

ROGER BACON ON SUBSTANTIAL CHANGE

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Abstract: In the standard medieval interpretation of Aristotle's theory of change, a substantial change occurs instantaneously. Roger Bacon rejects this standard reading and defends the alternative view that a substantial change is a temporal process, one that involves different stages occurring one after another. In this paper I present Bacon's original view by analyzing the extensive discussion he devotes to it in his late work *Communia naturalium* (Book I, part 4, chapters 1-3).

According to the standard medieval interpretation of Aristotle's theory of change, there is an important structural difference between changes with respect to accidental categories (like locomotion, alteration, increase and decrease) and changes with respect to the category of substance, that is, generation and corruption. The difference has to do with the temporal character of the two kinds of change: accidental changes occur successively and hence take time, whereas substantial changes do not involve temporal succession but rather occur suddenly, that is, they are instantaneous. For example, while the change of some water from being cold to being hot involves a succession of phases and hence takes time, the change of water into air occurs suddenly, that is, in an instant.

Despite its popularity among Aristotelian commentators, the claim that a substantial change is instantaneous is absent from the discussion that Aristotle explicitly devotes to change in the *Physics*. It has, however, an Aristotelian background. In *Physics* III, Aristotle defines motion (or change) as the act of what is in potency in so far as it is in potency, and he clearly assumes that this definition applies to both accidental and substantial changes.¹ In *Physics* V, however, when he takes a closer look at the different kinds of change, Aristotle introduces a strict sense of the term 'motion' such that only accidental changes and not also substantial changes are motions in this strict sense.² In the standard medieval interpretation, the main reason why Aristotle denies that substantial changes are motions in the strict sense is that, unlike accidental changes, they are instantaneous.

¹ Aristotle, *Physics*, III.1, 200b32-201a15.

² Aristotle, *Physics*, V.1, 225a20-2, 225b11.

Bacon departs from this standard interpretation. He argues that it is wrong both from the doctrinal point of view and as an exegesis of Aristotle's distinction between accidental and substantial changes in *Physics* V. He maintains that substantial changes, just like accidental changes, take time. He defends this highly original view in many of his works. As Silvia Donati has shown in her extensive investigation of Bacon's authorship of the works edited in the *Opera hactenus inedita*, the view is found in *De XI^o libro, Qq. Metaph. I,II,V-X, Qq. Phys. I-VIII, Qq. De causis, Qq. De gen.*, and in the *Communia naturalium*.³ It is in this last work that Bacon offers the most extensive discussion of this view. He devotes to it the first three chapters of the fourth part of the first book, the part about the production of things (*de produccione rerum in generali*).⁴ In a previous paper I have dealt very marginally with Bacon's discussion of substantial change in the *Comm. nat.*, focusing on the influence of Avicenna's view.⁵ In this paper I offer a more comprehensive presentation of Bacon's discussion by examining in some detail its main aspects.

1. *The nature of substantial change*

Bacon starts his analysis with a brief description of the nature of generation, the paradigmatic case of a substantial change:

(T1) Generation is the coming out of matter from potency to act, or equivalently the coming out of what is generable from non-being to being, that is, from being in potency to being in act. And it is clear from what has been said beforehand that an essence that is incomplete and in potency proceeds towards its completion and act through generation. And the coming out from the potency of matter is nothing else but the progress of an incomplete essence towards the

³ Silvia Donati, 'Pseudoepigrapha in the *Opera hactenus inedita Rogeri Baconi*? The Commentaries on the *Physics* and on the *Metaphysics*', in *Les débuts de l'enseignement universitaire à Paris (1200-1245 environ)*, eds. J. Verger and O. Weijers, Turnhout: Brepols, 2013, pp. 179-187.

⁴ Roger Bacon, *Communia naturalium*, I, part 4, d. 1, cc. 1-3, ed. R. Steele, Oxford, 1911, *Opera hactenus inedita Rogeri Baconi*, fasc. 2, p. 240, l. 4-p. 250, l. 14.

⁵ Cecilia Trifogli, 'Avicenna's *Physics* in Roger Bacon's *Communia naturalium*', in *The Arabic, Hebrew and Latin Reception of Avicenna's Physics and Cosmology*, eds. D. N. Hasse and A. Bertolacci, Berlin: De Gruyter, 2018, pp. 443-451. Avicenna maintains that substantial changes are instantaneous. Bacon deals with Avicenna's view at the very end of his discussion of substantial change in *Comm. nat.* I, part 4, d. 1, c. 3, p. 248, l. 15-p. 250, l. 14. I will not present again this aspect of Bacon's discussion in this paper.

terminus of the generation, so that the thing that was in potency then becomes in act, as Aristotle establishes at the end of *Metaphysics* VIII.⁶

In this description Bacon does not adopt Aristotle's definition of motion as the act of what is in potency in so far as it is in potency (which when applied to the case of generation would mean that generation is the act of what is generable in so far as it is generable).⁷ He adopts instead Avicenna's definition of motion in terms of *exitus*, that is, coming out, from potency to act.⁸ He expands, however, Avicenna's definition by providing some indications of what this coming out involves in the specific case of generation, that is, the coming into being of a substance. Indeed, he refers to matter as the thing that comes out from potency to act, and he specifies the coming out from potency to act as a process of completion, a passage from being incomplete to complete. There is an incomplete essence that becomes complete and hence actual through generation.

It is difficult to give a precise reconstruction of Bacon's assumptions about generation at work in this short description, but the sections of the *Comm. nat.* devoted to matter are of great help.⁹ Of crucial importance is the distinction that Bacon draws between the metaphysical and physical notions of matter. Matter in the metaphysical sense is something distinct from any form, either substantial or accidental.¹⁰ This kind of matter corresponds to what is usually called prime matter by medieval commentators. Unlike later commentators, however, Bacon does not think that prime matter or metaphysical matter is the one relevant for generation, the kind of matter that is a principle of substantial change. For Bacon maintains that this kind of matter is present in every created substance, and therefore also in substances that are not subject to substantial change, like the celestial bodies. The matter relevant for

⁶ *Comm. nat.* I, part 4, d. 1, c. 1, p. 240, ll. 10-18: "Est autem generacio exitus materie de potencia ad actum, sive exitus generabilis de non ente ad ens, hoc est, de ente in potencia ad esse actuale. Et patet ex predictis quod essencia incompleta et in potentia vadit per generacionem ad complementum et actum. Et nichil aliud est exitus de potencia materie nisi quod essencia incompleta sic promoveatur in terminum generacionis, unde illud quod fuit in potencia postea fit in actu, sicut Aristoteles determinat in fine octavi *Metaphysicae*." All quotations from the *Comm. nat.* are from Steele's edition. I have kept the orthography of this edition but have occasionally changed its punctuation.

⁷ Aristotle, *Physics*, III.1, 201a9-15.

⁸ On Avicenna's definition see Trifogli, 'Avicenna's *Physics*', pp. 445-446.

⁹ For some excellent recent studies on Bacon's very complex notion of matter, see Anna Rodolfi, '*Dicitur materia propriissime et strictissime*. Roger Bacon and the Ontological Status of Matter', in *Roger Bacon's Communia Naturalium. A 13th Century Philosopher's Workshop*, eds. P. Bernardini and A. Rodolfi, Firenze: Sismel-Edizioni del Galluzzo, pp. 83-102; Michela Pereira, 'Remarks on *materia naturalis*', *ibid.*, pp. 103-138.

