Aggiornamento and the Sciences: What Does it Mean?

• **Michael Hanby** •

"*Aggiornamento* toward the sciences cannot mean ceding sole authority over nature to science, but must instead mean bringing science and nature within the ambit of Christ's revelation of man to himself as a creature given to himself by God, created in and destined for communion."

Of the many ambiguities to follow in the wake of the Second Vatican Council, perhaps none is more difficult to resolve, or in more urgent need of resolution, than the meaning of *aggiornamento* as it concerns the Church's relationship to modern science. This ambiguity stalks the pages of the council documents themselves. On the one hand, *Gaudium et spes*, 36 affirms the "legitimate autonomy" of the sciences, and the documents as a whole praise and marvel at scientific and technical progress in a way, to be perfectly honest, that sometimes looks naïve in retrospect. On the other hand, *Gaudium et spes* regards the cultural dominance of scientific rationality and progressivism as one of the principal sources of that pervasive atheism, that eclipse of the sense of God and man, which made the council so urgent in the first place. This eclipse has only grown darker in the years since the council, and no one has done more to stress the urgent need for a new theological and metaphysical

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engagement with the sciences than Joseph Ratzinger.[1] This essay cannot hope to approach this task in anything like the exhaustive fashion it demands; I merely hope to sketch the outlines of a future treatment.[2]

The way that most Catholics seem to have interpreted the Church's openness to science is neatly exemplified by Robert George and Christopher Tollefsen in their book, *The Embryo*, which maintains that science establishes that the embryo is a human person and that embryos should thus be accorded protection under the law. Distinguishing between embryo science, embryo technology, and embryo ethics, George and Tollefsen write that "embryo *science* tells us two important things about human embryos: *what they are* and when they begin."[3] George has made similar remarks in other contexts with respect to science more generally. Embryo *technology*, as distinct from embryo *science*, tells us what we can *do* with embryos. And it seems that theology or religion, though it doesn't qualify as Rawlsian public reason in the way that George and Tollefsen's argument aspires to, belongs with moral philosophy in telling us what we *ought* or *ought not* to do with embryos.[4] It seems to me that we could drop the qualifier "embryo," and we would have a general statement about the relation between science, technology, theology, and philosophy. Each is essentially outside of the others, taking over where the other leaves off.

Now there are a couple of objections I want to make to this straightaway, mostly in the interest of noting them and setting them aside, at least for the time being. If this sort of understanding of the relationship between theology, philosophy, and science is truly indicative of the legitimate autonomy affirmed by the council, then either a) *Gaudium et spes*, 22 and its claim that Christ reveals man to himself is *not* the hermeneutical key to the meaning of the council that John Paul II and Benedict XVI have made it out to be, or b) the anthropological meaning revealed in Christ is simply a *moral*

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[1]Among the many examples, see Ratzinger, *Without Roots: The West, Relativism, Christianity, Islam*, trans. Michael F. Moore (New York: Perseus, 2006), 126–28.

[2]See my book tentatively titled, *No God, No Science: Creation, Cosmology, Biology*, forthcoming from Blackwell.

[3]George and Tollefsen, *Embryo: A Defense of Human Life* (New York: Doubleday, 2008), 6.

[4]See George and Tollefsen, *Embryo*, 19–22, 203–10.

meaning, supervening, as it were, on merely physical nature. In a technological culture such as ours, such a conclusion is destined to be regarded as mere *moralism*, that is, as morality having nothing to do with reality, and to remain ineffectual. (This is one reason, perhaps, why "New Natural Law" arguments only ever seem to convince those who are predisposed to believe them already.)[5] In other words, relation to Christ—*being a creature*—while perhaps essential to the order of grace and salvation has nothing to do with *what things are*. Now before this paper is over, I want to suggest precisely the opposite: that *Gaudium et spes*, 22 *is* the key to understanding the legitimate autonomy of the sciences because creation, which only emerges fully to view in the light of Christology, is in one of its most basic senses *what things are*. But I want to come to this claim first not theologically or by appealing to the authority of the council, but by suggesting that the conventional interpretation of the Church's affirmation of science, exemplified by the remark from George and Tollefsen, is deeply problematic because it is theoretically and historically untrue to the nature of science and to its relation to philosophy and theology.

My essay is not about George and Tollefsen *per se*; and it would take a much more detailed analysis to do their argument the justice it deserves. I advert to their book merely as representative of a widespread perspective. At the risk of committing injustice, however, I would suggest that theirs is ultimately a disastrous line of argumentation, more political than philosophical, which threatens to concede the war for the sake of the battle.[6] Seeking to qualify as

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[5]As Tracey Rowland puts it, "Liberals just don't buy the medicine, even when the theological ingredients have been expressly excluded and the principles repackaged in explicitly Liberal idioms. This often leads to a situation in which Catholics talk to other Catholics in an idiom which was devised for dialogue with unbelievers, while the unbelievers are either not persuaded or so poorly educated as to be unfamiliar with the idiom. When natural law is marked as universally reasonable without any accompanying theological baggage, it can begin to sound, in Russell Hittinger's memorable phrase, 'like a doctrine for Cartesian minds somehow under Church discipline'" (Rowland, "Natural Law: From Neo-Thomism to Nuptial Mysticism," *Communio* 35 [Fall 2008]: 375). Rowland is citing Hittinger, *First Grace: Re-Discovering the Natural Law in a Post-Christian World* (Wilmington: ISI Books, 2003), 62.

