hermann Diels and Walther Kranz (1996), *Die Fragmente der Vorsokratiker*, Berlin: Weidmannsche Verlagsbuchhandlung, 1951-2; repr. Zurich: Weidmann, 6th ed., 3 vols., 1: 232-7 (Fragments nos. 6-8) and Kathleen Freeman (1983), *Ancilla to the Pre-Socratic Philosophers*, Oxford: Blackwell, 1948; repr. Cambridge, MA: Harvard University Press, 43-4. Also Leonardo Tarán (1965), *Parmenides: a Text with Translation, Commentary and Critical Essays*, Princeton: Princeton University Press and Alexander P. D. Mourelatos (1970), *The Route of Parmenides: a Study of Word, Image, and Argument in the Fragments*, New Haven: Yale University Press.

namely that the nature of existence (*tabī'at al-wujūd*) is one single thing by definition as well as by description, and that essences (*māhiyyāt*) are totally not the same as the nature of existence, because these [essences] are things to which existence is attached and concomitant with (*ya'rid lahā al-wujūd wa yalzamuhā*), such as 'manness'.¹⁹

Before we proceed, it is important to note Ibn Sīnā's definition of change. For him, change is the transition or passage from potentiality into actuality that happens in time and uninterruptedly (*khurūj 'an al-quwwah ilā al-fi'l fī zamān wa 'alā al-ittisāl*).²⁰ Ibn Sīnā recognizes no less than five kinds of change, namely, change in the category of place, quality, quantity, position, and substance. These cases of change are called locomotion or local change (*harakah fī al-makān*, e.g. the natural upward motion of fire); alteration or change of attributes (*istihālah*, e.g. change of colour in an object); growth (*numuww*, e.g. change of calf into cow) and diminution (*dhubūl* or *idmihlāl*, e.g. the withering of plants) or—when the change is not due to nourishment—expansion (*takhalkhul*) and condensation (*takāthuf*); positional change (*harakah fī al-wad'*, e.g. the motion of celestial bodies), and substantial change (i.e. generation and destruction (*kaḥn wa fasād*) of species and its individual instances, e.g. the coming to be of man and a man), respectively.²¹ All these kinds of change, as he notes elsewhere, are gradual (*tadrijī*) except for substantial change, which is instantaneous (*daf'atan*).²² Now in this context Ibn Sīnā's investigation centers around the question whether or not change is possible and, if it is, how it should be accounted for, and finally what principles are required to explain change.

As one might expect, Parmenides' outright rejection of change has led some people to maintain that if something cannot come into being out of nothing (*min al-mustahīl an*

¹⁹ *Ibid.*, 26 (lines 11-14) and 27 lines 1-4.

²⁰ *Ibid.*, 82 lines 6-7.

²¹ *Ibid.*, 81 lines 7-15;

²² *Ibid.*, 98 lines 10-11; cf. Ibn Sīnā (1974), *Kitāb al-Hidāyah*, Cairo: Maktabat al-Qāhirah al-Hadithah, ed. M. 'Abduh, 136-7.

yatakawwan al-shay' 'an lā shay'), whereas the fact of observation (*'iyān*) confirms that change is real, it seems safe to say that coming-into-being is the manifestation of what is latent (*al-burūz 'an al-kumūn* or *zuhūr al-kāmin*).²³ Criticizing this theory, Ibn Sīnā argues that granted that nothing can come to be out of nothing and that every thing is generated from its like in nature, one can still affirm that it is possible for something to be generated from something else different both in species as well as in nature (*'an shay' laysa mithlahu fī al-naw' wa lā mushābihahu fī al-tab'*). For example, a chair is produced from wood, or a table from a chair.²⁴ Their principle that what is not a thing cannot be the substrate for something (*lā shay' lā yakūn mawdū'an li al-shay'*) would be true only if we had claimed that a thing can subsist in nothing or come to be out of nothing, which is obviously impossible. But if what is meant is that a thing comes to be from not-being, that is, after it was not (*ba'da lā shay'*), then—considered in this sense—'nothing' is not a substrate for the thing.²⁵ Yet if they accept this latter interpretation then they have contradicted their own thesis that nothing is generated.

Turning to the exponents of latency (*ashāb al-kumūn*), Ibn Sīnā rejects the idea that natural bodies intermingle (*tadākhul*) with one another in such a way that there is a portion of everything in everything (*inna fī kulli jism mazjan min ajzā' kāminah*). Not only are the substances of the four simple bodies indestructible (*al-basā'it jawāhiruhā lā tafsud*), but none of these elements, on this theory, exists in its purity (*lā shay'a minhā yūjad sarfan*). There is no such thing as pure earth, water, etc. but rather, each of these is a mixture of everything else (*mukhtalit min al-jamī'*); and if they look distinct from one another it is because of the differences in the ratio of the mixture. It is the quantitative predominance of one constituent over the rest that makes the difference

²³ Ibn Sīnā (1969), *al-Shifā': al-Tabī'īyyāt: al-Kawn wa al-Fasād*, Cairo: Dār al-Kātib al-'Arabī, ed. Mahmūd Qāsim, 86 (lines 1-9) and 94 line 5.