¹⁰ *Comm. nat.* I, part 1, d. 1, c. 4, p. 14, l. 23-p. 15, l. 4; part 2, d. 1, c. 4, p. 61, ll. 3-6.

substantial change is matter in the physical sense, which he also refers to as natural matter. The following passage, taken from a list of six senses of the term 'matter' distinguished by Bacon,¹¹ contains his characterization of natural matter:

(T2) In the third way matter is taken specifically according to the use of natural philosophers as the subject of generation; its distinctive property is that of being an incomplete thing in potency to a specific being. And such a subject is a composite in potency to the complete being of a composite... And this composite is the essence of some genus relative to two species.¹²

Following a standard view of matter as principle of nature, Bacon defines this kind of matter as the subject of a substantial change, and he takes it that such a subject is something that persists throughout a substantial change, and thus is common to both the substance that comes to be in such a change and to the substance that is corrupted. The distinctive property that Bacon ascribes to natural matter as subject of a substantial change is that of being incomplete. The contrast that Bacon has in mind here is the contrast between the incompleteness of natural matter and the completeness of something belonging to a species, something with a specific being. Thus the relevant incompleteness of natural matter is incompleteness with respect to a species. In the Aristotelian context what is defined as incomplete with respect to a species is a genus. The passage from a genus to one of its species in the Porphyrian tree is a passage from something indeterminate, and hence incomplete, to something more determinate, and hence more complete, where the determination or completeness is achieved by adding specific differences. Appealing to this Aristotelian background, Bacon identifies natural matter with the genus. More precisely, given a substantial change from a substance of species A to a substance of species B, the natural matter in this change is the proximate genus to which both species A and B belong.¹³

¹¹ On Bacon's list of the senses of matter, see the section 'Bacon on Matter' in the entry 'Roger Bacon' by J. Hackett for the *Stanford Encyclopedia of Philosophy*. See also Rodolfi, '*Dicitur materia propriissime*', pp. 86-89.

¹² *Comm. nat.* I, part 2, d. 1, c. 4, p. 61, l. 6-17: "Tercio modo dicitur materia specialiter in usu naturalium pro subjecto generationis, cuius proprietas est ut sit res incompleta in potencia ad esse specificum. Et hoc principaliter est compositum aliquod in potencia ad esse compositi completum ... Et hoc compositum respectu duarum specierum est essentia alicujus generis."

¹³ For a more detailed account of Bacon's classification of natural matter in a categorial order, see Pereira, 'Remarks', pp. 114-134.

Bacon illustrates this general account of substantial change with the example of the generation of water from earth:

(T3) For this reason the natural matter in the generation and corruption of a species is the incomplete essence of the proximate genus, which is apt by nature to be completed by the species ... And this matter in the generation of species always has one of the species, for example, the essence of the genus existing in the earth has the specific nature of earth. And when a contrary agent that can produce water, like water or a celestial power, acts on earth, it causes the corruption of the specific matter of earth up to the essence of the genus, which is common to water and earth, and it produces water from that incomplete essence. Therefore, that essence is said to be in potency to the water to be produced, and it is the material principle in the generation of water and in the corruption of earth. And likewise for the other things that are generated by nature.¹⁴

In Bacon's account then a genus as the material principle of a substantial change acquires a very solid ontological status. Far from being a mere abstraction, differing only conceptually from a species, a genus is a thing in its own right, albeit incomplete: an incomplete thing, according to text (T2), or an incomplete essence, according to texts (T1) and (T3). Text (T2) also indicates that this incomplete thing or essence is not simply a form or a collection of forms but it is a composite, that is, a hylomorphic compound, comprising matter and form, and thus an incomplete (material) substance. Accordingly, a substantial change is the process by which an incomplete generic substance, that is, a substance with the essence of a genus, becomes a complete specific substance, that is, a substance of a specific nature.

2. Substantial change and alteration

After presenting Bacon's view about the nature of substantial change, we can now dwell into his discussion of the temporality of this change. Bacon introduces this

¹⁴ *Comm. nat.* I, part 1, d. 1, c. 4, p. 15, l. 21- p. 16, l. 3: “Quapropter materia naturalis in generatione specierum et corruptione est essentia generis proximi incompleta, que nata est compleri per species ... Et hec materia in generatione specierum habet semper unam illarum, ut essentia generis in terra habet naturam specificam terre. Et quando agens contrarium, ut aqua vel virtus celi que potest facere aquam, agit in terram, corrumpit materiam specificam terre usque ad essentiam generis, que est communis aque et terre, et de illa essentia incompleta producit aquam. Unde illa essentia dicitur in potencia esse ad aquam producendam, et est principium materiale in generatione aque et corruptione terre. Et sic in aliis generatis per naturam.”

issue immediately after his short presentation of substantial change in text (T1). Referring to the incomplete essence that becomes complete through such a change Bacon says:

(T4) But there is a doubt as to whether <an incomplete essence> progresses <towards its completion> suddenly or successively, because all people posit that a substantial form is induced as a whole in an instant.¹⁵

Thus, the common opinion is that a substantial change occurs at once, that is, in an instant, and the reason of this is that the induction of a substantial form of which a substantial change consists is instantaneous. An exponent of this common opinion whom Bacon explicitly considers and to whom he devotes special attention is Avicenna.¹⁶ As I have argued in another paper, Avicenna's treatment of substantial change in his *Physics* had a dominant influence on Bacon.¹⁷ Another exponent of the common opinion is Averroes, who is followed by the major 13th-century Latin commentators: Albert the Great, Thomas Aquinas, and Giles of Rome.¹⁸

In Bacon's report, the common view also posits that in the generation of a substance B starting from a substance A, the induction of the substantial form of B comes at the end of an alteration, that is, of a qualitative change, in substance A. This is relevant for the question of the temporality of a substantial change, because while the induction of the substantial form of B is instantaneous, the alteration preceding it is temporal. For example, in the generation of fire from air, the substantial form of fire is induced instantaneously but the air becomes hot gradually (alteration); the becoming hot of air is a successive process involving different degrees of intension of heat. Thus, the common opinion appeals to the existence of a concomitant process of alteration to account for the fact that the overall process of a substantial change, as including an alteration, takes time, although the induction itself of the substantial form is instantaneous.

Bacon thinks that this common view is totally wrong. His first line of attack is directed against the assumption of an alteration accompanying a substantial change.

¹⁵ *Comm. nat.* I, part 4, d. 1, c. 1, p. 240, l. 18-241, l. 3: "Set an subito an successive sic promoveatur dubitacio est, quia ponitur ab omnibus quod forma substancialis inducitur tota in instanti."

¹⁶ *Comm. nat.* I, part 4, d. 1, c. 3, p. 248, l. 15-p. 250, l. 14.

¹⁷ Trifogli, 'Avicenna's *Physics*', pp. 447-448.

¹⁸ For some textual references, see Donati, 'Pseudoepigrapha', p. 180, n. 83.

For Bacon this assumption is a fiction and a source of confusion in the assessment of the issue of the temporality of a substantial change:

(T5) First, however, we must rule out the alteration which is invented here before the last coming out of the terminus of the generation, so that we are only left with the truth of generation.¹⁹

Bacon puts forward four arguments against the existence of an alteration in a substantial change.

