Natural Law, Metaphysics, and the Creator: Natural law as the laws of physics[1]

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Trying to summarize the view of the world given by the secularist appropriation of science now common in Western culture, Simon Blackburn describes things this way:

> "the cosmos is some fifteen billion years old, almost unimaginably huge, and governed by natural laws that will compel its extinction in some billions more years, although long before that the Earth and the solar system will have been destroyed by the heat death of the sun. Human beings occupy an infinitesimally small fraction of space and time, on the edge of one galaxy among a hundred thousand million or so galaxies. We evolved only because of a number of cosmic accidents . . . Nature shows us no particular favors: we get parasites and diseases and we die, and we are not all that nice to each other. True, we are moderately clever, but our efforts to use our intelligence . . . quite often backfire . . .That, more or less, is the scientific picture of the world." [2]

I will call a view such as this 'the secularist scientific picture' (SSP, for short), to distinguish it from a mere summary of contemporary scientific data. It remains a widely held picture of the world, even though, as I will show in what follows, research in various areas is making inroads against some parts of this view.

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[2] Simon Blackburn, "An Unbeautiful Mind," *New Republic*, 5 and 12 (Aug. 2002), p.29.

On SSP, as I will understand it for purposes of this paper, the natural laws Blackburn refers to are typically taken to be the laws of physics, and all other laws are supposed to be reducible to the natural laws of physics. All *things* in the world are thought to be reducible to the fundamental units of matter postulated by physics and governed by the natural laws of physics.

One important presupposition of SSP is a metaphysical rather than a scientific principle, namely, that constitution is identity. For anything made of parts, that thing is identical to the parts that are its constituents. There is nothing to a whole other than the sum of its parts. And, of course, the same holds for each of the parts. Each part is also nothing more than the sum of *its* parts, and so on down to the most fundamental level. Ultimately, everything is identical to the most fundamental parts that constitute it. On SSP, these are the elementary particles governed by the natural laws of physics.

The metaphysics incorporating the principle that constitution is identity is one version of reductionism. As Robin Findlay Hendry puts it, "the reductionist slogan is that *x* is reducible to *y* just in case *x* is 'nothing but' its reduction base, *y*."[3] Applied to theories rather than things, reductionism holds that all the sciences reduce to physics, and all laws are reducible to the laws of physics, together with bridge laws connecting theories in the higher-level sciences to theories in physics.

The appeal of reductionism was greatly enhanced by scientific developments in the 20th century, especially in molecular biology and genetics. Describing the growth in adherence to reductionism in consequence of these scientific developments, Cynthia and Graham MacDonald say,

> "The use of chemical theory in all these developments [in biology was] … crucial, suggesting that biology was reducible to chemistry and thereby to physics, given that the reducibility of chemistry to physics was thought to have been demonstrated by the physical explanation of chemical bonding. The major trend in all of this scientific work was to explain processes at the macro-level by discovering more of the detail of microprocesses. Reductionism looked to be an eminently suitable research strategy."[4]

[3] Robin Findlay Hendry, "Emergence vs. Reduction in Chemistry", in *Emergence in Mind,* ed. Cynthia MacDonald and Graham MacDonald, (Oxford: Oxford University Press, 2010), p.209.

[4] *Emergence in Mind,* ed. Cynthia MacDonald and Graham MacDonald, (Oxford: Oxford University Press, 2010), p.3.

Reductionism is often thought to rest on another metaphysical claim as well, namely, the claim that there is causal closure at the level of physics. On this metaphysical view, apart from quantum indeterminacy, there is a complete causal story to be told about everything that happens; and that complete causal story takes place at the level of the elementary particles described by physics. As Cynthia and Graham MacDonald explain this claim,

> "[on reductionism] the difficulty of downward causation was avoided, since reduction would place all such causation at the level of the physical. The problem of the causal powers of the higher-level properties was solved: the reductionist's picture would endorse their causal efficacy, but would do so at a cost, robbing them of any causal autonomy. For, according to the reductionist, any higher-level property that has causal powers has them because it is, really, a physical property. Physics is fundamental, where 'fundamental' means that the physical is causally, ontologically, and explanatorily all-encompassing."[5]

On the view of natural laws in SSP, then, any causality found at the macro-level is just a function of the causality at the micro-level of physics. Because there is causal closure at the lowest level, the causal interactions among the fundamental particles of a thing are not open to interference by anything which is not itself at the most fundamental level and governed by the natural laws operating on that level. And everything that happens at any higher level, from the chemical to the psychological, happens as it does just because of the causal interactions among the fundamental physical particles involved.

So, for example, any act of a human being is explained by events at the level of bodily organs and tissues; these are explained by events at the level of cells; these are explained by events at the level of molecules; these are explained by events at the level of atoms – and so on down to the lowest level, at which there are the causal interactions among the elementary particles postulated by physics and governed by the natural laws of physics. The causal interactions of things at this lowest level thus account for everything else that happens, including those things human beings do.

[5] MacDonald and MacDonald 2010, pp.2-3.

Or, to put the point of this example in a more provocative way, on SSP love and fidelity, creativity, the very achievements of science, and any other thing that makes human life admirable or desirable is itself just the result of the causal interactions of elementary particles in accordance with the natural laws of physics. *Every* human act is determined by the causal interaction of elementary particles governed by these natural laws; and even the belief that SSP is correct is so determined. SSP has so strong a hold on some contemporary philosophers that they see no alternative to holding that all mental states are causally determined by the physical states of the brain, which are in turn causally determined by causal interactions at the lowest level.