²⁴ *Ibid.*, 94 (lines 5-15) and 95 (lines 1-3).

²⁵ *Ibid.*, 95 lines 4-6.

(*yusammā bi al-ghālib*).²⁶ Basic to this theory is the Anaxagorean notion of seeds of all kinds of thing, pre-existing in the primitive mixture and persisting in each of its products, just like the case of all the parts of a plant contained in its seed or those of man in the sperm. In other words, whatever is generated from a seed was in the seed, and therefore generation is but the separating-out of things which were mixed together in a seed; latent and imperceptible in the mixture, they became manifest through a process of segregation and recomposition.²⁷

By saying that everything contains something of everything and that the elements never cease mixing with and transforming into one another, the partisans of latency succeeded in accomodating change—though reducing it to nothing more than alteration (*istihālah*)—without violating the Parmenidean formula that reality is one, that from 'what is not' nothing can come, and that anything that *is* cannot pass away into nothing. Ibn Sinā rejects such a theory, arguing that:

If [by such a statement] they endorse the interpenetration (*tadākhul*) of bodies, they have maintained an impossible theory that is clearly absurd in every respect. Otherwise, if they have in mind contiguity and mixture (*mujāwarah wa mukhālatah*) that occur [among bodies], in the sense

²⁶ *Ibid.*, 79 (lines 11-18) and 101-103. Quite a similar theory is held by the Mu'tazilite al-Nazzām as reported in al-Ash'arī (1963), *Maqālāt al-Islāmiyyīn*, Wiesbaden: Franz Steiner, ed. H. Ritter, 327; al-Jāhiz (1937-1947), *Kitāb al-Hayawān*, Cairo: Dār al-Ma'ārif, ed. 'Abd al-Salām M. Hārūn, 1:6 ff.; cf. Harry A. Wolfson (1976), *The Philosophy of Kalām*, Cambridge MA: Harvard University Press, 495-517; also Josef van Ess (1960), art. "Kumūn" in *Encyclopedia of Islam*, Leiden: E. J. Brill, new ed. 7 vols., 5: 384-5.

²⁷ See Diels and Kranz, *die Fragmente der Vorsokratiker*, 2: 34-9 (Fragments nos. 4-12); Freeman, *Ancilla to the Pre-Socratic*, 83-5; or for more detail, Francis M. Conford (1930), "Anaxagoras Theory of Matter," *Classical Quarterly* 24/1: 14-30 and op.cit. 24/2 (1930): 83-95; Gregory Vlastos (1974), "The Physical Theory of Anaxagoras," in *The Pre-Socratics: A Collection of Critical Essays*, New York: Anchor, ed. A. P. D. Mourelatos, 459-88 and Malcolm Schofield (1980), *An Essay on Anaxagoras*, Cambridge: Cambridge University Press.

that what is latent is the portion [of everything] contained [within everything] (*al-kāmin huwa al-mustabtin min al-ajzā'*), and by containment is simply meant those [portions] being inside the body and distant from its simple and manifest [body], then it would follow that the inside of water would be the place of a latent [portion] of fire in such a way that the condition of that place would be like that of heated water in which the heating affects nothing but rendering the hidden manifest. Indeed, [the water] should have been much hotter than it [actually] is, precisely because concentration inside is more effective than diffusion outside (*al-inhisār fī al-bātin ajma' min al-intishār fī al-zāhir*). One can just verify or falsify this by sense observation: for both the inside and outside of water, and no matter how little or how much you take from it, is just of one and the same nature.²⁸

Next Ibn Sīnā refutes the idea attributed to Empedocles which says that since the four elements are permanent, enduring physical bodies, all change must therefore be a rearrangement of ungenerated, indestructible substances. In this theory, something is said to be generated when the elements (i.e. the Many) are mixed with one another and form a unity (i.e. the One), and is said to pass away when the unity is split up into many particles again; that is to say, the coming-into-being of the One is the extinction of the Many, and vice versa. All these processes, we are told, are governed by two opposite forces: Love—which enables the elements to mingle and unite (*mahabbah murwahhidah*)—and Strife, which allows them to separate from each other (*ghalabah mufarriqah*).²⁹ It is obvious that this theory is also

²⁸ *Shifā': Tabī'iyāt: Kawn wa Fasād*, 103 lines 4-13.