[6]In calling this argument political rather than philosophical, it is not my intent to engage in "philosophical name calling," a term which George and Tollefsen employ to deflect the criticism of Lee Silver. Rather I am pointing to the fact that

"public reason" by premising their moral philosophy on a purely scientific account of the organism, they fail to acknowledge that the ontological identity of organisms is as much a philosophical question as a scientific one, or more fundamentally, that scientific accounts of the organism are always already mediated by a metaphysics and that purely scientific accounts of the organism do not, therefore, exist. They are left, as a result, with an ontologically "weak" and ultimately reductive account of the organism that is insufficient in "hard cases" such as brain death and the stem-cell harvesting technique known as ANT-OAR.[7]

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the argument seems determined in advance by the exigencies of "public reason," which are political in nature, and which disguise their ontological commitments under the guise of proceduralism and ontological neutrality, thus precluding and excluding argument over ontological first principles, including those governing "public reason." George's and Tollefsen's argument commends itself to the public square by virtue of its resting on a "scientific," rather than metaphysical or theological foundation, but in so doing it begs all the fundamental philosophical questions.

[7]In fairness, both of these subjects are only given passing mention in their book, and yet their brief appearance raises troubling questions that go to the heart of the weakness in their approach. They appear to accept, without much reflection, both the current definition of brain death exemplified by the 1968 report of the Ad Hoc Committee of the Harvard Medical School (133–34) and the procedure for producing embryonic stem cells known as ANT-OAR by creating "biological artifacts" from human germ cells that merely "resemble" embryos (210–14). They offer cautious support for this latter procedure and refer to a supportive 2006 *First Things* article by E. Christian Brugger as ostensible justification, while simply ignoring the protracted 2004–2005 debate over the issue that took place in the pages of this journal which would call into question the tidy division of labor that is the basis of their entire argument in support of the embryo (231, n. 6). These are distinct questions to be sure, and it would be hasty to draw hard conclusions about their stance on these issues from the scanty evidence they have provided here. Doing so would require us to consider the question of brain death and ANT-OAR in detail, and it would require us to re-adjudicate the question of the organism's ontological identity (and the relation between science and metaphysics) in a way that is beyond our modest scope here. In the interim, I will merely state what I take to be the problem in their understanding of the embryo/organism that underlies these questionable (if tentative) conclusions, bearing in mind that doing justice to their position would require a further development. Taking their definition of the embryo/organism from a systems biology perspective which they (falsely) take to be unmediated by metaphysical assumptions, they repeatedly refer to the embryo as "a single biological system with a developmental trajectory" (p. 39) or as possessing "all the necessary organizational information for maturation" [and] "an active disposition to develop itself using that information" (53), or as capable of

The tidy distinction between science, technology, and philosophy misses three crucial points. First, modern science does *not* in fact tell us *what things are* because it is historically and theoretically premised to a great extent upon the attempted *renunciation* of this very question.[8] Or rather, since being is the object of the intellect and the ontological question is unavoidable, the sciences always provide a reductive answer to that question while attempting to foreswear it, equating ontological identity with systemic function and causal history. Second, modern science is already technological from the very beginning. The analytic rationality of science is already technological in form. It proceeds by separating in thought and practice what is united in reality, regards its objects in advance as artifacts—as accidental aggregations of parts outside of parts.[9] Experimental

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developing "in due course and by intrinsic self-direction the immediately exercisable capacities for characteristically human functions" (79). Having foresworn the need for a principled metaphysical account of the organism's ontological identity (form) that transcends systemic function, the presence or absence of such a "developmental trajectory" appears then to become the criterion of identity for determining what the system in question is. Thus if it is possible to eliminate this developmental trajectory through bio-engineering (ANT-OAR), we can conclude that the entity in question is not a person, just as we conclude that the brain-dead person is no longer a person "because the irreversible collapse of the brain destroys the capacity for self-directed integral organic functioning of human beings who have matured to the stage at which the brain performs the key role in integrating the organism. What is left is no longer a unitary organism at all" (133). See the Winter 2004, Spring 2005, Summer 2005, and Winter 2005 issues of *Communio* for the protracted debate over ANT-OAR. For an argument against the brain death criterion, see Robert Spaemann, *Love and the Dignity of Human Life: On Nature and Natural Law* (Grand Rapids: Eerdmans, 2012), 45–69.

[8]Joseph Ratzinger makes a similar point. "Practical knowledge must—as we have already seen—by its own intrinsic aim be positivistic; it must be confined to what is given and can be measured. But the consequence of this is that it no longer inquires after truth. It achieves its successes precisely by renouncing the quest for truth itself and by directing its attention to the 'rightness,' the 'soundness' of the system whose hypothetical design must prove itself in the functioning of the experiment" (Ratzinger, *Introduction to Christianity*, trans. J. R. Foster [San Francisco: Ignatius Press, 2004], 77).