To philosophers in the grip of SSP, libertarian free will can seem impossible. Since neural states are part of a causal chain that is determined by causal interactions at the level of the microphysical and there is causal closure at that lowest level, not only states of the will but in fact all mental states, considered as mental, seem causally inert. Cynthia and Graham MacDonald summarize this position this way:

> "The physicalist is thought to be committed to the 'basic' or fundamental character of the physical, and an expression of this is contained in the assumption that the physical domain is causally closed: any event that has a cause has a complete (sufficient) physical cause. The thought that a mental event (or a mental property) could cause an effect without relying on, or working through, physical events (or properties) was rightly deemed inimical to physicalism. … [I]f the higher-level property's causal power is constituted by the contribution from the lower-level-realizing properties, then it is difficult to see how its causal power could fail to be exhausted by that contribution – it seems that it will contribute nothing of its own to the effects it is said to cause."[6]

It is not surprising, then, that, as regards freedom of the will, philosophers who accept something like SSP tend also to accept compatibilism, the theory that the will of a human person can be both free and also causally determined. Compatibilism appears to be a sort of corollary to the scientific picture that embraces reductionism and causal closure at the

[6] MacDonald and MacDonald 2010, p.8, p.12.

microphysical level. If all macrophenomena are reducible to microstructural phenomena and if there is a complete causal story to be told at the micro-level, then whatever control or freedom we have as macroscopic agents has to be not only compatible with but in fact just is a function of the complete causal story at the micro-level.

For many people, me included, the implications of SSP seem highly counter-intuitive. Can the laws of all the other sciences really be reduced to the laws of physics? Is everything really completely determined by causal interactions at the microphysical level? Could it really be the case that the mental states of a person are causally inert as far as his own actions are concerned? Could an act of will really be both free and yet also causally determined?

Natural law in the thought of Thomas Aquinas

It is instructive to reflect on SSP by contrasting it with the very different view of the world held by the medieval philosopher Aquinas. Aquinas talks of natural law, too; but, as is well-known, the notion of natural law in the thought of Aquinas is nothing like the notion of natural law in SSP.[7] With respect to the notion of the natural law in Aquinas's thought, human persons and human agency are not rendered marginal or even invisible, as they seem to be in SSP. They are at the center of the discussion.

Aquinas's notion of natural law has been the subject of extensive discussion,[8] and different characterizations of it have been given. Sometimes natural law is described as if, for Aquinas, it were a matter of innate and incorruptible knowledge of moral truths.[9] Sometimes it is characterized more as the set of moral principles itself, or the set of some especially fundamental sort of moral truths.[10] And sometimes it is categorized as a matter of metaphysics, as something that grounds morality.[11] Aquinas's

[7] For more discussion of Aquinas's notion of natural law and its place within Aquinas's metaethics and normative ethics, see the chapter on goodness in my *Aquinas*, (New York and London: Routledge, 2003).

[8] For one recent and sophisticated treatment of the topic, see Mark Murphy, *Natural Law and Practical Rationality,* Cambridge Studies in Philosophy and Law (Cambridge: Cambridge University Press, 2001).

[9] Ralph McInerny explains it this way: "natural law is reason's natural grasp of certain common principles which should direct our acts." Ralph McInerny, *Aquinas on Human Action. A Theory of Practice,* (Washington, D.C.: Catholic University of America Press, 1992), p.110.

[10] McInerny himself says, "natural law is a dictate of reason"; and a little later he remarks that there is a way in which "natural law is a claim that there are moral absolutes". Ralph McInerny, *Ethica Thomistica. The Moral Philosophy of Thomas Aquinas,* (Washington, D.C.: Catholic University of America Press, revised edition 1997), p.46 and 47.

[11] For example, in a discussion of the relation of rights and law, John Finnis says, "if I have a natural -- as we would say, human -- right I have it by virtue of natural law". John Finnis, *Aquinas: Moral, Political, and Legal Theory,* (Oxford: Oxford University Press, 1998), p.135.

characterization of the natural law is complicated enough to provide some justification for all these different descriptions.

When Aquinas explains his notion of natural law, he says that the *natural* law is a participation on the part of a human person in the *eternal* law in the mind of God.[12] And, when he explains the *eternal* law, he says that it is the ordering of all created things as that ordering is determined in the mind and will of the Creator.[13] For a created person to participate in the eternal law of God, then, is for that person to have a mind and will which reflect their origin in the Creator: the natural law in created human persons is an analogue of the eternal law in the Creator.