²⁹ *Ibid.*, 82 (lines 13-18), 83 (lines 1-2), 89 (lines 8-18) and 90 (lines 1-9). For further detail, see Diels and Kranz, *Fragmente der Vorsokratiker*, 1: 311-29 (Fragments nos. 6-39); Freeman, *Ancilla to the Pre-Socratic*, 52-7; Friedrich Solmsen (1965), "Love and Strife in Empedocles' Cosmology," *Phronesis* 10: 109-48 and Denis O'Brien (1969), *Empedocles' Cosmic Cycle: A Reconstruction from the Fragments and Secondary Sources*, Cambridge: Cambridge University Press.

put forth in response to Parmenides' objection. Conceding as he does that nothing comes to be that has not always been, Empedocles nevertheless admits that change is too obvious a fact to deny. Thus he precludes the possibility of generation and considers change to be nothing more than alteration. In his criticisms of such a view, Ibn Sīnā comments:

With regard to the one who postulates Love and Strife [as principles of change], because he denies generation and destruction of the elements but then forgets that [denial], he thinks that the elements may undergo change of states (*tastahīl*) whenever Love predominates, and that it [i.e. Love] may unite and gather them [i.e. the elements] in one sphere which [as a result] is different from the elements in nature. Similarly, as the sphere undergoes alteration, it breaks up into elements. Thus, on his view, the coming-together (*ijtimā'*) [of the elements] is doubtless due to some common matter (*māddah mushtarakah*), whereby the form of [each of] the elements is taken off and replaced with that of the sphere; whereas separation (*iftirāq*) leads to the removal from it of spherical form and the attachment of elemental form. This view in a way led him to regard Love as capable of producing motion out of nature; for him it [i.e. Love] constitutes the nature [i.e. source] of motion.³⁰ The doctrine of Love and Strife is indeed falsified by the truth [i.e. fact] of observation about the generation of elements from and into one another. He also contradicts himself when he asserts that Love has the power to gather [the elements and turn] them into one nature, as a result of which they become neither fire nor air nor water nor earth anymore. But then when Strife is gaining control, they soon split up, giving rise to the elements again in such a way that the forms of these elements disappear whenever Love takes over.³¹

³⁰ *Shifā': Tabī'iyāt: Kaww wa Fasād*, 99 lines 1-6.

³¹ *Ibid.*, 112 lines 6-10.

Ibn Sīnā also takes issue with the atomists who likewise reduce change to mere rearrangement of minimal, unsplitable corpuscles (*ajrām ghayr mutajazzi'ah*) or atoms. Unlike Anaxagoras and Empedocles who posited animistic agencies to account for change, the early atomists (Leucippus and Democritus) think that the universe and its workings can be explained by nothing save the collision (*sadmah*) of atoms, which are said to be finite in number and dispersed through an infinite void. On their theory, atoms will always roam and move by colliding and crashing against each other through the void until impeded by collision with another atom. Not only is their motion continuous (since there is nothing to stop them in the void) but there exists no reason for their haphazard behavior (*tataharrak harakāt kayfa ittafaqa*).³² Atoms have been colliding and will continue to do so forever, each collision owing simply to previous one but itself causing another crash, ad infinitum (*harakātuhā hādithah 'an harakāt qablahā bilā nihāyah*).³³ To be precise, the effect of the collision will depend on their shape and size (*tasduru 'anhā af'al mukhtalifah li ajli ashkāl mukhtalifah*)³⁴ as well as their weight: either the atoms rebound from one another, or if the colliding atoms are hooked or barbed or their shapes otherwise correspond to one another, they cohere and then form compound bodies. Indeed, just like their predecessors the atomists too apparently developed their theory in light of Parmenidean notion of 'what is'. For we are further told that each individual atom is ungenerated and indestructible, homogeneous in nature but not in shape (*ghayr mutakhālifah illā bi al-shakl*), complete, continuous, solid and indivisible (*lā tanqasim; lā taqbal qismat al-infisāl li salābatihā*). This atomic 'what is' thus may have void outside it, but none (and hence no motion) within (*'adam takhallul al-khalā'*).³⁵ Accordingly, from the atomists' point of view, change can and does occur, this being interpreted in terms of the

³² *Ibid.*, 83 lines 16-17.

³³ *Ibid.*, 84 lines 1-2.

³⁴ *Ibid.*, 83 lines 14-15.