[9]The "accidental" character of this aggregation does not preclude these parts being organized. Artifacts are organized after all. The characterization turns on the fact that for an artifact, its organization is ontologically secondary and thus extrinsic to the parts as parts, so that its unity qua artifact is precisely identical with this organization, whereas the form of an organism is intrinsic to it, conferring upon it a unity that transcends and thus *ontologically* precedes the coordinated interaction of

science, which knows *by* intervening and altering the relations among the parts in order to *produce* knowledge, *is* the fusion of *technê* and *logos*, making and knowing.[10] In fact, the very need to abstract a "moment" when embryos begin—as if time were a densely packed series of discrete Humean instances stacked end to end—is generated by our technological mastery over embryonic life, just as the need to declare death as closely as possible to the moment is partially dictated by the technological exigencies of organ transplantation and extraordinary measures for prolonging life.[11] This illustrates perfectly those exigencies, diagnosed by Heidegger, Hans Jonas, and George Grant, which follow from a technological ontology.[12] Third and finally, both this conception of the scientific object and of scientific reason are already mediated in advance by a metaphysics, and by implication, a theology.[13] Let me briefly try to develop these points.

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its parts as the source of their interaction.

[10]A quintessential statement of this is in Bacon, *The New Organon*, ed. Lisa Jardine and Michael Silverthorne (Cambridge: Cambridge University Press, 2000), II.1-5.

[11]Lesley M. Rice has written an excellent essay dealing with this point which I hope will soon be published.

[12]See Heidegger, "The Question Concerning Technology," in David Farrell Krell (ed.), *Martin Heidegger: Basic Writings* (San Francisco: Harper, 1993), 307–42; Hans Jonas, "The Practical Uses of Theory," in *The Phenomenon of Life: Toward a Philosophical Biology* (Evanston: Northwestern University Press, 2001), 188–210; George Parkin Grant, *Technology and Justice* (Notre Dame: University of Notre Dame Press, 1986), 11–34.

[13]In the interest of brevity, I will not expand much upon this theological dimension in this essay. See part two of my forthcoming book, *op. cit.* I will simply summarize a much longer argument by saying that as a metaphysics, the technological ontology of modernity is premised upon a reduction of *esse* from act to the brute facticity of externalized matter. This has as its theological correlate a theological extrinsicism in which God is a unitary finite object within the positivity of being, extrinsically juxtaposed to the world. This is the basis for the reduction of creation to manufacture, as well as modern naturalism's juxtaposition of the natural and supernatural as mutually exclusive agencies and forms of explanation. In seventeenth-century science, this theology was positively affirmed and was indeed a crucial occasion for, and ingredient in, the new mechanical conception of nature. Inasmuch as a God who is extrinsic to the world is incidental to an understanding of it, this natural theology had a kind of planned obsolescence built into it, such that by the late eighteenth and early nineteenth century it was possible to kick away the divine support for the view of nature which this notion of God helped occasion. Nevertheless, this theology remains in force, albeit usually negatively, in the contemporary evolution of this ontology, determining in advance

One cannot properly understand the advent of modern science without understanding it as an insurrection against the Aristotelianism of the schools, and its metaphysics are still best understood in contrast with that which it overthrew. Let me summarize a long story by saying that the newly emergent natural philosophy which continues to form the ontological basis of modern science is characterized by four essential features in contrast with its predecessor.

First, the new conception of science, as proposed by Bacon or Descartes, is not just a new and better means or *method* for achieving the same ends as traditional science. Bacon is quite clear from the very inception of his *New Organon* that his is a new proposal for what the sciences in fact *are* and the ends they serve. The new sciences are to serve human progress. They are to be active, not contemplative; or rather, contemplation itself is now a dimension of action since the truth of science is now to be measured, literally, by its products.[14] They seek not to conform the mind to reality but to conform reality to human use, or rather to equate these two things in new conceptions of reason, knowledge, and truth. Louis Bouyer is right to stress the historical connection between science and magic.[15]

Second, this new conception of science entails a new conception of its objects, of nature. The new science grants an epistemic priority to analysis, "to bring natural bodies together and take them apart," as Bacon puts it, and this epistemic priority of analysis has its ontological correlate in the reduction of being from the *actus essendi* to the brute facticity or bare particularity of simple natures.[16] This reduction of being from act to facticity not only brings about the reduction of nature to artifice noted above, which makes each thing an accidental aggregation of parts outside of parts, but it bifurcates the world into primary and secondary qualities, thus

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what God "must be" if he were to exist. This tacit agreement about what God "must be," given our understanding of nature, is much more fundamental than the fact that some affirm this view of God for the sake of believing it, while others affirm it for the sake of denying it.

[14]Francis Bacon, *The New Organon*, p. 6, 13, I.56, I.71, I.73, I.85, I.109.

[15]Bouyer, *Cosmos*: *The World and the Glory of God*, trans. Pierre de Fontnouvelle, (Bronx: Fordham University Press, 1988), 153–59.

[16]Bacon, *The New Organon*, I.4.

ushering in the reign of epistemology whose purpose is to make the world safe for physics, and it effectively dispenses with the question of being, thereby elevating natural science to the position of first philosophy and insuring forever the impossibility of integrating the sciences into a more comprehensive order of knowledge which they themselves do not adjudicate and on which they themselves depend. Notice here the isomorphism between an order of knowledge in which science is outside of philosophy is outside of theology and the order of being in which parts are outside of parts are outside of parts.