The ordering of creation in the eternal law includes all the organization of the created world; but it is the moral ordering in the eternal law that is at the heart of the natural law. A human person's intellect has enough of the light of reason to be able to discern what is good and what is evil, and his will has some natural inclination to follow reason's light.[14] The natural law in a created person is therefore a participation in the Creator in two ways, first by way of knowledge about good and evil in the intellect and secondly by way of an inward principle in the will that moves to action in accordance with the deliverances of the intellect.[15]

So, for example, Aquinas says,

> "all acts of virtue pertain to the natural law... for everything to which a human being is inclined in accordance with his nature pertains to the natural law. Now everything is naturally inclined to an operation appropriate to it in accordance with its form... And so since the rational soul is the proper form of a human being, there is in every human being a natural inclination to act in accordance with reason. But this is to act in accordance with virtue."[16]

And he goes on to explain,

> "if we are talking about virtuous acts in themselves, that is, insofar as they are considered in their proper species, then in this way not all virtuous acts belong to the natural law. For

[12] *ST* IaIIae.91.2.
[13] *ST* IaIIae.91.1.
[14] *ST* IaIIae.91.2.
[15] See, for example, *ST* IaIIae.93.6. There Aquinas remarks that both ways are diminished in the wicked because their knowledge of the good and their inclination to it are imperfect.
[16] *ST* IaIIae.94.3.

> many things are done virtuously to which nature at first does not incline; rather human beings come to find them by the investigation of reason, as useful for living well." [17]

In fact, Aquinas maintains that the eternal law as it is in the mind of the Creator can be made known to created persons not only by the light of reason[18] but also by revelation. Just as human beings are made in the image of God, so the free agency of created persons is an image of the free agency of the Creator. God can exercise his free agency by choosing to share his mind with his creatures; and so God can reveal to human beings parts of the eternal law that might not be available to them by the natural light of reason alone. Human persons therefore have access to the natural law both because of the light of reason and also because of the Creator's willingness to reveal some part of the eternal law to them.[19]

Aquinas describes law in general as an ordinance of reason for the common good which is made by the person who has the care of the community and which is promulgated. A question therefore arises for Aquinas whether natural law is also promulgated. In reply, he says that the natural law is promulgated just in virtue of the Creator's instilling it into a created person's intellect as a matter of natural knowledge.[20] In the will, however, what the Creator instills is not a habit of knowledge but rather an innate inclination for the good, as perceived by the intellect. Even so, the will is master of itself and free. Contrary to the compatibilist account of free will typically taken to be implied by SSP, for Aquinas the will is free in the strong sense that nothing, not even the intellect, acts on the will with efficient causation.[21]

Although the general precepts derived from the divinely implanted habit of knowledge in the intellect cannot be completely wiped out even in evil people, secondary precepts derived from these general precepts can be blotted out; and even the application of the most general precepts to

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[17] *ST* IaIIae.94.3.

[18] See, for example, *ST* IaIIae.19.4 ad 3. There Aquinas remarks that a created person can know and will in a general way what God wills because a created person can know that God wills what is good. And so, Aquinas says, "whoever wills something under some description (*ratio)* of the good has a will conformed to the divine will as far as the description of what is willed [is concerned]."

[19] *ST* IaIIae.19.4 ad 3

[20] See, for example, *ST* IaIIae.90.4 ad 1. But the natural knowledge in question consists in very general moral precepts, the precepts of the natural law, such as that the good is to be done and the bad is to be avoided (*ST* IaIIae.94.2).

[21] I have argued the case for this claim in the chapter on freedom in my *Aquinas*, (New York and London: Routledge, 2003).

particular actions can be hindered by the effects of moral evil on a person's intellect.[22]

Aquinas makes an analogous point as regards the natural inclination to act in accordance with the good. He argues that even the natural inclination to the good can be undermined by moral evil. In the wicked, not only is the natural knowledge of the good corrupted by the passions and morally evil habits, but also

> "the natural inclination to virtue is corrupted by habits of vice."[23]

So one way to understand Aquinas's account of natural law is as a gift of the Creator to the human persons he has created. It consists in a pair of habits, one in the will and one in the intellect, which is given to human beings either by means of the innate light of reason or through the Creator's revelation of his own mind to his creatures. Although, apart from revelation, these gifts are implanted innately, they are so far in the control of the creature that a person's exercise of his free will in evil acts can corrupt them. Nothing about God's rendering the natural law innate in human persons takes away from them their free agency.

Just as many people find the implications of SSP counter-intuitive, so, for many people, the implications of Aquinas's account of natural law, grounded as it is in his metaphysics and theology, seem counter-intuitive too. Can everything in the world really be traced back to an omnipotent, omniscient, perfectly good Creator? Could it really be the case that a human person has the causal powers of intellect and will which reflect the eternal law in the mind of the Creator? Or, to put the question in a less theological way, could the action of something at the macro-level, such as a human being, exercise causality, from the top down, as it were, without being itself determined at the micro-level? Could it really be, for example, that human beings have libertarian free will?

Double vision

Any attempt to hold in one view the very different notions of natural law in SSP and in the outlook of Aquinas can induce vertigo. How is one to understand the differences in worldview between the two, and how could

[22] *ST* IaIIae.94.6.
[23] *ST* IaIIae.93.6.

one even begin to adjudicate their competing claims, or the competing accusations of being counter-intuitive?

It will be profitable to begin by considering their highly various foundational metaphysics.

As has often been remarked, one notable difference between the notion of natural law in SSP and the Thomistic notion of natural law is that, for Aquinas but not for SSP, natural law is the law of a law-giver, whose mind is the source of the law and whose relation to and care for other persons lead him to promulgate the law. On the view of natural law in SSP, the whole notion of law is only metaphorical or analogous. A natural law of physics understood as SSP sees it is a generalization describing the nature of the world at the microphysical level. It is not prescriptive; it is not promulgated; and it is not the result of an act of intellect and will on the part of a lawgiver.