The first two arguments rely heavily on Bacon's own account of substantial change as a process of completion of a substantial nature, a process by which a substantial nature passes from an initial incomplete state (corresponding to the essence of a genus) to a final complete state (corresponding to the essence of a species). In this account, both the initial and the final states are degrees of a substantial nature (the genus and species to which the generated substance belongs). The two arguments also assume that in the common opinion, alteration is a process that intervenes between these two extreme states, so that the degrees of the qualities involved in the alteration are intermediate between the two extreme ones. The first argument is then based on the inference that, if there are intermediate degrees between these two extreme ones, they can only be substantial degrees (degrees of a substantial nature) too, and not accidental degrees (degrees of qualities), contrary to the common opinion:

(T6) When an incomplete substantial nature progresses towards its completion, this change of it develops from an incomplete degree to a complete degree. But these two extreme degrees are of the same genus, that is, they are substantial degrees and belong to the substance of the thing. Therefore, the intermediate degrees will be substantial too, because the medium is of the same genus as the extremes, as we are taught in *Metaphysics* X. Therefore, there is no accident intervening between these extremes. Therefore, there is no intervening alteration.²⁰

¹⁹ *Comm. nat.* I, part 4, d. 1, c. 1, p. 240, l. 18-241, l. 3-6: "Primo tamen oportet excludere alterationem quamdam que hic fingitur ante ultimum exitum termini generacionis in esse, ut stemus solum in ipsa veritate generacionis".

²⁰ *Comm. nat.* I, part 4, d. 1, c. 1, p. 241, ll. 6-15: "Cum vero natura substancialis incompleta promovetur ut compleatur, decurrit hec transmutacio ejus a gradu incompleto ad gradum completum.

This argument relies on an Aristotelian *auctoritas* from *Metaphysics* X about the homogeneity in nature between extremes and medium²¹ in support of the claim that the intermediate degrees must be substantial. The second argument, however, provides a more substantive reason for the same claim. The reason is that these intermediate degrees become components of the generated substance: just as the generated substance is composed of the initial and final states, corresponding to its generic and specific being respectively, so it is composed of all the states intervening between the initial and final ones. Therefore, these intermediate states must be substantial degrees and not accidental ones, since accidents are not components of a substance:

(T7) Furthermore, if accidental dispositions were added to the first substantial degree of the material essence, which must progress continuously towards the last substantial degree, and the thing that is generated is composed of the first and last degrees, then I ask about these intermediate accidental degrees whether they are destroyed, which is absurd, or whether the thing generated is composed of these degrees together with the first and last degrees, and in this case a substance would be composed of a substance and an accident.²²

The other two arguments show that the common opinion cannot give a satisfactory account of the subject of the alteration concomitant with a substantial change. According to this opinion, the alteration must precede the induction of the new substantial form, and hence must precede the coming into being of the new substance; therefore, the candidates for being the subject of this alteration are items that precede the new substance. And these are only two: (i) the initial substance, that is, the substance subject to corruption; (ii) the subject of the substantial change itself, that is, the natural matter common to the initial and final substance. Although neither the

Set isti duo gradus extremi sunt ejusdem generis, scilicet, quia sunt substantiales et de rei substantia. Ergo si qui sunt medii gradus, erunt similiter substantiales, quia medium est ejusdem generis cum extremis, ut docetur decimo *Metaphysicae*. Ergo nullum accidens cadit in medio inter hec extrema. Set alteracio non est nisi inter accidentia. Ergo nulla est ibi alteracio intercepta.”

²¹ Aristotle, *Metaphysics*, X.7, 1057a19-20.

²² *Comm. nat.* I, part 4, d. 1, c. 1, p. 241, ll. 15-22: “Item, si dispositiones accidentales adderentur super primum gradum essencie materialis substantialem promovendum continue in ultimum gradum substantialem, et res generata componitur ex primo gradu et ultimo, quero de istis mediis gradibus accidentalibus, aut cedunt in nichil, quod est inconveniens, aut componetur generatum ex eis cum primo gradu et ultimo, et ita fieret substantia ex substantia et accidente.”

third nor the fourth argument explicitly consider alternative (i), the third argument seems to rule out both alternatives (i) and (ii), whereas the fourth argument only rules out alternative (ii).

The third argument is the following:

(T8) Furthermore, let us consider the generation of a species from common matter, as for example the generation of fire from water through the corruption of water and the coming out of fire from the potency of matter. If a degree between the potency of matter and the last coming out in being of the substantial form is an accident, like heat, and an accident is not renewed except because of the renewal of its subject, since the proper subject of any accident is prior by nature to the accident itself, therefore the proper subject of heat would be induced as prior by nature in this process. But such a subject can only be the substance of fire; therefore, the substance of fire will, at least by nature, be prior to heat and to every accident of fire; therefore, the generation would be prior by nature to the alteration, if there were an alteration in this process.²³

In the example of the substantial change from water to fire, the relevant alteration is a process of becoming hot, and so the relevant accident acquired by the subject of this alteration is heat. According to alternative (i), the subject of the heating, the thing that becomes hot, would be the water to be transformed into fire; according to alternative (ii), such subject would be natural matter, the matter common to air and fire. The argument then appeals to a principle that rules out both alternatives (i) and (ii) by showing that the only subject in which heat comes to be could be fire. The principle states that the coming into being of a new accident presupposes the coming into being of its proper subject. In our example, the proper subject of heat is fire. Therefore, the newly generated heat can only exist in the newly generated fire, and not in the pre-existing water or natural matter.

²³ *Comm. nat.* I, part 4, d. 1, c. 1, p. 241, l. 22-p. 242, l. 2: “Item, loquamur de generatione alicujus speciei ex materia communi, ut de generatione ignis ex aqua per corruptionem aque et educationem ignis de potencia materie. Si igitur gradus inter potenciam materie et exitum ultimum forme substantialis in esse sit accidens, ut caliditas, et accidens non renovatur nisi per renovationem sui subjecti, quia proprium subjectum cujuslibet accidentis precedit natura ipsum accidens, ergo prius natura inducetur ibi subjectum proprium caliditatis. Set hoc non potest esse nisi substantia ignis; quare substantia ignis precedet natura saltem caliditatem et omne accidens ignis; et ideo generatio precedet alterationem per naturam, si ibi esset alteracio.”