³⁵ *Ibid.*, 83 lines 10-13.

combination and separation of atoms (in the case of generation and destruction respectively) as well as (in the case of alteration) rearrangement and change of their position in the compound body (*istihālatahā bi ikhtilāf al-wad' wa al-tartīb li tilk al-ajzā' fi al-mujtama' minhā*).³⁶

Ibn Sīnā rejects such an explanation of change on several grounds. First of all, the atomists have claimed that atoms are homogeneous both in nature and solidity and hence indivisible, but they leave unexplained the question what it is that gives each atom a certain shape and size, or to put it in other words, whether or not the atoms have their respective shape and size determined by their nature (*taqtadīhā tabī'atuhā*) or rather by some external factor (*ta'rid lahā min khārij*). If it is due to their nature, and their nature is one and the same, then the atoms should have had uniform, rather than variegated shape and size. If on the other hand the shape and size of the atoms are determined by some external factor, then it follows that each atom is by nature predisposed to, or capable of, being split and moulded (*fa tibā'uhā musta'iddah li an taqbal al-taqtī' wa al-tashkīl*) from the outside, such that each atom is in turn susceptible to further division and extension (*taqbal al-qismah wa al-ittisāl*), in which case it would be possible that each part of the atom be discontinuous in itself but continuous by virtue of something else (*kullu juz'in minhā bi haythu yajūzu 'alayh al-fasl fi nafsihi wa al-wasl bi ghayrihi*) at the same time.³⁷ So in any case, unless they abandon their own assertion, the atomists would inevitably contradict themselves.

Moreover, if the atoms are all of the same stuff, then there can be no difference between two atoms in contact

³⁶ *Ibid.*, 84 lines 5-13. Leucippus' teachings on the subject as recorded by Diogenes Laertius are given in Diels and Kranz, *Fragmente der Vorsokratiker*, 2: 70-1; whereas that of Democritus are given in *ibid.*, op. cit. 2: 139, 174-8, 180 (Fragments nos. 9, 156, 164, 167, 168 and 176); Freeman, *Ancilla to the Pre-Socratic*, 93, 106-8. For detailed studies, see Cyril Bailey (1964), *The Greek Atomists and Epicurus*, Oxford, 1928; repr. New York: Russel and Russel; David J. Furley (1967), *Two Studies in the Greek Atomists*, Princeton: Princeton University Press; Rudolf Löbl (1976), *Demokrits Atome*, Bonn: Habelt and Andrew Pyle (1995), *Atomism and Its Critics*, Bristol: Thoemmes Press.

³⁷ *Shifā'*: *Tabī'iyāt: Kaww wa Fasād*, 114 lines 4-12.

and a single large atom. But why is it, asks Ibn Sīnā, that when they come into contact, the atoms did not coalesce into one, as drops of water merge together when drop touches drop, encroaching on each other's border (in which case they would—by definition—cease to be atoms)?³⁸ A further argument given by Ibn Sīnā against the atomists is that if all bodies are composed of atomic corpuscles, as they claim, and if atoms are of the same stuff and are the same in nature, then all natural bodies would have one and the same natural motion, which is not the case, because earth falls whereas fire rises.³⁹

Having examined the pre-Aristotelian theories of change and shown how they all fail not only to allow for the distinction between alteration and generation but also to explain substantial change, Ibn Sīnā proceeds to set forth his own theory of change by first formulating the problem in terms of the number of principles required in any change. It is worth noting that prior to Parmenides, the early philosophers who inquired into the origin and nature of the universe apparently started with the rather simple observation of everyday phenomena of change such as heated water turning into air (i.e. steam) or the change of air, when cooled, into water droplets. The early Greek inquiry culminated in Heraclitean doctrine that everything is in constant flux. Granted that change is undeniable, they posited one element as principle: water for Thales; air according to Anaximenes; fire in Heraclitus' view.⁴⁰ By contrast, those who faced the challenge of Parmenides, as we have seen, followed him in ruling out all change except alteration, which is thought to involve more than one principle, namely, the four roots or elements of Empedocles; Anaxagoras' seeds; or the so-called 'atoms' of Leucippus' and Democritus'.⁴¹

³⁸ *Ibid.*, 117-8 where Ibn Sīnā points out other related difficulties that the adherents of atomism have to explain.

³⁹ *Ibid.*, 119 lines 7-19.

⁴⁰ *Ibid.*, 81 (lines 12-17) and 82 (lines 1-6).

⁴¹ Here we deliberately pass over Ibn Sīnā's rebuttal of the pre-Parmenidean philosophers' ideas since they were concerned less with the problem of change than with cosmogony.

It is worth noting that, all his criticisms notwithstanding, Ibn Sīnā like Aristotle does make use of the pre-Socratic ideas in developing his own theory of change. The notion of elemental bodies, perceptible qualities of matter, as well as their mixture and interaction are among the cases in point. Indeed, he recognizes fire, air, water, and earth as the basic stuffs out of which all sublunary things are composed, in addition to the ungenerated and indestructible aether, which constitutes the celestial bodies.⁴² The reason why he posits five, rather than four elements or just one is that whatever their number the elements, being simple bodies, must correspond to the three simple motions which are observed everywhere, namely, motion on the circular line (around the cosmic center) and motions in either of the two directions along the straight line (upward, away from the center, or downward, toward the center). Given that the simple, natural rectilinear motions belong to four elements, i.e. fire and air (upward) and water and earth (downward), there must exist a fifth simple body to which simple circular motion is natural.⁴³