Third, the elimination of being as act is also the elimination of substantial form: because *esse* and *essentia* are correlative, because *essentia* was the actuality of matter, and because the new analytic science prizes a counterfactual world of inertial singularities over the actual world of things whose act of existence implicates them from the inside in the single actuality of an anterior order.[17] A radically voluntarist theology was the historical precondition and indeed an active agent in this destruction; a radically extrinsicist—and therefore idolatrous—theology continues to be enforced by it, even if that theology is cast merely in the role of a foil. This is perennially the case, for instance, with neo-Darwinian biology.

Finally, the reduction of act to facticity and the elimination of form liberates matter from its dependence upon form and elevates it to a position of ontological primacy, so that it becomes synonymous with nature itself.[18] This new concept of matter is, as René Guénon describes pure quantity, "the 'residue' of an existence emptied of everything that constituted its essence."[19] Emptied of all the qualities heretofore conferred on matter by form, matter becomes actual and positive in its own right outside of and prior to form, which is reduced either to shape which follows accidentally upon the movement and arrangement of matter (Descartes) or to law extrinsically governing the construction of natural "artifacts" (Bacon).

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[17]See, e.g., Bacon, *The New Organon*, I.15. "There is nothing sound in the notions of logic or physics: neither substance, nor quality, nor action and passion, nor being itself are good notions; much less heavy, light, dense, rare, wet, dry, generation, corruption, attraction, repulsion, element, matter, form, and so on; all fanciful and ill-defined."

[18]See Descartes, *The World* 7, CSM I, 92.

[19]René Guénon, *The Reign of Quantity* (London: Luzac, 1953), 13.

There are numerous variations on the modern concept of matter, and there were differences over whether the corpuscles of matter were penetrable or divisible and whether there could be movement in a void. Descartes identified matter with extension. Newton separated matter from extension, identifying the latter with absolute space which he thought necessary for motion, and equated matter or body with "determined quantities of extension which omnipresent God endows with certain conditions," namely that they be mobile, that they exclude one another from the same space, and that they be capable of exciting various perceptions of the senses and the mind and of being moved by it in turn, as our wills move our bodies."[20] The seventeenth-century understanding of matter later gives way to a concept of quantity of energy distributed between potential, kinetic, and entropic states.[21] There are nevertheless three essential characteristics common to all of these conceptions. The first, which follows upon the elimination of formal qualities, is sheer abstract externality, by which I do not simply mean the capacity for filling space, but also a certain point at which brute facts, "*positiva*," become theoretically, if not physically impenetrable.[22] With the elevation of sheer externality to ontological primacy, reality becomes essentially superficial, and depth will henceforth mean simply a compounding of surfaces that submit of infinite addition and division, but no further *penetration*.[23] The identification of matter with externalized quantity means, secondly, that the very essence of

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[20]Newton, "De Gravitatione et Aequipondo Fluidorum," in Hall and Hall (eds.), *Unpublished Scientific Papers of Isaac Newton* (Cambridge: Cambridge University Press, 1962), 140.

[21]See Mary B. Hesse, "Action at a Distance," in Ernan McMullin (ed.), *The Concept of Matter in Modern Philosophy* (Notre Dame: University of Notre Dame Press, 1978), 119–37.

[22]This capacity for occupying space to the exclusion of other bodies is the "true form and essence" of both Cartesian and Newtonian matter. See Descartes, *The World* 6, CSM I, 92; Newton, "De Gravitatione," 140. On "brute facts" (positiva), see Bacon, *The New Organon* I.48.

[23]"All the perversions that human freedom can inflict upon being and its qualities always aim at one thing: the annihilation of the depth dimension of being, things to which being remains a mystery even, indeed, precisely in its unveiling." See Balthasar, *Theo-Logic I: Truth of the World*, trans. Adrian J. Walker (San Francisco: Ignatius Press, 2000), 16. For more on "the turn to the superficial," see Joe Sachs, *Aristotle's On the Soul and On Memory and Recollection* (Santa Fe: Green Lion Press, 2004), 1–42.

matter lies in its *measurability*.[24] What fundamentally changes as matter is later transformed into energy is not the "essence" of matter as measurable, but the sophistication of our instruments and our measurements. Energy, to paraphrase Hans Driesch, is a measurement for causality that has been quantified.[25] Nobody knows *what* energy is—or whether, I dare say, it is anything—and nobody needs to know so long as the concept allows our measurements to come out right and to resolve certain physical problems that eluded Newtonian physics.[26] Finally, insofar as measurement entails the isolation of discrete quantities external to and comparable with other quantities, the identification of matter with *measurability* is tantamount to its identification with *manipulability*.[27]

This ontological transvaluation is the metaphysical presupposition of modern science, not its conclusion, and it profoundly transforms the subject matter of the sciences, the objects of science, and the nature of scientific intelligibility and truth.[28] First, with form now consequent on the organization of brute matter, and with matter itself identified with externalized quantity, scientific attention shifts from things and their natures—which no longer exist—to the relations extrinsically governing the interactions of quanta, the so-called laws of nature which enjoyed their finest hour in the seven-

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[24]I cannot resist noting a certain irony here. This conception of cold, objectified matter is often credited with expelling the last vestiges of naïve anthropomorphism from the cosmos. In truth, however, one could hardly imagine a more anthropomorphic idea than the idea that nature is fundamentally identical with our capacity (in principle) for measuring it.