The principle according to which a new accident requires a new proper subject is very obscure, and difficult to make sense of. Taken at face value, it seems to imply that, in the present case, only fire as the proper subject of heat can acquire heat, and hence to rule out that any subject distinct from fire can become hot. So not only natural matter but also water cannot become hot, because the newly generated heat can only come to be in its newly generated proper subject, and this is fire, not water. It is hard to believe that Bacon accepts a principle that is in open conflict with the empirical evidence that water and other substances distinct from fire do acquire heat, that is, they become hot. So the principle should not be taken at face value. In the absence of any explicit indications by Bacon, however, it is difficult to speculate about its appropriate interpretation. One way to make sense of it is to restrict its application to the case in which the only available subject for an accident would be natural matter. The principle would then say that the coming into being of a new accident in matter presupposes the coming into being of the substantial form of its proper subject in matter. In our case this means that the coming into being of the accident of heat in matter presupposes that matter already has the substantial form of fire. The principle interpreted in this restricted way makes more sense. The problem is that this interpretation makes Bacon's third argument against the existence of an alteration concomitant with the substantial change of water into fire very weak. For it does not take into account the alternative idea that the subject of the alteration is the initial substance -in our case that the subject of the heating is the water itself- and not its matter. But it is exactly this alternative idea that the common opinion under attack may well advocate. The natural way to interpret the common opinion is indeed that the generation of fire from water starts with the heating of water; the heat is then increased until it reaches such a high degree that it is incompatible with the substantial form of water; once this degree is reached, the substantial form of water ceases to exist and the substantial form of fire is newly introduced in matter. It is not clear, however, how Bacon's third argument works against this standard account of the view that posits an alteration concomitant with a substantial change.

The fourth argument rules out alternative (ii), according to which the subject of the concomitant alteration is the same subject of the substantial change itself, that is, the natural matter common to the initial and final substance. It does this by appealing to a universally accepted Aristotelian principle about the subject of an accidental change, according to which such a subject is a complete substance,

something with a specific being. There is not a subject of this kind in a substantial change:

(T9) Furthermore, since an alteration is from a subject to a subject that exists in act with a specific being, as Aristotle establishes, there will not be an alteration in this case, given that there is not a subject that persists in act, but there is a being in potency as subject.²⁴

Bacon concludes his rejection of the common opinion about the existence of an alteration accompanying a substantial change by summarizing the main objections raised against this:

(T10) (i) And for this reason it must be said that there is no alteration in this process, because an accident is generated only because of the generation of its subject, whereas the common subject, which is natural matter, exists in potency and not in act. (ii) And therefore there are there the generation of a substance, which is called simple generation or generation simply, and the generation of an accident, which is called generation in a qualified way. (iii) Therefore, all dispositions between the potency of matter and the last act are substantial degrees and none of them is accidental. For this is impossible, as has been proved.²⁵

This summary is confusing. Parts (i) and (ii) apparently make conflicting claims about the accidental change of alteration posited by the common opinion: in part (i) the existence of such a change is denied while in part (ii) it is admitted. A way of reconciliation is suggested by Bacon's explanation in part (i) of the claim that there is no alteration. The explanation is an appeal to the principle about the generation of an accident used in the third argument above, which states that the generation of an accident presupposes the generation of its proper subject, which is the complete

²⁴ *Comm. nat.* I, part 4, d. 1, c. 1, p. 242, ll. 2-6: "Item, cum alteracio est a subjecto in subjectum actu existens in esse specifico, ut Aristoteles determinat, non erit hic alteracio, cum non sit subjectum manens in actu, set ens in potencia pro subjecto."

²⁵ *Comm. nat.* I, part 4, d. 1, c. 1, p. 242, ll. 10-19: "(i) Et propter hoc dicendum est quod nulla est hic alteracio, quia hic non generatur accidens nisi per generationem subjecti sui, subjecto communi existente ente in potencia et non in actu, quod est materia naturalis. (ii) Et ideo est ibi generacio substancie, que vocatur generacio simplex vel simpliciter, et generacio accidentis, que vocatur generacio secundum quid. (iii) Unde omnes dispositiones inter potenciam materie et ultimum actum sunt gradus substantiales et nulla accidentalis. Impossibile enim est hoc sicut probatum est."

substance. This explanation suggests that Bacon's initial claim in (i) that there is no alteration should be understood in a qualified sense: there is no alteration preceding the coming into being of the new substance. This qualified reading of the claim is compatible with the assumption that there is in fact an alteration, as it is said in (ii), but this comes after the completion of the substantial change and not before it, as the common opinion assumes. This interpretation finds some confirmation in the final part (iii) of the passage. Bacon repeats here the conclusion of his first two arguments according to which all intermediate degrees in a substantial change between the potency of matter and the ultimate act are substantial degrees and not accidental ones. This conclusion rules out the existence of an alteration preceding the completion of the substantial change, but not of an alteration following it.

The fact that Bacon does not provide a detailed presentation of the common opinion about the alteration accompanying a substantial change makes it difficult to assess how compelling his arguments against it are. What is relatively clear is that for the common opinion to be the target of Bacon's arguments, it must posit that: (i) the accidental states are intermediate between the initial and final states of a substantial change, and that (ii) the subject of the alteration is the (natural) matter itself, so that matter passes from the incomplete state corresponding to the nature of the genus to the complete state corresponding to the nature of the species with the addition of degrees of qualities. If the common opinion is interpreted in this way, then Bacon's arguments against it have quite some force. It is very unlikely, however, that this interpretation of the common opinion is a fair one.

3. *Degrees of substances*

It is the claim in part (iii) of text (T10) about the existence of degrees of substance which introduces the next stage of Bacon's discussion of the temporality of substantial change:

(T11) But then a more serious doubt arises. For if this is true, then a substance receives the more and the less in its generation, when it is extracted from potency to act, and it receives intension and remission.²⁶

²⁶ *Comm. nat.* I, part 4, d. 1, c. 2, p. 242, ll. 22-25: "Sed tunc gravior occurrit dubitacio. Si enim hec sunt vera, tunc substantia suscipit magis et minus in generacione, cum extrahitur de potentia ad actum, et suscipiet intencionem et remissionem."

This stage then focusses on the issue of the intension and remission of a substance. Bacon assumes that the existence of degrees of substance and therefore of intension and remission in a substance follows from his refutation of the common opinion in the previous section. He also admits, however, that the existence of such degrees is controversial among Aristotelian philosophers and so it deserves a more thorough examination.

Bacon's discussion has two parts: the first part contains arguments in favour of the existence of substantial degrees; the second part deals with Aristotelian objections against it.

The first argument in favour of the existence of substantial degrees is one ascribed to Averroes in his commentary on Book IV of *De Caelo*.²⁷ The argument appeals to the uncontroversial assumption that accidents have degrees and then shows that the existence of degrees of substance follows from the existence of degrees of accidents:

(T12) ... if the heat of fire can be diminished by the corruption of a part of it, while the whole substantial form remains, for the same reason the same hold if it is diminished in another part and a third part and so on, and the whole substance of fire will remain untouched and not diminished. Therefore, the proper passion could be corrupted in its totality while its subject remains in act, which is impossible. Therefore, the remission of the substance of the subject of an accident follows from the remission of that accident, and so it is necessary to posit that there is an intension of substance simultaneous with the intension of an accident in generation.²⁸

The argument considers the case of a substantial change from fire to another substance, say water, and appeals to the common assumption that this process involves a remission of heat in fire. The idea is that fire needs to become less hot than how it actually is in its natural state in order to be transformed in a substance like

²⁷ We could not find this argument in Averroes's commentary.