Furthermore, he acknowledges hot and cold, dry and moist not only as the basic properties of matter (i.e. the elements) but also as the primary pairs of opposites, which can be theoretically arranged in pairs to produce the four simple bodies corresponding to the simple rectilinear motions: fire is light, hot and dry; earth is heavy, cold and dry; air is light, hot and moist; water is heavy, cold and moist.⁴⁴ In his system, hot and cold, dry and moist play almost the same role Empedocles assigned to the opposite forces of Love and Strife, namely as the proximate efficient cause in the process of elemental transmutation, whereas the four elements serve merely as the material cause (or simply: matter) in such a natural change.⁴⁵ For, according to Ibn Sīnā as for Aristotle, an adequate explanation of anything should

⁴² *Shifā': Tabī'īyyāt: Kaww wa Fasād*, 155 (lines 1-8) and 189.

⁴³ *Shifā': Tabī'īyyāt: Samā' Tabī'ī*, 303 (lines 5-9) and *Shifā': Tabī'īyyāt: Kaww wa Fasād*, 6-16.

⁴⁴ *Shifā': Tabī'īyyāt: Kaww wa Fasād*, 154 lines 3-17.

⁴⁵ *Ibid.*, 189 lines 5-11.

cover four most fundamental items, to wit: (1) the thing's efficient cause, that is, the principle and source of all its motions; (2) its material cause, i.e. its physical constituent, matter or ingredient; (3) its formal cause, that is, its nature or essence as reflected in its definition, e.g. the genus 'animal' or species 'man' or 'tree'; and (4) its final cause, that is, the goal or purpose of its being there.⁴⁶

Now, the gist of Ibn Sīnā's account of change is this: all change or process in nature—as opposed to that in art or technology—requires at least three participants. First, there must be some subject or substratum (*ma'vdu'*) that can be identified at the beginning of the process and re-identified in the end of it—that which persists throughout (*shay' thābit*). In addition, there must be two states (*hālah*) or properties (*sifah*) of the subject such that the two are in opposition or contrary to each other and one is succeeded by the other. The two properties or states involved in a change may be a pair of traditional opposites, e.g. hot and cold, dry and moist, as in the case of generation and destruction of the four elements from and into one another; or they may be opposite in the sense that only one of them denotes possession or presence of 'form', whereas the other signifies lack or privation ('*adam*') of it—which holds good for substantial change, i.e. in the case of generation and destruction of composite natural bodies such as animals and plants. It is these three factors that Ibn Sīnā following Aristotle calls 'principles' (*mabādi'*) of change in nature.

Consider, for example, the transformation of elements: when water turns into air or fire into water, the actual change that occurs is between their opposite qualities, hot giving way to cold and dry to moist. But there is something underlying such processes, which remains the same before, during and after the change, namely the substratum that in this context is called 'prime matter' (*al-'unsur al-awwal*). Thus when a certain amount of air comes into being, for instance, it does so because at the same time a

⁴⁶ *Shifā'*: *Tabī'īyyāt: Kaww wa Fasād*, 199 lines 6-7; and *Shifā'*: *Tabī'īyyāt: Samā' Tabī'ī*, 48.

corresponding amount of water passes away; but what really happens is that the underlying substratum, the so-called 'prime matter', passes from the condition of water into that of air.⁴⁷

What is understood from [the expression that] it [i.e. a body] is changing (*kawnuhu mutaghayyiran*) is that the acquired property that used to exist with it passes away, while a new property comes to be (*kāna bisifah hāsilah batalat wa hadathat lahu sifah ukhrā*) in such a way that there exists [1] something that persists, which is the one that is changing (*shay' thābit hurwa al-mutaghayyir*) and [2] the [initial] state where the property was present and then disappeared (*hālah kānat mawjūdah fa 'adumat*) and [3] the [final] state where the property was absent and then comes about (*hālah kānat ma'dūmah fa wujidat*). Thus it is clear that insofar as [a body] is changing there must exist for it [1] something capable of receiving that from which and into which it changes, [2] the form acquired, and [3] the lack or privation of it that was [and now is] with the vanishing form. Consider, for example: a cloth that is black; whiteness; and blackness. The property 'black' was initially absent, while the quality 'white' was present.⁴⁸

Substantial Generation

According to Ibn Sīnā, one cannot solve the problem of change without first understanding the difference between substantial change (*kawn jawharī*) or absolute generation (*kawn mutlaq*) and accidental change or alteration, which he also calls 'relative generation' (*kawn muqayyad*).⁴⁹ While both kinds of change may be understood in terms of an underlying, enduring substratum (be it subject or matter) that is endowed with a property (be it state or form) and later with the opposite property, the two are distinguished in that in accidental change it is the individual instance of substantial species or form that survives (*yabqā naw' al-*

⁴⁷ *Shifā': Tabī'iyāt: Kaww wa Fasād*, 189 (lines 12-14) and 190 (lines 1-16).