[25]"Energy," Driesch says, "is a measurement and nothing else; it measures the amount of causality given off or received by a limited system in no other sense than the kilogramme or the pound measures the amount of gravitating matter" (Driesch, *The Science and Philosophy of the Organism* vol. 2 [Aberdeen: Aberdeen University Press, 1908], 162).

[26]Newton famously declared that he would not "feign hypothesis" (*hypotheses non fingo*) with respect to the cause or the essence of gravity. It was enough to be able to measure it. Newton, *The Principia: Mathematical Principles of Natural Philosophy*, ed. I. Bernard Cohen and Anne Whitman (Berkeley: University of California Press, 1999), 943.

[27]This, it seems to me, is one of the lessons of the "observer effect" in physics.

[28]It also has divine voluntarism as its historical occasion and theological extrinsicism as its ongoing theological correlate.

teenth and eighteenth centuries.[29] So, e.g., force, not motion or moving things becomes the subject of Newtonian physics; natural selection and the evolutionary process, not living organisms, becomes the subject matter of evolutionary biology, and so on.[30] Second, the things themselves are reconceived as the sums of those interactions; organisms become living machines in the older nomenclature or "a single biological system with a developmental trajectory" in George's and Tollefsen's.[31] Finally, since matter is now identified with external quantity and entities are now identified with the coordinated interactions of their parts and the sum of the causes which produced them, the intelligibility—the *truth*, and thus for all intents and purposes the *being—of things* becomes precisely identical with *our* various capacities for measurement and control in the form of predictive success, the replication of experimental results, or successful manipulation.[32] Which is to say once again that truth, as the being-in-itselfness of things, has been abandoned because being itself has already been instrumentalized. This is the real meaning of the Baconian equation of knowledge and power.[33] It is not that knowledge is simply *for the sake of control*. Ours, in other words, is not a statement about the good uses to which science can be put or the subjective intentions of this or that scientist. We needn't deny that science has brought enormous benefits. We needn't doubt the wonder or even the piety that motivates some scientists, and we needn't regard every scientist as Faust's Wagner, trying to cook up

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[29]In Descartes' mind, this was the great virtue of a *mathesis universalis*. It did not matter what things were, "whether the measurement in question involves numbers, shapes, stars, sounds, or any other object whatever" (Descartes, *Rules for the Direction of the Mind*, CSM I, 19).

[30]See chapters 5 and 6 of Hanby, *No God, No Science*, forthcoming.

[31]George and Tollefsen, *Embryo*, 39.

[32]This is the practical instantiation of what Henry Veatch called the "relating logic," of modern science exemplified by the *Principia Mathematica*, which transforms the basic form of proposition "X is so" that the "is" no longer unfolds the being of a thing by explicating the predicate of a subject, but becomes a logical function, a copula, joining extrinsic terms. Thus Veatch insists that the logic of modern science is a logic that cannot say what anything is. See Veatch, *The Two Logics: The Conflict between Classical and Neo-Analytic Philosophy* (Evanston: Northwestern University Press, 1969), 26–62, 126–44.

[33]See Hans Jonas, *The Phenomenon of Life: Toward a Philosophical Biology* (Evanston: Northwestern University Press, 2001), 188–210.

Homunculus in his basement—though we should take heed when an eminent scientist such as James Watson asks, "If we could make better human beings by knowing how to add genes, why shouldn't we?"[34] The point, rather, is that scientific cognition in its very form and logic is a knowing *by means of control*, and thus a knowing which imposes an *a priori* ontological reduction upon its objects.

It is at this point that someone typically takes up the Baconian injunction to judge science by its products and pulls out the conversation stopper, "science works." This is a serious point, though more debatable than we tend to think.[35] But what does this objection really amount to? To invoke *success* as a measure of truth is already to have equated truth with utility and knowledge with power, which of course is precisely what Bacon proposes. And this is the very epitome of *sophistry*, not necessarily as a matter of will, but as a matter of ontology.[36] "Science works" can serve as a conversation stopper that puts an end to thinking because the reduction of truth to functional success has already relinquished the claim which the truth of being makes upon reason. Sophistry in this ontological sense is compatible with a kind of benevolence and even compatible with a certain commitment to getting to the bottom of things. But the reduction of reason to power and truth to control entails a corresponding reduction on the side of things which determines in advance that the "bottom of things" can only ever be a surface.

Our point, at any rate, is not to dispute that "science works." Indeed it often works all too well. Nor is it to deny that in "working," science opens a window into the truth of things. *Agere sequitur esse*, after all; a thing's operations *do* manifest its being. To the contrary, our argument is that science *cannot help* disclosing the truth of things, *cannot help* saying what things are, in spite of *science's own attempts* to disavow that question and to substitute a functional

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[34]Cited in Gregory Stock, *Redefining Humans: Our Inevitable Genetic Future* (New York: Houghton Mifflin, 2002), 12.

[35]How well does a science "work," we might ask, that requires us to deny the reality of so-called secondary qualities and thus to relegate to the status of epiphenomena the world we can't help living in?

[36]The most profound diagnosis of this sophistry that I know of can be found in D. C. Schindler, *Plato's Critique of Impure Reason: On Goodness and Truth in the Republic* (Washington: The Catholic University of America Press, 2008), 1–39.

conception of truth for an ontological one. It is science itself that feigns no interest in the question of "what things are." This is exemplified by this passage from Claude Bernard, the father of experimental medicine.