This dissimilarity is correlated with a much greater difference as regards the ultimate foundation of reality. On SSP, the ultimate foundation of reality consists in those elementary particles described by the ultimately correct version of contemporary physics and their causal interactions governed by the natural laws of that physics. All the sciences are reducible to physics. And everything that there is is reducible to the elementary particles composing it. Persons are no exception to this claim. Persons too are reducible to the elementary particles that constitute them. At the ultimate foundation of all reality, therefore, is only the non-personal.

What is challenging for SSP therefore is the construction of the personal out of the impersonal. The mental states of persons, their free agency, their relations with each other all have to be understood somehow as built out of the physically determined interaction of the non-personal.

On Aquinas's view, things are in a sense exactly the other way around. That is because for Aquinas the ultimate foundation of reality is God the Creator, who exists in the three persons of the Trinity. of course, on the doctrine of the Trinity, the word 'person' is used in a technical sense. But, even on that technical sense, each person of the Trinity has mind and will. And so it is also true that each member of the Trinity counts as personal in our ordinary sense of being characterized by mind and will. Furthermore, on the doctrine of the Trinity, none of the persons of the Trinity is reducible to anything non-personal. That is, it is not the case that the persons of the Trinity are reducible to the Godhead or to being qua being or to anything else at all. On the Thomistic worldview, the ultimate foundation of reality is therefore precisely persons.

It would not be hard, I think, to trace the notable differences between SSP and Aquinas's worldview, as implied by their varying notions of

natural law, back to the great dissimilarity in their metaphysical views regarding the ultimate foundation of reality. But, given this radical difference between SSP and the Thomistic worldview as regards such foundational matters, is it so much as possible to reason about their competing claims?

of course, people who are very much in the grip of SSP might suppose that there is no point in trying to do so. For them, an evaluative comparison of the two differing pictures of the world is not worth the effort; the Thomistic view of the ultimate foundation of reality is no longer a live option. No doubt, those committed to a Thomistic worldview return the compliment as regards SSP, which is not a live option for them either.

Nonetheless, even in the face of this great divide, I want to see what can be done by way of an evaluative comparison; and I want to do so without addressing the question of the existence of God. Even if the recent history of philosophy did not make us pessimistic about the prospects for success when it comes to arguing over the existence of God, it is clear that it would not be profitable in a short paper to tackle a disagreement of this magnitude head-on. It is, however, possible to evaluate these two differing worldviews with regard to one somewhat smaller metaphysical issue. This is the issue of reductionism.

The brief sketch of Aquinas's views given above makes clear that Aquinas's metaphysics is incompatible with reductionism, unlike SSP, which is committed to it.[24] As I explained at the outset, reductionism has come under increasing attack in recent years, in science as well as in philosophy. In what follows, I will sketch a little of this attack and argue that the rejection of reductionism it supports is right. And then I will not argue but only suggest that such a rejection of reductionism is more at home in a worldview such as that of Aquinas, which sees the ultimate foundation of reality as personal.

Reductionism

Although reductionism comes in many forms, they share a common attitude. In virtue of supposing that all the sciences are reducible to physics, reductionism holds that ultimately all scientific explanation can be formulated solely in terms of the microstructural. That is one reason why reductionism is often taken to imply a commitment to causal closure at the microphysical level.[25] One way to understand reductionism, then, is that it

[24] For defense of the claim that Aquinas's metaphysics rejects reductionism, see Chapter 1 of my *Aquinas,* (New York and London: Routledge, 2003).

[25] For a helpful discussion of the general problem of reductionism relevant to the issues considered here, see Alan Garfinkel, "Reductionism", in *The Philosophy of Science*, ed. Richard Boyd, Philip Gasper, and J.D.Trout, (Cambridge, Mass.: MIT Press, 1993), pp.443-459. Garfinkel argues against reductionism by trying to show that reductive microexplanations are often not sufficient to explain the

ignores or discounts the importance of levels of organization or form, as Aquinas would put it, and the causal efficacy of things in virtue of their form.

This feature of reductionism also helps explain why it has come under special attack in philosophy of biology.[26] Biological function is frequently a feature of the way in which the microstructural components of a thing are organized, rather than of the intrinsic properties of the microcomponents themselves. Proteins, for example, tend to be biologically active only when folded in certain ways, so that their function depends on their three-dimensional structure. But this is a feature of the organization of the protein molecule as a whole and cannot be reduced to properties of the elementary particles that make up the atoms of the molecule. In fact, for large proteins, even an omniscient knowledge of the properties of the elementary particles of the atoms that comprise the protein may not be enough to predict the structure of the folded protein,[27] because the activity of enzymes is required to catalyze the folding of the components of the molecule in order for the protein to have its biologically active role.[28]

In his magisterial attack on reductionism from the perspective of philosophy of biology, John Dupré takes the examples in his arguments