⁴⁸ *Shifā': Tabī'iyāt: Samā' Tabī'ī*, 17 lines 1-6.

⁴⁹ *Shifā': Tabī'iyāt: Kaww wa Fasād*, 124 lines 11-13.

jawhar thābitan),⁵⁰ whereas in substantial change it is the matter (*al-jawhar al-māddī*) that persists throughout (before, during, and after) the change.⁵¹ At the risk of seeming repetitious, we must recall that all change therefore requires three principles, namely, two opposites, i.e. (1) the form that is lacking or lost and (2) its opposite form that is acquired, and (3) the underlying thing or substratum. This is why sometimes it is said that all change is between contraries (*al-harakāt kulluhā bayn al-mutadāddāt*),⁵² for change is a process from not-being to being, a transition from privation to possession, and a perfection or actualization of the potential. Since it involves the acquisition of some property, every change thus has an initial state, in which the property is lacking or not present while its privation is, and a final state, in which the property is present. This holds good for all cases of change, including alteration and generation, which will be the focus of our concern in what follows.

Before we proceed any further, a brief note on terminology might be useful for our purposes. First, we must note that what Ibn Sīnā means by 'substance' (*jawhar = ousia*) is any self-subsistent entity, that is, everything that can exist independently from, and does not need something else to support its existence. Substance in this sense is contrasted with 'accident' (*'arad = sumbebçkos*), defined as that which cannot dispense with and hence, if at all, must inhere in a subject or substratum (*marwūdū' = hupokeimenon*).⁵³ It follows then that often—but not always—substance happens to be identical with subject or substratum. Ibn Sīnā also recognizes the Aristotelian distinction between two meanings in which the term is used: (1) substance in the primary sense (otherwise termed 'primary substance') refers to concrete individuals such as this man or that horse, whereas (2) substance in the secondary sense (hence the

⁵⁰ *Shifā': Tabī'iyāt: Kawm wa Fasād*, 124 lines 8-10.

⁵¹ *Ibid.*, 124 lines 17-18.

⁵² *Shifā': Tabī'iyāt: Samā' Tabī'ī*, 102 line 9.

⁵³ See Ibn Sīnā (1960), *al-Shifā': al-Ilāhiyyāt*, Cairo: OGI, ed. G.C. Anawati et al., 2 vols., 1:57.

term 'secondary substance') signifies essence (i.e. genus and species).⁵⁴ Another term that is crucial for our purposes is 'form' (*sūrah*). According to Ibn Sīnā, the form of a thing is its quiddity by which the thing is what it is (*māhiyyatuhu allatī bihā huwa mā huwa*), which is set in contrast to 'matter' or that which carries the quiddity (*al-hāmil li māhiyyatihi*).⁵⁵ But he further differentiates between two notions of 'form,' namely (1) the corporeal form (*sūrah jismiyyah*), which is the property of being three-dimensional, and (2) substantial form or species form in the sense of essence (Ar. *naw'* or *haqīqah* = Gr. *eidos* or *to ti çn einai*) e.g. 'being-a-man' or manness, just as he uses the term 'matter' in reference to the physical material (*māddah jismiyyah*) of which something is made, as well as in reference to the indestructible stuff (Ar. *hayūlā* = Gr. *hulç*), the substratum underlying all substantial change that continues passing from one substance to another.⁵⁶

Now, the point that Ibn Sīnā apparently wants to make while underscoring the distinction between the two cases of change is that always there is something persisting that underlies change, not only in alteration, where the substratum is the substance itself and so the form acquired is a property in some category other than substance such as quality or quantity (considering, for example, the case of the four elements transforming into one another by exchanging their qualities, or the wheat turned into blood and the blood becoming bones); but also in substantial generation, where the form acquired is a property in the category of substance—for example, the property of being a

⁵⁴ Ibn Sīnā (1959), *al-Shifā': al-Mantiq: al-Maqūlāt*, Cairo: OGIG, ed. G.C. Anawati et al., 91 and 95.

⁵⁵ *Shifā': Tabī'yyāt: Samā' Tabī'ī*, 34 lines 8-9.