> Our feelings lead us at first to believe that absolute truth must lie within our realm; but study takes from us, little by little, these chimerical conceits. Science has just the privilege of teaching us what we do not know, by replacing feeling with reason and experience and clearly showing us the present boundaries of our knowledge. But by a marvelous compensation, science, in humbling our pride, proportionately increases our power. Men of science who carry experimental analysis to the point of relatively determining a phenomenon doubtless see clearly their own ignorance in its primary cause; but they have become its master; the instrument at work is unknown, but they can use it. This is true of all experimental sciences in which we can reach only relative or partial truths and know phenomena only in their necessary conditions. But this knowledge is enough to broaden our power over nature. Though we do not know the essence of phenomena, we can produce or prevent their appearance, because we can regulate their physico-chemical conditions. We do not know the essence of fire, of electricity, of light, and still we can regulate their phenomena to our advantage. We know absolutely nothing of the essence of life; but we shall nevertheless regulate vital phenomena as soon as we know enough of their necessary conditions.[37]

One needn't look very far to find such sentiments among scientists.[38]

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[37]Claude Bernard, *An Introduction to the Study of Experimental Medicine* (New York: Dover, 1957), 82.

[38]See, e.g., the remarks of Jacques Loeb at the turn of the twentieth century. "It is seemingly taken for granted that 'truth' in biology, or science in general, is of the same order as 'truth' in certain of the mental sciences; that is to say, that everything rests on argument or rhetoric and that what is regarded as true today may be expected with some probability to be considered untrue tomorrow…It should, however, be remembered that modern biology is fundamentally an experimental and not a descriptive science; and that its results are not rhetorical, but always take one of two forms: either it is possible to control a life phenomenon to such an extent that we can produce it at desire (as, e.g., the contraction of an excised muscle); or we succeed in finding the numerical relation between the conditions of the experiment and the biological result (e.g., Mendel's law of heredity). Biology as far as it is based on these two principles cannot retrogress, but must advance" (Loeb, *The Mechanistic Conception of Life* [Chicago: University of Chicago Press,

This is why the tidy distinction between science, technology, and philosophy cannot be sustained, because science is *essentially* technological: subjectively in the way that scientific cognition fuses making and knowing, *technê* and *logos*; objectively in the way that this cognition beholds its objects. Technology, as Heidegger and Grant have taught us, is not merely an instrument that we use. It is the all-pervasive ontology in which we moderns live and move and have our being. This is why the sciences, for all their wondrous achievements and for all that they have enabled us to do to the world, do not tell us *what things are*. Or rather since the question of "what things are" is inherent in reason's very structure and thus ontologically unavoidable, it is why they necessarily supply a reductive answer to this question. There is no way from within the terms of this ontology to account for ontological identity and unity as genuinely transcending the coordinated interaction of a thing's parts—though emergentism, a reductionist form of anti-redutionism, attempts to do this—and there is thus no way for the sciences to give a principled account of a thing as a *per se* unity that is the subject of its own being and development. This is in spite of the fact that this unity is the starting point of scientific inquiry and impossible to dispense with in practice. There is a bright side to this impossibility, however. It means that mechanical analysis is never *merely* mechanical and that there is perhaps a door to an authentic dialogue between science and theology in the fact that there is infinitely more going on in the act of scientific cognition than the scientist's own ontology can allow for.[39] At present, however, this door is all but slammed

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1912], 3). Gregory Stock expresses similar sentiments at the turn of the twenty-first century: "Over the past hundred years, the trajectory of the life sciences traces a clear shift from description to understanding to manipulation . . . . In the first half of the twenty-first century biological understanding will likely become less an end in itself than a means to manipulate biology. In one century, we have moved from observing to understanding to engineering" (Stock, *Redefining Humans*, 1–18).

[39]Just as the spatio-temporal contiguity of parts is insufficient to specify the nature of their inter-relation in a living being, so too the "impersonal" terms of physics and chemistry alone (which reduce to relations of spatio-temporal contiguity) are not enough to specify even machine-like functions. As Michael Polanyi argues, these require "regulatory" or "operational" principles that can only be grasped in "gestalt-like" terms. "For in order that we may formalize the relations that constitute a comprehensive entity, for example, the relations that constitute a frog, this entity, i.e., the frog, must be first identified by tacit knowing, and, indeed, the meaning of a mathematical theory of a frog lies in its continued bearing on the

shut, and this difficulty is compounded by the fact that the technological ontology of science, with its conflation of truth and utility, provides every incentive to lock it. This is why the question of *what things are*, to the extent that we still want to know and to the extent this ontology has not robbed the question of its intelligibility, cannot be left to the sciences. *Aggiornamento* toward the sciences cannot mean ceding sole authority over nature to science, but must instead mean bringing science and nature within the ambit of Christ's revelation of man to himself as a creature given to himself by God, created in and destined for communion.