²⁸ *Comm. nat.* I, part 4, d. 1, c. 2, p. 243, ll. 1-10: "... si caliditas ignis potest per corrupcionem remitti secundum partem aliquam, stante forma substantiali integra, eadem ratione si remittatur secundum aliam partem, et terciam, et omnis remanebit substancia ignis illesa non remissa. Ergo posset propria passio corrumpi totaliter, subjecto manente in actu, quod est impossibile. Quare remissionem accidentis sequitur remissio substancie subjecti sui, et ita ad intencionem accidentis in generatione, oportet ponere quod simul tempore sit intencio substancie."

water, which is not by nature hot in the same degree as fire. The common opinion about the existence of an alteration concomitant with a substantial change, which was already rejected by Bacon, would posit that this process of remission of heat in fire precedes not only the coming into being of the substantial form of water but also any change that affects the substantial form of fire itself. Bacon's argument shows that this cannot be the case. The remission of the heat of fire does involve the remission of the substantial form of fire. The idea is that, when the heat of fire undergoes a process of remission, the substantial form of fire also undergoes a process of remission so that, when fire loses some degree of heat, it also loses some degree of its substantial form. The argument is a *reductio*: suppose that the remission of the heat of fire does not affect the substance of fire so that the substance of fire remains in exactly the same state throughout this process; but this process leads to the corruption of heat; therefore, at the end of this process, when heat no longer exists, the substance of fire would be exactly the same as it is at its beginning, so that fire could exist without heat, which is its proper passion, and this is obviously absurd.

The common opinion would probably avoid this absurd conclusion by assuming that there is a minimum degree of heat compatible with fire so that the substance of fire is not affected by the process of remission until the minimum degree is reached. At the next step of the process, when the minimum degree is further diminished, then the substance of fire is corrupted and the substance of water comes into being. In this view, then, the remission of heat is responsible for the corruption of the substance of fire without thereby causing any remission of the substance of fire. Bacon does not explicitly consider this alternative view, but his argument suggests why he would not accept it. According to Bacon, this view does not give a satisfactory account of the effect of the remission of heat on the substance of fire. For example, it does not answer questions like: if the remission of heat from its maximum degree all the way down to the minimum degree does not affect the substance of fire at all, why does the remission of heat from the minimum degree to the next one below affect it so drastically as to be responsible for its corruption?

As the final sentence of text (T12) shows, Bacon assumes that his argument for the existence of remission of substances can be reformulated for the case of intension. Accordingly, in his view, just as a substantial change involves the remission of the accidents of the substance to be corrupted and the intension of the

accidents of the substance to be generated, so it also involves the remission of the substance to be corrupted and the intension of the substance to be generated.

The second argument for the existence of substantial degrees confirms the main point established in the first argument about the existence of an intensification and remission of substance concomitant with the intensification and remission of accidents by appealing to the case of the generation of a mixed body:

(T13) Furthermore, the mixture of contrary elements such that something mixed from them is produced occurs in virtue of the remission of the things to be mixed in one nature composed of them. But if nothing except the accidents of these things were subject to remission, then no composite would be generated apart from an accident. Therefore the generation of a mixed thing would not be the generation of a substance but only of an accident, which is impossible. For this reason, when a mixed substance is generated, it is necessary that the things to be mixed be subject to remission in their substances; but the same things by nature are mixed and generated one from the other; therefore, when one of them is changed into another, like water into fire, there is there a remission of a substance just as of an accident, and therefore the generation of another substance.²⁹

The uncontroversial assumption about the generation of a mixed body is that the accidents proper of the elements from which the mixed body comes to be (for example, the heat of fire in a mixture involving fire), are subject to remission so that they become compatible one with the other by becoming less intense. The argument then shows by a *reductio* that the remission of accidents must be accompanied by a remission of the substances of the compounding elements: if only accidents were subject to remission, then what is generated in the mixture would only be new accidents and not also a new substance. This conclusion is absurd because a mixture is a case of substantial change, in which a new substance is generated, and not simply a combination of accidental changes, in which new accidents come to be. An

²⁹ *Comm. nat.* I, part 4, d. 1, c. 2, p. 243, ll. 10-21: “Item, mixtio contrariorum elementorum, ut fiat mixtum ex eis, fit per remissionem miscibilium in unam naturam compositam ex eis. Set si nichil remitteretur nisi accidens ex parte eorum, nullum compositum generaretur nisi accidens. Ergo generatio mixti non esset generatio substantie, set solius accidentis, quod est impossibile. Quapropter cum substantia mixta generatur, oportet quod miscibilia remittantur in substantiis suis; set eadem natura miscentur et generantur adinvicem; ergo quando unum transmutatur in aliud, ut aqua in ignem, ibi erit remissio substantie sicut accidentis, et ideo alterius substantie generatio.”

exponent of the common opinion denying substantial degrees, however, would not be convinced by this argument and would try to reply to it along the lines suggested for the first argument.

It is worth to point out that both arguments in (T12) and (T13) also contain a refutation of the common opinion about the alteration in a substantial change, according to which the only degrees are those of the alteration, and so degrees of qualities, that is, of accidents. It makes sense therefore to compare the refutation of the common opinion about the alteration contained in the arguments in (T12) and (T13) with the refutation we have analyzed in the previous section. It turns out that the two refutations are different. The refutation of the previous section shows that there is no alteration concomitant with the substantial change. In our suggested interpretation, there is an alteration, but this alteration comes after or before the substantial change. The refutation in the arguments in (T12) and (T13) admits instead that there is such a concomitant alteration but show that what is concomitant is the process of intensification or remission of a substance. As the last sentence of (T12) puts this point, we need to posit an intensification of substance temporally simultaneous with the intensification of accidents.

Whether and how the two refutations can be reconciled is a highly speculative issue, given the absence of any relevant remarks by Bacon himself. From the theoretical point of view, however, the account of substantial change provided in this section as involving a simultaneous process of accidental and substantial intension and remission is much more satisfactory than the one resulting from the discussion in the previous section.

Let us now turn to the second part of Bacon's discussion in which he deals with some Aristotelian *auctoritates* which are against the existence of degrees of substance. The most compelling of such *auctoritates* is the famous claim in the *Categories* that substance is not subject to intension and remission (*substantia non suscipit magis et minus*).³⁰ In Bacon's view this claim can be reconciled with the assumption of degrees of a substance by distinguishing (i) the being of a substance and (ii) its coming into being. The claim is true when applied to the being of a substance, but it is not true when applied to its coming into being:

³⁰ Aristotle, *Categories*, 5, 3b33-4a9.

(T14) If one raises the objection that, according to Aristotle in the *Categories*, substance does not receive the more and the less, it must be said that (i) a secondary substance in which two or more primary substances agree can be compared to the first substance; and in this case that secondary substance is as a whole and wholly in any primary substance, as animal is in this animal and in that animal, and man is in this man and that man ... Therefore Aristotle says in the *Categories* that one man is not more a man than another man, and it is only this that Aristotle means when he says that substance does not receive the more and the less.