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macrophenomena they are intended to explain and reduce. He says, "A macrostate, a higher level state of the organization of a thing, or a state of the social relations between one thing and another can have a particular realization which, in some sense, "is" that state in this case. But the explanation of the higher order state will not proceed via the microexplanation of the microstate which it happens to "be". Instead, the explanation will seek its own level..." (p.449). Aquinas would agree, and Aquinas's account of the relation of matter and form in material objects helps explain Garfinkel's point. A biological system has a form as well as material components, so that the system is not identical to the components alone; and some of the properties of the system are a consequence of the form of the system as a whole. Garfinkel himself recognizes the aptness of the historical distinction between matter and form for his argument against reductionism. He says, "the independence of levels of explanation ... can be found in Aristotle's remark that in explanation it is the form and not the matter that counts." (p.149). See also Philip Kitcher, "1953 and All That: A Tale of Two Sciences", in *The Philosophy of Science*, op.cit., pp.553-570. Particularly helpful and interesting on this subject is a recent book by John Dupre, *The Disorder of Things. Metaphysical Foundations of the Disunity of Science*, (Cambridge, MA: Harvard University Press, 1993). Dupre argues that causal determinism falls with the fall of reductionism.

[26] . See, for example, Alan Garfinkel, "Reductionism", and Philip Kitcher, "1953 and All That: A Tale of Two Sciences" in *The Philosophy of Science*, ed. Richard Boyd, Philip Gasper, and J.D.Trout, (Cambridge, Mass.: MIT Press, 1993), pp.443-459 and pp.553-570.

[27] For a connection between reductionism and predictability, see Tim Crane, “Cosmic Hermeneutics vs.Emergence”, in MacDonald and MacDonald 2010, p.28. Crane says, “Sometimes it is said that emergent properties are those properties of a thing whose instantiation cannot be predicted from knowledge of the thing’s parts.... [P]roperly understood, the idea ofpredictability contains the key to emergence.”

[28] . See, for example, Frederic M. Richards, "The Protein Folding Problem", *Scientific American* 264 (Jan. 1991) 54-63. According to Richards, for relatively small proteins folding is a function of the properties and causal potentialities among the constituents of the protein, but "some large proteins have recently been shown to need folding help from other proteins known as chaperonins." (p.54)

against reductionism from ecology and population genetics, rather than molecular biology.[29] He summarizes his rejection of reductionism this way:

> "[On reductionist views,] events at the macrolevel, except insofar as they are understood as aggregates of events at the microlevel -- that is, as reducible to the microlevel at least in principle -- are causally inert.... [But] there are genuinely causal entities at many different levels of organization. And this is enough to show that causal completeness at one particular level [the microlevel] is wholly incredible."[30]

In philosophy of science, as Dupre's work illustrates, arguments against reductionism have frequently been directed against the possibility of reducing biology to physics; but analogous arguments can be used to undermine even the project of reducing chemistry to physics.

So, for example, consider the chirality or handedness of a molecule. The same constituents of a molecule can form different chiral analogues or enantiomers, depending on whether those very same constituents are in a left-handed or a right-handed form. Enantiomers of the same molecule can behave very differently. It turns out, for example, that different enantiomers of organophosphates, which are a mainstay of insecticides, have radically different toxicities for freshwater invertebrates. Testing for the ecological safety of one enantiomer alone can give very misleading results about the safety of an insecticide.[31] Each enantiomer has its own form or organization, and the causal power of the enantiomer is a function of the configuration of the whole.

In a detailed defense of the claim that chemistry cannot be reduced to physics, Hendry takes as one of his examples ethanol and methoxymethane. Hendry says,

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[29] John Dupré, *The Disorder of Things. Metaphysical Foundations of the Disunity of Science*, (Cambridge, MA: Harvard University Press, 1993); see especially chapters 4-6.

[30] Dupré 1993, p.101.

[31] See, for example, "Enantioselectivity in environmental safety of current chiral insecticides", Weiping Liu, Jianying Gan,* Daniel Schlenk, and William A. Jury,

Proc Natl Acad Sci U S A. 2005 January 18; 102(3): 701–706. PMCID:
Published online 2005 January 4. doi: 10.1073/pnas.0408847102. PMC545578

> "These are distinct substances, though each contains carbon, oxygen, and hydrogen in the molar ratios 2:1:6. Clearly, the distinctness of ethanol and methoxymethane as chemical substances must lie in their different molecular structures, that is, the arrangement of atoms in space..." [32]

Discussing another of his examples, hydrogen chloride, Hendry says,

> "if the acidic behavior of hydrogen chloride is conferred by its asymmetry, and the asymmetry is not conferred by the molecule's physical basis according to physical laws, then ontological reduction fails because the acidity is a causal power which is not conferred by the physical interactions among its parts."[33]

And he goes on to remark,

> "the explanation of why molecules exhibit the lower symmetries they do would appear to be holistic, explaining the molecule's broken symmetry on the basis of its being a subsystem of a supersystem (molecule plus environment). This supersystem has the power to break the symmetry of the states of its subsystems without acquiring that power from its subsystems in any obvious way. That looks like downwards causation."[34]

In addition to work such as this in the philosophy of biology and chemistry, there have also been attacks on reductionism in recent work in philosophy of mind and metaphysics. This work has attempted to undermine the credibility of the claim that there is causal closure at the microphysical level. So, for example, Alexander Bird has argued that a substance is what it is in virtue of having the causal powers it does; it could not be the substance it is and have different causal powers. For philosophers such as Bird, causal

[32] Hendry 2010, p.214.
[33] Hendry 2010, p.215.
[34] Hendry 2010, pp.215-6.

powers are vested in substances, not in events;[35] all causation is substance causation, not event causation. The constellation of the properties of a substance is another way of picking out what Aquinas would see as the form of the substance. For Bird, as for Aquinas, the form of a substance, its constellation of properties, gives that substance certain specific capacities for acting. A substance can act to exercise the causal power it has in virtue of its form or configuration. For this reason, a causal chain can be initiated by any substance at any level of organization. Consequently, there can be top-down causation, as well as bottom-up causation.