Creation and Aggiornamento

Creation *ex nihilo* is not a free-standing cosmology.[40] Theoretically and historically speaking, it is first and foremost a function of the doctrine of God and it emerges to metaphysical maturity as the Church grapples with the revision to the doctrine of God occasioned by the Incarnation.[41] The Incarnation revealed a God at once nearer *and* more remote than the God of Greek imagination, a God nearer to me than I am to myself, as St. Augustine put it, near *as* the transcendent Other who gives me to myself *ex nihilo*. "Being is innermost in each thing and most fundamentally inherent in all things since it is formal in respect of everything found in a thing," says Thomas. "Hence it must be that God is in all things, and innermostly."[42] If one can conceive of "how" Christ can be "very God" and "very man" without diminution of his divinity or negation of his humanity, then one can conceive, by analogy of course, of "how" God's interior presence to the creature establishes the creature in its very difference from God—in its legitimate autonomy. And one can similarly conceive, in the cognitive order, of how metaphysics and theology bear

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tacitly known frog" (Polanyi, *The Tacit Dimension* [Gloucester: Peter Smith, 1983], 20–21).

[40]See Simon Oliver, "Physics, Creation, and the Trinity," in *Anthropotes: Rivista de Studi sulla Persona e la Famiglia* 10/xxxvi/11 (2010): 181–206.

[41]See Gerhard May, *Creation ex Nihilo: The Doctrine of "Creation out of Nothing" in Early Christian Thought* (Edinburgh: T & T Clark, 1994), 12.

[42]Aquinas, *ST* I.8.1, resp.

immediately and interiorly on science while preserving their abiding difference and why science therefore derives its legitimate autonomy not by an illusory independence from metaphysics and theology, by standing outside them, but from an intrinsic relation to them that is always already tacitly operative whether this is acknowledged or not. The very distinction between God and the world upon which modern naturalism is predicated is an irreducibly theological distinction which presupposes something of what lies on either side of it. And the scientist or philosopher who draws this distinction is always tacitly doing theology in the very act of drawing it.

Because God is already the subsistent fullness of actuality who cannot be added to, he need do nothing other than *be* in order to cause the world.[43] All the "action" of creation, as it were, is on the side of the world. So creation in the active sense, says Aquinas, is simply God himself with a certain rational relation to the world.[44] Because there is nothing prior to creation upon which God might act, creation in the passive sense is not a qualification of the world, something *done* to it, but rather *is* the world in a real relation to God. Creation, in other words, is what the world is: a paradoxical "surplus" of being that is somehow not God. And of course this is precisely the place where things get interesting.[45]

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[43]I concur wholeheartedly with the claims of D. C. Schindler and Adrian Walker in this volume that the novelty of historical existence contributes to being. I would only add the paradoxical stipulation that this "contribution" occurs *within* the character of *esse* as *simplex et completum*, so that paradoxically this contribution to being (and God's receptivity to the world) unfold within God's superlative fullness. Ultimately, this is made possible by the coincidence of infinite unity and infinite difference in God's triune love, so that the difference internal to the divine unity is infinitely greater than the difference between God and the world, as indeed it must be, if God lacks a "real relation" to the world. See chapters 7 and 8 of *No God, No Science* for a more detailed elaboration of this point.

[44]Aquinas, *ST* I, q. 45, a. 3, ad 1.

[45]The challenge, in other words, is how to conceive of the addition of the world in a way that does not compromise God's supreme fullness as *ipsum esse subsistens*, on the one hand, and that supplies a positive account of the world's difference from God, on the other hand, so that this difference is itself good, and so that the world is "like God" in this very difference. I would suggest that this is itself a function of the trinitarian difference internal to divine simplicity, on the one hand, and to the *distinctio realis*, between *esse* and *essentia* in creatures on the other, which is not *simply* a "negative" reflection of the fact that creatures are not their own existence and having *esse* by participation, but a positive image of the convertability of *esse* and

But what difference does that make? It transforms the questions, first of all. If creation is the ontological structure of the world, then the question of creation is not fundamentally a question of temporal origins—what happened, for example, in so-called Planck Time 10^{-32} of a second before the Big Bang—but rather of *ontological* origins. Indeed Simon Oliver reminds us that "creation *ex nihilo*—the doctrine that creation, at any moment, is of nothing, as such privileges no *particular* temporal instant as revealing more acutely the nature of the cosmos suspended over the *nihil*."[46] This implies a distinction, though not a separation, between the orders of being and development that is crucial for understanding the organism as a *per se unum* (and of course it is precisely this that is missing in George and Tollefsen). But the more crucial point, at present, is this. To say that God is interiorly present to creatures as the source and giver of their being is to say that creatures themselves are *intensively* infinite in their very finitude—a manifold mightily surpassing measurement, as Augustine put it.[47] Though the real distinction between *esse* and *essentia* in its negative dimension expresses the non-necessity of existence and therefore the non-identity of being and essence, this non-necessity is the reverse side of a gratuity. So in its positive dimension this distinction provides a principled basis, in contrast to Greek thought, for seeing in the distinction between an essence or a nature and its bearer this surplus whereby we may regard the latter as in some sense *more* than the former. The concept of the person, which comes to anthropology by way of trinitarian theology and Christology, is the paradigmatic expression of this idea.[48]

Now in writing this essay I have wagered that others would have already written at length about the constitutive relationality and incommunicability of persons and about the implications of conceiving of *esse commune* as *simplex et completum sed non subsistens*. I will not duplicate those efforts. I would only add two other suggestions that

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essentia in the unity of God's triune being.

[46]Oliver, "Physics, Creation, and the Trinity," 191.

[47]Augustine, *Conf.* X.17.