(ii) A universal substance can be considered in another way, that is, in the order of its generation, and likewise an individual substance in the order of its generation, in so far as they proceed from potency to act. In this case, since this passage occurs through many dispositions that precede the last completion of a substantial form in being, which dispositions, as has been shown beforehand, cannot be accidents but degrees of substance, it is necessary that both a first and a second substance receive intension and remission in generation and corruption.³¹

Thus, using the example of the *Categories*, Bacon accepts Aristotle's claim that given two individual men, say Socrates and Plato, it is not the case that Socrates is more man than Plato; they are both man in exactly the same degree. The reason for this equality, however, is not that there are no degrees in the substance of man, but that the substance of man is completely realized in each of them. Socrates and Plato are both men in the maximum degree of the substance of man. This does not rule out, however, that there are degrees of different intensity of the substance of man. It only rules out that such different degrees are found in individual men as actually existing. Such degrees do exist but we have to look for them in the substantial changes through which Socrates and Plato, and the universal nature that they instantiate (*substantia*

³¹ *Comm. nat.* I, part 4, d. 1, c. 2, p. 243, l. 21-p. 244, l. 7: "Quod si obiciatur, Aristoteles in *Predicamentis*, quod substantia non suscipit magis et minus, dicendum quod (i) secunda substantia potest comparari ad primam in qua due vel plures conveniunt; et sic tota substantia illa secunda et totaliter est in qualibet prima, ut animal in hoc animali et illo, et homo in isto et illo... Et ideo Aristoteles dicit in *Predicamentis* quod unus homo non est magis homo quam alius, et sic solum intendit Aristoteles quod substantia non suscipit magis et minus. (ii) Aliter potest substantia universalis considerari in linea sue generationis, et singularis in sua, prout ipse vadunt de potencia ad actum. Et sic cum hic exitus fit per multas dispositiones precedentes ultimum complementum forme substantialis in esse, que dispositiones, ut prius ostensum est, non possunt esse accidentia set gradus substantie, oportet quod tam prima quam secunda suscipiant intencionem et remissionem in generatione et corruptione."

secunda), come into being. To put it concisely, being a man does not admit of degrees, but becoming a man does.

Another *auctoritas* from the *Categories* which apparently denies substantial degrees is the claim that there is no contrariety in substances,³² and contrariety is required to account for the more and the less. There is nothing like the contrariety between white and black -standard example of contrariety- between two substances of different species, say a man and an ass. In dealing with this *auctoritas* Bacon follows the same strategy as in dealing with the previous one, that is, he appeals to a distinction that reconciles the claim that there is no contrariety in substance with the existence of degrees of substance:

(T15) If one raises the objection that the more is what has less of the contrary and the less is what has more of the contrary, as is said in *Physics* V, and there is no contrariety among substances, as Aristotle says, it is clear that in substances there is no contrariety of forms or natures with respect to the same subject constituted in a specific act, as in quality, for example, the contrariety of white and black with respect to Socrates. But there is there a contrariety of substantial forms and natures with respect to a subject that is a being in potency and not in act, which is a thing of a genus or an individual of a genus, which is natural matter. Aristotle in the *Categories* denies the first contrariety in substance but not the other.³³

Bacon does not challenge Aristotle's assumption that the more and the less can only be defined in terms of contraries. What he denies is the objection that the relation of contrariety only holds between accidental forms like white and black. There is also another kind of contrariety, one that holds between substantial forms and natures. Bacon seems to assume that the most compelling reason for denying the existence of a contrariety between substantial natures is that there is not an appropriate subject for such contrary natures. But he thinks that the truth of the matter is that there is a

³² Aristotle, *Categories*, 5, 3b24-27.

³³ *Comm. nat.* I, part 4, d. 1, c. 2, p. 244, l. 31-p. 245, l. 13: "Si vero obiciatur quod magis est quod habet minus de contrario, et minus quod habet magis, ut dicitur 5^o *Physicorum*,³³ et in substantiis non est contrarietas, ut dicit Aristoteles, patet quod non est ibi contrarietas formarum vel naturarum circa idem subjectum constitutum in actu specifico ut in qualitate, sicut albi vel nigri circa Socratem. Est tamen ibi contrarietas formarum et naturarum substantialium circa subjectum quod est ens in potencia et non in actu, quod est res alicujus generis, vel individui ejus, quod est materia naturalis. Prima igitur negat Aristoteles a substantia in *Predicamentis*, set non aliam."

subject for contrary substantial natures, which is of a different kind from the subject of contrary accidental forms. The subject of a contrariety between accidental forms is a substance, that is, in Bacon's words, a thing with a specific being, a thing belonging to a species; the subject of a contrariety between substantial forms and natures is instead a thing with a generic being, a thing belonging to a genus. Such a thing is the subject in a substantial change, that is, natural matter. Accordingly, there is a structural similarity between accidental and substantial changes, since they both involve contrary forms that follow one another in a subject.

4. *The temporality of substantial change*

The conclusion of the existence of the degrees of substance immediately leads to the question about the succession and temporality of a substantial change:

(T16) But if this is the case, then a doubt specifically arises about the coming out of matter from potency to act, which is generation, and the conclusion that follows from what has been said is that generation occurs successively, and it is a motion and not a mutation. For if this coming out runs through the degrees of intension of a substantial nature, which are added one to the other, it is necessary that in this coming out there is succession and time.³⁴

The passage of matter from potency to act in a substantial change consists in matter taking on more and more intense degrees of the substantial nature to be generated. Such a succession of degrees can only occur successively, and therefore takes time.

While Bacon believes that the claim that a substantial change is successive and temporal necessarily follows from the claim that there are degrees of substance, he is also aware that it is highly controversial. Indeed, as he remarks in text (T4), the universal agreement is about the opposite claim, that a substantial change is instantaneous. Thus, in order to give this claim a firm foundation, the objections against the temporality of a substantial change must be answered. And it is to these objections that Bacon devotes the final stage of his discussion of substantial change in the *Comm. nat.*

³⁴ *Comm. nat.* I, part 4, d. 1, c. 3, p. 245, ll. 16-21: "Set si ita sit, tunc specialiter sequitur dubitacio de ipso exitu materie de potencia ad actum, qui est generacio, et concluditur ex dictis quod ipsa fit successive, et sit motus, non mutatio. Si enim hic exitus currat super gradus intencionis nature substancialis, quorum quilibet ad alium additur, oportet quod sit successio in hoc exitu, et tempus."

The most compelling of such objections is already hinted at in the introductory passage (T16) when from the claim that a substantial change occurs successively it is inferred that a substantial change would then be a *motus* and not a *mutatio*. In this context, I will translate these two terms as motion and mutation respectively. The reference here is to Aristotle's discussion about the species of change in *Physics* V.1. As I have pointed out in the introduction, it is indeed the discussion of *Physics* V.1 that is the *locus classicus* for the view that a substantial change is instantaneous.³⁵ There, Aristotle distinguishes between motion and mutation, and argues that a substantial change is not a motion but a mutation. According to a common reading of this distinction, the main reason for which Aristotle denies that substantial change is a motion is that it occurs in an instant, whereas motion must be temporal. That this is the common reading of Aristotle's distinction is confirmed by the fact that in the collection of *auctoritates* published by J. Hamesse the claim "Motus est transmutatio successiva quae fit in tempore, sed mutatio [i.e., generatio et corruptio] est transmutatio subitanea quae fit in instanti" appears among the *auctoritates* from Aristotle's *Physics* V.³⁶

Despite its popularity, this common reading does not have direct textual support. Aristotle does not say explicitly that a substantial change is instantaneous. In fact, in Bacon's view, the common reading is wrong. He proposes an alternative reading according to which the distinction Aristotle draws between motion and mutation is based on a difference in their subjects and not on a difference in their temporal nature.