⁵⁶ See *Shifā': Ilāhiyyāt*, 77 line 8, and 79 line 3; also Ibn Sīnā (1986), *Kitāb al-Hudūd*, in *Tis' Rasā'il fī al-Hikmah wa al-Tabī'iyāt*, Dār al-Qābus, ed. H. 'Asī, 82-4 and cf. Lettinck (1994), *Aristotle's Physics and Its Reception in the Arabic World*, Leiden: E.J. Brill, 98. For Aristotle's definition of form (*to eidos*) as essence (*to ti çn einai*) see *Metaphysics*, Delta 2, 1013a26 and *Physics* II.3, 194b26. In *de Generatione et Corruptione* II.9, 335b6, however, he uses the term *morphç* or form. It seems that *eidos* represents intelligible form (idea; concept), whereas *morphç* refers to sensible, perceptible form or shape.

man—in which case the change is that there is generated or comes to be a man (say, Zayd) where there was no such an individual. Also in this case, Ibn Sīnā insists, something is always there which was at first devoid of but is now possessed of the form. For according to him it is just impossible that a material body (in contrast to the immaterial) be generated out of nothing (*lā yajūz an yakūn kaww al-jirm wāqī'an 'an lā jirm*)⁵⁷—a fundamental doctrine that presupposes not only the conservation of matter, but also a theory of cycles, such that the universe or any part thereof is said to emerge from some principle or source and return to it again, and re-emerge once more, in a recurring fashion.

One of the peculiar features about substantial change in contrast to other kinds of change is that always or in most cases what comes to be a new substance is determined by the very nature of the parental substance—‘nature’ in the sense of ‘formal’ cause. Thus we observe that men beget men, and not cats or fish. This is true of all things that change by nature. Such regularity and necessity, on Ibn Sīnā’s view, cannot be ascribed to mere chance or luck, but must be due to the form or nature that lies within.⁵⁸ It is in this respect that the nature of a thing is said to be identical with its form, such that the latter, being the formal cause, also becomes, in a sense, the principle of change in substance. For as we noted above, Ibn Sīnā adopts the Aristotelian four causes in his analysis of change, and he criticizes the early materialists for their failure to identify the principle and source of change in the universe. Recognizing only the material cause (such as water for Thales, air for Anaximenes, fire for Heraclitus), these ancient Greek thinkers were consequently led to believe that the nature of a thing (that is, its principle or source of change) is to be found nowhere but in its matter. Thus, Antiphon reportedly argued, if a wooden bed were planted in the ground, what would grow, if anything could, would be not a bed, but wood—that is, the material of which the

⁵⁷ See *Shifā': Tabi'iyāt: Kaww wa Fasād*, 124 lines 5-7 and 17.

⁵⁸ See *Shifā': Tabi'iyāt: Samā' Tabi'i*, 54 lines 10-17.

bed is made. So the bed's nature, he inferred, is its very matter (i.e. the wood).⁵⁹ Ibn Sīnā rejects such a view and instead maintains that the nature of a thing is to be located in its form. The form also works as the final cause in determining the structure of a natural thing—that is, that for the sake of which the change (in this case: the coming-into-being of substance) occurs. Thus the final cause of a bird's possession of wings, for example, is flight, and flight is one of the constituents of the nature or form of a bird—that is, part of its essence or that which makes such a thing bird.

Most importantly, however, unlike other cases of change, substantial generation is instantaneous. That is to say, when a substance—for example, a man—is generated or comes into being, it does so all at once, and not gradually. Unlike Aristotle, whose exact position on this issue is still a moot point,⁶⁰ Ibn Sīnā explicitly asserts that substantial change occurs instantaneously (*daf'atan*), and he offers several arguments for this thesis. First, he remarks that it is only metaphorically (*qawl majāzī*) that motion or change is said to take place in the category of substance, for strictly speaking, substance is not susceptible to motion or change, the reason being that motion is gradual, but when a substantial nature (*al-tabī'ah al-jawhariyyah*)—i.e. the species form—is destroyed, the destruction occurs all at once, and likewise, when it is generated (*hadathat*), the generation happens instantaneously. In such cases, Ibn Sīnā points out, there exists no intermediary perfection or state between the pure potentiality of being a substance and the actual reality of being that substance (*lā yūjad bayna quwwatihā al-sarfah wa fi'lihā al-sarf kamāl mutawassit*). This is so because substantial forms do not allow of intensification or diminishment (*lā taqbal al-ishtidād wa al-tanaqqus*).⁶¹ That is to say, with respect

⁵⁹ *Ibid.*, 36 lines 12-15

⁶⁰ See Jon McGinnis. "On the Moment of Substantial Change: A Vexed Question in the History of Ideas," paper presented at the World Congress for Middle Eastern Studies (WOCMES) Avicenna Study Group Colloquium, 8-13 September 2002 at University of Mainz, Germany. I am grateful to McGinnis for kindly sending me his personal copy.