[48]See Robert Spaemann, *Persons: The Difference between "Someone" and "Something,"* trans. Oliver O'Donovan (Oxford: Oxford University Press, 2007), 5-33; Joseph Ratzinger, "Concerning the Notion of Person in Theology," *Communio: International Catholic Review* 17 (Fall 1990): 439-54.

are implicit in them and which bear on the question of science's relation to metaphysics and theology. First, I would stress that *esse commune* is paradoxically common to all things and proper to each so that I am always already implicated in the single actuality of a larger order in the very act that establishes me in my incommunicable substantiality. And I would wish to make this something of a hierarchical principle for the cosmos as a whole: the more profoundly I am integrated into the world, the deeper my capacity to receive it, the more distinct I am from it. I am simultaneously more integrated into the world and more distinct from it than, say, a stone is, which can hardly be said to have a "world" in the same way. Second, to say that *esse commune* is non-subsistent, that Being only *is* in beings of a determinate form, means that the intensive infinity conferred by *esse* is not to be juxtaposed *to* the finite, as some unintelligible *noumenon* lying behind appearances, but is rather the inexhaustibility *of* the finite *in* its very finitude, a depth that is communicated *in form*. This makes form itself a principle of intelligibility and mystery at once, or rather, it transforms the meaning of intelligibility as such.

This inexhaustible surplus is the positive ground of the interminable restlessness of science (there are several "negative" sources of this restlessness as well).[49] But insofar as the sciences are predicated upon the elimination of the depth dimension of being, they can only regard this depth in the form of an unsolvable problem that calls forth an ever more sophisticated technological response. (This is why no moral*ism* is sufficient to withstand the technological imperative.) But what would it mean to see this surplus for what it is: the incommunicable interiority proper to each thing by virtue of its participation in *esse commune*? There is much more to be said about this than I can say here in the space that I have left. I would wish to suggest, for instance, that the restoration of a proper

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[49]These have their roots both in the conception of "the natural" as the "essentially manipulable," and in the fact that technological interventions in nature, because they are interventions into a whole and because they seek of their very logic to project human power beyond a human scale, always entail unintended consequences that tend to elude human control, and to call forth a further, technological response. See Heidegger, "The Question Concerning Technology," in Krell (ed.), *Basic Writings from Being and Time (1927) to The Task of Thinking* (San Francisco: Harpers, 1977), 311–41; Hans Jonas, *The Phenomenon of Life*, 188–210; George Parkin Grant, *Technology and Justice* (Concord, Ont.: 1986), 11–34.

understanding of being as act and of *esse commune* brings about a corresponding transformation in how we understand the nature of scientific inquiry and its objects. A deeper understanding of the way *esse commune* is simultaneously common to all things and incommunicably proper to each, and thus how my act of existing implicates me in the actuality of a prior order, would have a corresponding effect upon how we understand scientific cognition. It would prevent the scientist from regarding the parts of reality analytically abstracted in thought or in experiment as ontologically prior to the actual wholes from which they were abstracted, and it would clarify the nature of the scientist's own act and prevent his retreat to an Archimedean point outside of nature where he temporarily exempts himself from his own reductions.[50] But the principal point I want to emphasize just now is this: If creatures, as incommunicable subjects of being, are intensively infinite due to the presence of God as the most interior source of their being, then the *via negativa* that is part of any approach to God extends, by analogy to creatures. This *negativa* here is not a simple "not knowing," as if it were a problem left unsolved or as if we had determined reason's limits in some transcendental fashion. Rather it is integral to the proper knowledge of a truth—the truth of being, the truth which *is* being—which is inexhaustible and which cannot, by definition, be mastered or controlled. Knowledge that would be adequate to this truth must therefore take the form of a "learned ignorance," to use Nicholas of Cusa's phrase, in order to apprehend the intensive infinity of things which can only be grasped as infinite in the mode of its slipping away.[51] "The more profoundly learned we are in this ignorance," says Cusanus, "the more closely we draw near the truth itself."[52] That the mysterious inexhaustibility of form precludes our dominance of nature is an implication of its inaccessibility which Bernard failed to grasp, and it could provide the

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[50]For an excellent critique of scientific analysis see David L. Schindler, "The Given as Gift: Disciplinary Abstraction in the Sciences," in *Ordering Love: Liberal Societies and the Memory of God* (Grand Rapids: Eerdmans, 2011), 383–429. See also chapter 9 of *No God, No Science*, forthcoming. On the necessity of reductionist scientists to exempt themselves from their own reductions in the act of theorizing, see Hans Jonas, "Cybernetics and Purpose: A Critique," in *The Phenomenon of Life*, 108–34.

[51]"Because the infinite escapes all proportion, the infinite as infinite is unknown" (Cusanus, *De Doct. Ign.*, I.1.3).

[52]Cusanus, *De Doct. Ign.*, I.3.10.

basis for a recuperation of experimental abstraction and mechanical analysis without the reductionist fantasies that have heretofore attended it. But this requires an adequate grasp of "what things are." And an adequate grasp of what things are requires the restoration of a contemplative science, a science whose object is being and whose form and goal is not manipulation but adoration. This, in turn, requires a true *aggiornamento*: a fundamental and rigorous rethinking of the nature of science and a rediscovery of the true relationship between science, metaphysics, and theology.[53]

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