Bacon formulates his alternative reading in terms of a distinction between two significates of motion:

(T17) If one says that in *Physics* V Aristotle says that generation is not a motion but a mutation, it must be replied that motion is taken in two ways. (i) In one way as any successive transmutation. And motion taken in this way is included in the definition of time, when Aristotle says that time is the number of motion with respect to the before and after. Therefore, the motion that is included in the definition of time is motion in the most proper sense. And this is the first and

³⁵ Aristotle, *Physics*, V.1, 225a35-2, 225b11.

³⁶ Jacqueline Hamesse, *Les Auctoritates Aristotelis. Un florilège médiéval. Étude historique et édition critique*, Louvain-Paris: Publications Universitaires-Béatrice-Nauwelaerts, 1974, p. 152, n. 150. This *auctoritas* is left by the editor as *locus non inventus*.

principal significate of motion. Therefore, given that generation is divided according to the division of time, it is necessary that generation is a motion, that is, a successive transmutation. (ii) In *Physics* V, however, motion is taken in another and equivocal way, that is, as a transmutation from a subject to a subject, as Aristotle says there, and he means: from a positive subject in act to the numerically and specifically the same positive subject in act, for example in the case of alteration the transmutation from Socrates being white to Socrates being black, and in locomotion from Socrates being up to Socrates being down, and in increase from Socrates being small to Socrates being big. But things are otherwise in substance because there is there a transmutation from a subject in potency to a subject in act, for example from a genus to a species, or equivalently from the material principle up to the specific being, which is the terminus of generation. For the transmutation there is not from Socrates to Socrates, or from something in act to something in act, but from potency to act. And motion taken in this way is more special than motion taken in the first way. For the successive transmutation is restricted to a subject in a specific act. But the mutation opposite to motion taken in the first way occurs in an instant, since, unlike that motion, it has no succession; but the mutation opposite to the motion taken in the second way is successive, and therefore that mutation is not in an instant but in time. And this mutation is generation and corruption.³⁷

The first significate of motion as successive transmutation is not one explicitly given by Aristotle. It is, however, found in a famous passage of Averroes's commentary on the *Physics* in which the *Commentator* deals with an apparent inconsistency in

³⁷ *Comm. nat.* I, part 4, d. 1, c. 3, p. 246, l. 5-p. 247, l. 3: “Si vero dicatur quod Aristoteles dicit in 5^o *Physicorum* quod generacio non est motus set mutacio, dicendum est quod motus sumitur dupliciter, (i) uno modo pro omni transmutatione successiva. Et sic cadit motus in diffinitione temporis, cum dicit quod tempus est numerus motus secundum prius et posterius. Unde motus, ut cadit in diffinitione temporis, est proprissime motus. Et hec est prima significacio motus et principalis. Et ideo cum generacio dividitur secundum divisionem temporis, oportet quod generacio sit motus, id est, transmutatio successiva. (ii) Set in 5^o *Physicorum* aliter accipitur motus et equivoce, scilicet, pro transmutatione que est a subjecto in subjectum, ut ibi dicit, et hoc est dictum: a subiecto in actu affirmato ad subjectum idem numero et specie in actu et affirmatum, ut in alteracione ab albo in nigrum fit transmutacio a Socrate albo in Socratem nigrum, et in loci mutacione a Socrate existente sursum ad Socratem factum deorsum, et in augmentacione a Socrate parvo in Socratem magnum. Set in substantia non est sic, quia ibi est transmutacio a subjecto in potencia ad subjectum in actu, ut a genere in speciem, seu a materiali principio usque in esse specificum, quod est terminus generationis. Non enim est ibi transmutacio a Socrate in Socratem, nec ab aliquo in actu ad aliquem in actu, sed a potencia in actum. Et sic motus sumptus est specialior quam prius. Artatur enim transmutatio successiva ad subjectum in actu specifico. Set mutacio opposita primo motui est in instanti, nullam habens successionem sicut ille motus; set mutacio opposita secundo motui est successiva, et ideo non est illa mutacio in instanti set in tempore. Et hec mutacio est generacio vel corrupcio.”

Aristotle's classification of motion in the categories.³⁸ It is very likely that Bacon's source here is Averroes, although the fact that Bacon classifies this significate as the most appropriate and primary one hints at a contrast with Averroes on the issue of the ontological status of motion.³⁹ This contrast is not relevant to our purpose. What is important for us is that Bacon thinks that this most appropriate significate of motion is also one that applies to all kinds of change: both accidental and substantial. Thus generation and corruption too are motions in this significate: they are successive transmutations, and hence take time.

Substantial changes, however, are not motions if motion is taken in the more restrictive significate introduced by Aristotle in *Physics* V. The restriction is about the subject of a change: only changes that have a substance as their subject are motions in the restrictive sense. Changes of this kind are the accidental changes, changes occurring in a substance that remains the same qua substance but some of its accidental properties vary. In Bacon's example, the individual substance Socrates is the subject of motions in the restrictive sense: he remains the same qua substance while he changes with respect to his colour (alteration), his place (locomotion), and his size (quantitative change). The subject of a substantial change is not a substance like Socrates, that is, a thing with the nature of a species. Such a subject is matter or the material principle, which in Bacon's interpretation is a thing with the nature of a genus and therefore in potency to a thing with the nature of a species. According to the terminology of *Physics* V, then, a substantial change is not a motion but a mutation. In Bacon's interpretation, however, this does not at all mean that a substantial change is not temporal but instantaneous. As he points out at the end of text (T17), an instantaneous change would not be a motion in its primary significate of being a successive transmutation, but a change that is not a motion in the restrictive sense of *Physics* V is not instantaneous.

Bacon's interpretation of the distinction of *Physics* V between motion and mutation as based on a difference in their respective subjects has much stronger textual support than the interpretation of the common opinion according to which the distinction is based on a difference in their temporal nature. It does not address,

³⁸ Averroes, *Commentarium magnum in Aristotelis De Physico auditu libri octo*, Venice: Giunta, 1562, repr. Frankfurt a.M.: Minerva, 1962, V, t. c. 9, fol. 215ra.

³⁹ On the debate about the ontological status of motion arising from Averroes's discussion of the classification of motion in the categories, see, for example, Cecilia Trifogli, *Oxford Physics in the Thirteenth Century (ca. 1250-1270)*, Leiden-Boston-Köln: Brill, 2000, pp. 37-66.

however, the argument from which the common opinion very likely originates. Although not found in Aristotle's text itself, this argument is supplied by Averroes in his commentary as an argument left implicit by Aristotle for his attentive reader to formulate. The argument appeals to the claim that a substantial change is a change from privation to habit, that is, from non-being to being; privation and habit, however, are not contraries but contradictories, that is, opposites with nothing intermediate between them.⁴⁰ And the absence of intermediate stages in a change prevents it from occurring successively.