One way to think about such recent anti-reductionist moves in philosophy is to see them as adopting a neo-Aristotelian metaphysics of a Thomistic sort. For Aquinas, a thing's configuration or organization, its form, is also among the constituents of things; and the function of a thing is consequent on its form. Dupre himself is aware of the Aristotelian character of his position. In making his case for the rejection of both reductionism and the causal closure view, he says that there is no reason for "attaching preeminent metaphysical... importance to what things are made of. ... why should we emphasize matter so strongly to the exclusion of form?".[36]

On philosophical views such as these, a thing is not just the sum of its parts, reductionism fails, and there is not causal closure at the microphysical level. The component parts of a whole can sometimes explain *how* the whole does what it does. But *what* the whole does has to be explained as a function of the causal power had by the whole in virtue of the form or configuration of the whole.

An example drawn from neuroscience

Some contemporary philosophers of mind, such as E.J. Lowe, for example, suppose that similar lessons apply with regard to the mind and to mental states.[37] Like Bird and others, Lowe argues that genuine causal powers belong only to substances and that substances have the causal powers they do in virtue of the properties (or the form) of the whole. On his view, a mental act is an exercise of the causal power had by a human being in virtue of the complex organization had by human beings.

To see the sort of idea at issue here, consider a relatively well-studied capacity of the brain such as the capacity for face recognition. Suppose that

[35] There are differing ways of understanding this claim. For one interpretation which allows a role to events, taken in a certain way, see Timothy O'Connor and John Ross Churchill, "Is Non-reductive Physicalism Viable within a Causal Powers Metaphysic?", in MacDonald and MacDonald 2010, p.45.

[36] Dupre 1993, pp.92-93.

[37] Lowe's view differs from Dupre's, in that Lowe hopes to make his view consistent even with the acceptance of causal closure principles.

a man Max walks into a crowded room and immediately recognizes his daughter by face. The mental act of seeing and recognizing his daughter's face will feel instantaneous to Max. But in fact this one mental act is correlated with an enormous amount of neural activity. Light falling on the retina, transmitted by the optic nerve in two different streams of information, is processed by several areas in the visual cortex before being processed further in the temporal lobes, and so on, in a long story.

As we now know, if this processing were disrupted at any given point, either the mental act of seeing would fail entirely, or it would be produced in some way that would make it seriously defective as an act of face recognition. If the process were disrupted at the point found in blindsight patients, for example, then although Max would indeed have visual information about his daughter's face, Max would report that he could see nothing at all. Or if the process were disrupted at the point at which it is disturbed in visual agnosia, then Max would have consciously accessible to him a lot of visual information about the face of his daughter; but if we were to ask him whether he sees his daughter's face, he would say 'no', in virtue of his inability to recognize what he sees as her face. And if the limbic system were defective in a certain way, or if its connection to the visual system were somehow undermined, then Max would suffer from Capgras syndrome, in which vision is retained but without its usual emotional tone. If the normal visual processing were disrupted in Max because of the deficits of Capgras syndrome, then Max would report that he saw someone who looked exactly like his daughter in every respect; but he would deny strenuously that the person he saw actually *was* his daughter.

On the anti-reductionist views argued for by Bird, Lowe and others, we need to understand the causal power of face recognition through vision as an act of the causal power had by a human being. The causal power is not vested in any of the parts of the neural system alone. Rather, it emerges from the configuration of the person as a whole, and it can be exercised only by the person. In cases of blindsight, visual agnosia, or Capgras syndrome, there has been some disruption of parts of the great complex of neural processing such as that underlying the one sudden mental act of vision in which Max sees his daughter and recognizes her face. Without the smooth functioning of the system as a whole, there is not the one apparently instantaneous mental act of face recognition. For this reason, it seems right to say that, when at a particular moment of time Max suddenly sees and recognizes his daughter's face, he is exercising a causal power which is vested *in him*, at the level of organization of a human being as a whole.

It would not undermine this picture of Max if neuroscientific experiments demonstrated conclusively that there were neural events occurring in Max's visual cortex in advance of the moment of time at which Max reported seeing his daughter. On the contrary, on this view, this is the conclusion one would expect. Until the system is functioning as a whole, the causal power of the whole cannot be exercised. Nonetheless, it remains the case that the causal power of face recognition is vested in Max, and not in particular neural parts of Max.

The case of autism

In fact, recent discoveries in neuroscience and developmental psychology suggest that we should go even further in this direction. These discoveries suggest that in order to understand some cognitive capacities we need to consider a system that comes into existence only when two people are acting in concert. Research on some of the deficits of autism have helped to make this clear.

Autism in all its degrees is marked by a severe impairment in what some psychologists and philosophers call 'mindreading' or 'social cognition'. We are now beginning to understand that mind reading or social cognition is foundational to an infant's ability to learn a language or to develop cognitive abilities in other areas as well.