⁶¹ *Shifā': Tabī'iyāt: Samā' Tabī'ī*, 98 lines 10-12.

to any given substance, there cannot be degrees of 'substancehood'—if we may say so. For instance, among humans there cannot be some who are 'more' human than others; all humans are essentially identical in their humanity. Being a substance of a certain kind, then, is an all-or-nothing affair, so that when one substance changes into another, it never does so by becoming more and more of one type of substance, while becoming less and less like another. Rather, it simply changes all at once. His argument runs as follows:

If it [i.e. any substantial form] allows of intensification and diminishing, then either [1] the species of the substance, when it is in the middle of the intensification or diminishing, would remain or [2] it would not remain. If on the one hand its species remains, then the substantial form would not change at all; rather, only an accident due to the form would change. Thus, that which is diminishing or intensified [namely, an accident] has ceased to be (*'aduma*), while the substance has not perished. However, this is a case of alteration or the like, but not [substantial] generation. If on the other hand the substance does not remain with the intensification, then the intensification has brought forth (*jalaba*) another [new] substance. And likewise for any instant one posits during the intensification another [new] substance would come to be, when the first has vanished (*batala*), and thus between one substance and another there would be a potentially infinite [number of] substantial species [i.e. forms], just as with qualities. But one already knows that this is contrary to fact, and therefore it follows that substantial forms pass away and come to be all at once.⁶²

To put it in other words, if a substance were to change gradually, then during the change either the species form

⁶² *Ibid.*, 98 lines 12-18. Translation adopted, with slight modification, from McGinnis, "On the Moment of Substantial Change," 4.

remains or it does not remain. If the species form itself remains during the transformation (or any stage of the process), then the same specific substance remains and only an accident belonging to the substance has changed, in which case it would not be generation or substantial change, but merely an alteration. If the species form does not remain, then at any instant during the change there would necessarily be some new substantial form. However, since for Ibn Sīnā time is continuous in the sense that it *can* be infinitely divided, then during the supposed gradual change of a substance at any of the potentially infinite number of instants during the transformation there would necessarily be a new substance. Consequently, during a supposed gradual substantial change from a substance of one type to a substance of another type there would be a potentially infinite number of substances different from both types that have come to be.⁶³

A further argument Ibn Sīnā adduces in favour of instantaneous generation is that if substantial change were gradual, then like accidental change such as alteration, growth, etc. it too would require some substance to serve as substratum. But this cannot be the case, because the substratum is taken to be that which remains before, during and after change, whereas in generation it is exactly the substance that is changing. Since there cannot be gradual change without a persisting substance, and since in substantial change there exists no underlying determinate substratum that could be the subject of a gradual change, it follows that substantial change must take place all at once.

We also hold that the subject (*mawdū'*) of substantial form does not exist actually except by receiving the form—as you know—and in itself can only exist potentially, if at all. Indeed, something that is not actualized cannot possibly move [or change] from one thing to another. Now if there were substantial change (*harakah jawhariyyah*), then there would have to exist something that undergoes the change (*mutaharrik* [namely, the subject of the various substantial forms]), something whose existence would be rendered

⁶³ McGinnis, "On the Moment of Substantial Change," 4-5.

actual by the form and would be an actual substance in its own right [in which case this subject would then already have to be or even identical with a substance]. Now if it [i.e. this substance] is the same substance that existed before, then it has remained in existence until the second [new] substance comes into being, without being destroyed and changing only its states, while keeping its substantiality unchanged. On the other hand, if it is an entirely new substance different from the one from and into which change is assumed [to occur] (*alladhī furidat al-harakah 'anhu wa alladhī ilayhi*), then this substance had in the first place passed away into the intermediary substance, and as such there would have been two distinct substances both existing in actuality. And this leads us back to our very statement concerning the substance from which motion is assumed to take place—that is to say, either [1] during the entire time [of the supposed gradual transformation] it first remains as the [intermediate] substance into which it changed, in which case the change into a new substance was [not really gradual at all, but occurred] all at once, or [2] for part of the time [of the supposed transformation] it retains its initial species form (*hāfīzan li-naw'ihī al-awwal* —so that there is the intermediate substance), and for the other part of the time it takes a different species form with no intermediary [so that there is the final substance], in which case the same corollary would follow such as in the instantaneous change from one species form into another (*al-intiqāl min naw' ilā naw' daf'atan*).⁶⁴

Conclusion

Ibn Sīnā defines nature as the essential (not accidental) principle of motion, change and rest. He rejects the Stoic definition of nature as the power which permeates a body. Ibn Sīnā disagrees with Parmenides and Melissus who dismiss motion and change as impossible. While allowing the possibility of change, he understands change as the transition or passage from potentiality into actuality that

⁶⁴ *Shifā': Tabī'iyāt: Samā' Tabī'ī*, 98 (line 18) and 99 (lines 1-9).

occurs in time and uninterruptedly. Ibn Sīnā adopts the Aristotelian four causes in his analysis of change and recognizes the five kinds of change, namely, change in the category of place, quality, quantity, position, and substance. He criticizes the theories of pre-Socratic philosophers such as Anaxagoras, Empedocles and Democritus which, he thinks, fail to distinguish alteration from generation and to explain substantial change. In contrast to Aristotle, however, Ibn Sīnā maintains that substantial change occurs all at once, not gradually, since in his view there is no intermediary state between the pure potentiality of being a substance and the actual reality of being that substance.