Bacon does not leave this argument unanswered. He deals with it in the second main objection against the temporality of a substantial change:

(T18) If it is said that generation is a mutation from a contradictory to a contradictory, and there is no medium between contradictories, therefore there are no intermediate degrees through which the motion runs, but there will only be the coming out from one contradictory to the other contradictory, it must be replied that the being in potency, which is called non-being with respect to a being in a specific act, is not a pure extreme of a contradiction, because the pure negation is a non-being which is neither in act nor in potency, and this kind of non-being is not the subject of generation and it is not from it that generation proceeds towards a being, and there is no natural transmutation from a non-being taken in this way to a being. For creation is from a pure non-being to a being. Generation instead is from a non-being in a specific act, which is a being in a generic act. And therefore each extreme of a generation is truly a being, and both extremes belong to one extreme of the contradiction, that is, to the affirmation. And within this affirmation, since there are many degrees between incomplete and complete, the thing subject to generation runs successively through the transmutation that is generation, and therefore generation is a motion.⁴¹

⁴⁰ Averroes, *Physica*, V, t. c. 9, fol. 214va: "Et quia manifestum est per se quod transmutatio quae est motus in rei veritate est inter opposita mediata et non est medium in transmutatione quae est de privatione in habitum, quia inter privationem et habitum non est medium, dimisit destruere hanc divisionem, quia est manifesta. Et quia vera contraria mediata inveniuntur in tribus praedicamentis, necesse est ut motus sit in tribus praedicamentis. Sed ipse non complevit hanc declarationem hoc modo et quasi dimisit prescriptionem diligenti."

⁴¹ *Comm. nat.* I, part 4, d. 1, c. 3, p. 247, ll. 3-19: "Si dicitur quod generacio est mutacio a contradictorio in contradictorium, et inter contradictoria non est medium, ergo non sunt gradus medii in quibus currat motus, set solum erit exitus ab uno contradictorio in aliud, dicendum quod ens in potencia, quod vocatur non ens respectu entis in actu specifico, non est purum extremum contradiccionis, quia pura negacio est non ens quod neque est actu neque in potencia, et tale non ens non est subjectum generacionis, nec ab eo itur ad ens, nec est aliqua transmutacio naturalis a non ente sic ad ens. Creacio enim est a non ente puro ad ens. Set generacio est a non ente in actu specifico,

In reply to the argument about contradictories Bacon concedes that a change between contradictories, such as non-being and being, would be instantaneous, given that there are no intermediate stages between contradictories that could account for the succession in such a change. He denies, however, its crucial premise that a substantial change is between contradictories. The starting point of a substantial change is not a non-being in an absolute sense, but a non-being in a qualified sense. It is a non-being with respect to a specific being but it is a being with respect to a generic being; in other words, it is not a thing with the nature of a species but it is a thing with the nature of a genus. And a thing with the nature of a genus is indeed a being, although an incomplete one when compared to a thing with the nature of a species.

5. Conclusion

In concluding this presentation of Bacon's very extensive and complex discussion of the temporality of substantial change, it is important to single out what the key ingredient of his original position is. This is the assumption that there are substantial degrees, that is, degrees of intension and remission of a substantial nature. Contrary to what Aristotle and the common reading of Aristotle say, Bacon maintains that a substance “receives the more and the less”, just like qualities do.⁴² That a substantial change takes time is an immediate consequence of the existence of such substantial degrees.⁴³

But what are these substantial degrees? It is difficult to give an exhaustive answer to this question on the basis of what Bacon says about them in his discussion of the temporality of substantial change or elsewhere. He gives a characterization of such degrees in terms of completeness: a substantial nature can be more or less complete, and a substantial change is one in which a substantial nature becomes complete. Another explicit claim he makes is that the contrast between incomplete and complete is the contrast between genus and species. The standard example that comes to mind is the contrast between animal and man, and the development of the embryo into a man. This may suggest that different substantial degrees correspond to

quod est ens in actu generali. Et ideo utrumque extremum generacionis est vere ens, et cadunt sub uno extremo contradiccionis, scilicet, sub affirmatione, in qua affirmatione, quia multi gradus sunt inter incompletum et completum, currit generabile successive per transmutacionem que est generacio, et ideo generacio est motus.”

⁴² See above, pp. xx-xx.

⁴³ See text (T16), p. xx.

different substantial forms: in our example, the incomplete one would correspond to the generic substantial form 'animal' and the complete one to the specific form 'man'. The suggestion then is that Bacon's view about substantial degrees amounts to a version of the theory of the plurality of substantial forms. I do not think, however, that this suggestion is correct.

An indication of this is the following. At Bacon's time the plurality of substantial forms was the standard view, whereas Bacon considers his position about the temporality of substantial change highly original, contrary to what all people think, namely, that substantial change is instantaneous.⁴⁴ Thus, reading Bacon's view about substantial degrees as a version of the plurality theory does not explain why Bacon regards his claim that a substantial change takes time so controversial. How can such a controversial and unique claim be a direct consequence of the common assumption of the plurality of substantial forms? Could it be the case that the pluralists simply fail to see that their assumption about substantial forms immediately entails that a substantial change is not instantaneous but takes time? This is hard to believe.

A much more convincing explanation is that Bacon's view about substantial degrees is not a version of the theory of plurality of substantial forms. And Bacon's discussion provides a clear indication of a more theoretical nature against this identification. This is the following: if substantial degrees are those that exclusively account for the fact that a substantial change takes time, as Bacon assumes, they must have the structure of a continuum. For time itself is a continuum, and in Bacon's account there must be an isomorphism between the time taken by a substantial change and the degrees successively acquired by the subject, so that to different parts of time there corresponds different degrees. Substantial forms, however, do not form a continuum. Even in the most generous pluralist view, according to which to each branch of the Porphyrian tree there corresponds a distinct substantial form, there are only a finite number of such forms. Thus, even if a substantial change may involve a succession of distinct substantial forms, this succession does not form a continuum, and therefore it is not enough to account for the fact that such a change takes time. What is required is a succession isomorphic to the succession of accidental degrees, like the degrees of heat, as is clear from Bacon's discussion of the common opinion's

⁴⁴ See text (T4), p. xx.

appeal to an alteration to account for the temporality of a substantial change;⁴⁵ thus, the succession of substantial degrees must form a continuum just like the succession of accidental degrees does, and hence it cannot be identified with a succession of substantial forms.

Indeed, Bacon's discussion makes it sufficiently clear that it is accidental degrees, and in particular the intension and remission of qualities, rather than the plurality of substantial forms that provide the structural model for substantial degrees.

Accordingly, a substantial change, in so far as it is viewed as a passage from an incomplete state to a complete state of a substantial nature passing through substantial degrees, has a similar structure to an accidental change like the intensification of heat.

It is also important to stress, however, that in Bacon's view the similarity between the two kinds of change is not complete. He thinks that there is a major difference in their respective subjects: the subject of an accidental change is a complete being (i.e., something with a specific being) whereas the subject of a substantial change is an incomplete being (i.e., something with a generic being).⁴⁶ A more fundamental distinction between the two kinds of change derives from the distinction between accidental and substantial degrees: substantial degrees are degrees of a substance, whereas accidental degrees are degrees of an accident, and substance and accident are two distinct kinds of entity. There is nothing in Bacon's discussion that suggests that the structural isomorphism between accidental and substantial degrees weakens the distinction between substance and accident. Although both have degrees, substance and accident are two irreducible kinds of thing. The question, however, of what their difference exactly consists in becomes more pressing. Bacon does not address this question in his discussion of the temporality of substantial change. It is therefore a valuable task of a future research project to try to reconstruct from other sections of his works what his reply to it would be.

⁴⁵ See above, pp. xx-xx.

⁴⁶ It is by appeal to this difference in subject that Bacon explain Aristotle's distinction in *Physics* V between substantial change and accidental change. See above pp. xx.