Since the discovery in the 1990s of a special kind of neurons (mirror neurons), there has been a growing consensus on the part of many neuroscientists and developmental psychologists that the cognitive capacities for mindreading are subserved by the brain's mirror neuron systems. So, for example, one group of researchers says that mirror neurons enable one person to know the mind of another

> "without any explicit reflective mediation. Conceptual reasoning is not necessary for this understanding. As human beings, of course, we are able to reason about others and to use this capacity to understand other people's minds at the conceptual, declarative level. … [but] the fundamental mechanism that allows us a direct experiential grasp of the mind of others is not conceptual reasoning but direct simulation of the observed events through the mirror mechanism."[38]

[38] Gallese et al. 2004, p.396.

Possession of a non-defective mirror neuron system is not enough to prevent autism, however. For an infant to develop normally, the mirror neuron system has be employed within the active functioning of a larger system composed of at least two persons, an infant and a primary caregiver. This system requires shared attention or joint attention between a child and its caregiver.

It is not easy to give an analysis of joint attention. One developmental psychologist, Peter Hobson, says, "Joint attention... occurs when an individual ... is psychologically engaged with someone else's ... psychological engagement with the world".[39] Elsewhere he says,

> "for an instance of infant social engagement to count as joint attention, it is not enough that the infant attends to some object or event that just happens to be at the focus of someone else's attention. Critically, the infant needs to be aware of the object or event as the focus of the other person's attention -- and in addition, for full 'jointness', he or she should share awareness of the sharing of the focus, something that often entails sharing an attitude towards the thing or event in question."[40]

This sort of joint attention is often called 'triadic joint attention' because the attention shared between child and caretaker is directed towards some third thing. This kind of shared attention is often manifested in young children by gaze alternation on the child's part between the caretaker and a third object.[41] Autistic children typically show serious deficits in triadic shared attention.

But researchers are now inclined to think that a there is a more foundational deficit in autism which has to do with what they call 'dyadic shared attention'. On the view of these researchers, it is hard to overemphasize the importance of dyadic attention-sharing for normal human development. As one scientist says, "this is the most direct sharing of attention and the most powerful experience of others' attention that one can have."[42]

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[39] R.Peter Hobson, "What Puts the Jointness into Joint Attention?" in JA, p.188.
[40] Hobson 2005, p.185.
[41] Franco 2005, p.129.
[42] Reddy 2005, p.85.

Many lines of recent research are converging to suggest that autism is most fundamentally an impairment in the capacity for dyadic joint attention.[43] Trying to summarize his own understanding of the role that the lack of shared attention plays in the development of autism, Hobson says that autism arise "because of a disruption in the system of child-in-relation-to-others".[44] By way of explanation, he says,

> "my experience [as a researcher] of autism has convinced me that such a system [of child-in-relation-to-others] not only exists, but also takes charge of the intellectual growth of the infant. Central to mental development is a psychological system that is greater and more powerful than the sum of its parts. The parts are the caregiver and her infant; the system is what happens when they act and feel in concert. The combined operation of infant-in-relation-to-caregiver is a motive force in development, and it achieves wonderful things. When it does not exist, and the motive force is lacking, the whole of mental development is terribly compromised. At the extreme, autism results."[45]

On Hobson's views, then, autism cannot be explained apart from a complex system involving two human beings, an infant and its primary caregiver. Any attempt to explain this system in terms of reductionism and causal closure at the microphysical level would lose the understanding of the jointness in attention critical for normal infant development. On the contrary, as the phrase indicates, joint or shared attention cannot be understood even just by reference to one human being taken as a whole, to say nothing of the lowest-level components of a human being. Rather, it has to be understood in terms of a system comprising two human beings acting in concert. This system enables the shared attention which in turn enables the connection necessary for typical infant development.

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[43] One group of researchers in this area says, "Early research findings focusing on the joint attention impairment [of autistic children] initially emphasized a specific impairment in triadic interactions rather than dyadic interactions. ... Recently, however, the tide has begun to turn. Several studies show group differences in dyadic interaction between children with autism and those with other developmental delays.... The research shows that certain measures of dyadic interaction predict diagnosis of autism several years later." Leekam 2005, p.207.

[44] Peter Hobson, *The Cradle of Thought. Exploring the Origins of Thinking,* (Oxford: Oxford University Press, 2004), p.183.

[45] Hobson 2004, p.183.

The moral of the story

SSP supposes that all macrophenomena are reducible to micro-level phenomena and that there is a complete causal story to be told at the micro-level. The converging lines of research in the sciences and several areas of philosophy, however, make a good case that reductionism is to be rejected. And if reductionism is rejected, then it is not true that the laws of higher-level sciences reduce to physics. It is not the case that everything is determined by the causal interactions at the level of the microphysical. And it is therefore also not the case that things at the macro-level are causally inert. Rather, causal power is associated with things at any level of organization in consequence of the configuration or form of those things.

For SSP, whatever control or freedom human beings have as agents at the macro-level has to be not only compatible with but in fact dependent on the complete causal story at the micro-level. But if reductionism is rejected, as the new work in philosophy and the sciences suggests it should be, then there can be causal efficacy at various levels of organization, including at the level of human agents. A person's intellect and will can exercise real causal efficacy, from the top down, in the way Aquinas supposes they do.

Dupre puts the point this way:

> "there is no reason why changes at one level may not be explained in terms of causal processes at a higher, that is, more complex, level. In the case of human action, the physical changes involved in and resulting from a particular action may perfectly well be explained in terms of the capacity of the agent to perform an action of that kind." [46]

He can take this position, because having rejected reductionism he is free to hold that

> "humans have all kinds of causal capacities that nothing else in our world has.... There is no good reason for projecting these uniquely human capacities in a reductionist style onto inanimate bits of matter. Nor is there anything ultimately

[46] Dupre 1993, pp.216-217.

> mysterious about particular causal capacities' being exhibited uniquely by certain very complex entities...." [47].

On this view, there is nothing mysterious about assigning such causal power to human beings. On the contrary, compatibilism looks like an unnecessary concession, an attempt to preserve what we commonly believe about our control over our actions in the face of a mistaken commitment to reductionism. With reductionism rejected in favor of a metaphysics that allows causal power vested in substances at any level, the causality exercised in libertarian free will is one more case of a kind of causation that even molecules can manifest.

In a metaphysical system of this anti-reductionist sort, the place of persons is not imperiled. In fact, even a human pair bonded in love, as a mother and child are, can be a sort of whole, with causal power vested in their bondedness.

Conclusion

If reductionism is rejected, as the work I have canvassed argues it should be, then with respect to this one issue the Thomistic worldview is more veridical and more worthy of acceptance than SSP is. By itself, of course, this conclusion certainly does not decide the issue as regards the central disagreement between SSP and the Thomistic view. It cannot adjudicate the issue regarding the ultimate foundation of reality. And so, as far as the evidence canvassed in this paper is concerned, the central disagreement between SSP and the Thomistic view remains an open issue. Clearly, it is possible to reject reductionism and accept atheism.

For that matter, it is possible to reject atheism and accept reductionism. As I have described it, SSP is a secular view that combines contemporary scientific theories with certain metaphysical claims. But it is possible to have an analogue to SSP in which a reductionist scientific view of the world is combined with a commitment to religious belief, even religious belief of an orthodox Christian sort. That is, SSP can have a theistic analogue, which includes most of the scientific and metaphysical worldview of SSP but marries it to belief in an immaterial Creator.

So, for example, consider Peter van Inwagen’s explanation of God’s providence. Trying to explain God's actions in the created world, Van Inwagen says that God acts by issuing decrees about elementary particles and their causal powers: "[God’s] action consists in His ... issuing a decree of

[47] Dupre 1993, p.216.

the form 'Let *that* [particle] now exist and have such-and-such causal powers.'"[48]. For van Inwagen, apart from miracles,[49] God's actions in the world consist just in creating and sustaining elementary particles and their causal powers. This, Van Inwagen says, "is the entire extent of God's causal relations with the created world".[50]

For most people conversant with religious discourse in the Judaeo-Christian tradition, this religious analogue to SSP will seem a very odd mix. Could it really be possible, as Van Inwagen is apparently claiming, that decrees concerning the existence and causal powers of particles exhaust the rich panoply of divine interaction with human persons that Judaism and Christianity have traditionally ascribed to God? Most orthodox interpreters of Judaism and Christianity have assumed that God also creates and sustains persons and that he engages in personal relationships with them. On their view, God not only issues decrees (about particles or anything else). God also cajoles, threatens, instructs, illumines, demands, comforts, and asks questions. At the heart of all these activities is the direct interaction between persons of the mind-reading sort.

Even if, *per improbabile*, all this and more could be reduced to decrees about particles, the reduction would have lost the personal connection that in both Judaism and Christianity has been the most important element in the relations between God and human persons. For van Inwagen, God interacts directly with particles and thereby, indirectly, with things composed of particles, including human beings. Most religious believers have supposed that God interacted directly, at least sometimes, with human persons.

For these reasons, reductionism does not fit well with theism. I am not claiming that it is incompatible with theism. The point is only that there is something awkward or forced or otherwise implausible about reductionism in a theistic worldview. It isn't natural there, one might say. On a worldview that takes persons to be the ultimate foundation of reality, reductionism to the level of elementary particles is not really at home.

By the same token, it seems to me that the rejection of reductionism is harder to square with a worldview in which the ultimate foundation of reality is impersonal. Here too the issue is not the compatibility of the two positions. I am not claiming that the rejection of reductionism is incompatible with a worldview on which the impersonal is foundational. The

[48] Van Inwagen 1995, p.49.

[49] On Van Inwagen's view, miracles are a matter of God's supplying "a few particles with causal powers different from their normal powers." Peter van Inwagen, *God, Knowledge, and Mystery. Essays in Philosophical Theology,* (Ithaca and London: Cornell University Press, 1995), p. 45.

[50] Van Inwagen 1995, p.44.

point is rather this. The rejection of reductionism leaves room for the place ordinary intuition accords persons in the world. But, to me at any rate, the metaphysics that gives persons this place is more readily intelligible on a worldview that sees persons as the ultimate foundation of reality. Figuring out how to make it cohere with the picture Blackburn paints, even if we subtract reductionism from that picture, strikes me as harder to do.