Lecture 3
The Soul in the Machine: Transforming the Cartesian World (I)

In the last lecture we discussed Leibniz's radically reactionary decision to revive substantial forms. After roughly a decade of commitment to some variety (or varieties) of the mechanical philosophy, Leibniz decided that it was necessary to revive the substantial forms of the schoolmen that he had so deliberately rejected in the walk in the Rosenthal when he was fifteen years old:

> But when I looked for the ultimate reasons for mechanism, and even for the laws of motion, I was greatly surprised to see that they could not be found in mathematics but that I should have to return to metaphysics. This led me back to entelechies, and from the material to the formal…. [Leibniz to Remond, Jan. 10 1714; G III 606 (L 655)]

With the revival of substantial forms we have the first big step toward Leibniz's mature system. In this lecture I would like to begin by examining the arguments that led Leibniz to revive substantial forms.

Let's return to the quotation from the "Conspectus libelli," the outline of the book Leibniz had intended to write. There, outlining one section of the book he wrote:

> There follows now a discussion of incorporeal things. Certain things take place in body which cannot be explained from the necessity of matter alone. Such are the laws of motion, which depend upon the metaphysical principle of the equality of cause and effect. Therefore we must deal here with the soul and show that all things are animated. Without soul or form of some kind, body would have no being, because no part of it can be designated which does not in turn consist of more parts. Thus nothing could be designated in a body which could be called 'this thing,' or a unity. [A6.4.1988; L 278-9.]

As I suggested last time, this passage gestures at two important clusters of reasons for introducing forms into bodies:

(1) If bodies were purely material, they would not be genuine individuals: "nothing could be designated in a body which could be called 'this thing,' or a unity." Forms are introduced to deal with that apparently metaphysical problem.
(2) "Certain things take place in body which cannot be explained from the necessity of matter alone." Forms must be introduced into bodies in order to ground an adequate natural philosophy, in particular, by introducing a source of activity into the world.

We will begin with the issue of unity before discussing the question of activity.

Not unsurprisingly, Leibniz's decision to revive substantial forms in 1678 or 1679 has its roots in the preceding years, though unfortunately there is not time this afternoon to sketch Leibniz's worries about unity and individuality in those years. But after he decided to take the first step from mathematics to metaphysics by introducing substantial forms, the question of unity becomes notably more prominent in his notes and sketches. It was a number of years, though, before he developed the argument in any detail. The biggest obstacle was probably his plan for draining the silver mines in the Harz mountains, which occupied a great deal of his time from late spring of 1678, when he

first broached the subject with his employer, the Duke Johann Friedrich, until April 1685, when the Duke Ernst August, Johann Friedrich's successor finally called a halt to the project. (This must have been a great disappointment to Leibniz, who stood to make a great personal fortune from this project, had he been able to get the windmills to work as planned.) But there were many other obstacles as well, other projects such as the first publication of the calculus and his intensive work on formalized languages and logics. There were also various political projects under Duke Ernst August, who became Elector of Hannover when Johann Friedrich died in December 1679, and who, unlike his predecessor as Elector, was largely uninterested in Leibniz's intellectual projects.

Despite his other activities, there are a slew of philosophical notes that show what Leibniz was thinking about in the early 1680s. But it wasn't until early 1686 that Leibniz seems to have had an opportunity to pull some of these threads together and try to produce a coherent statement of his philosophy. On 1/11 February 1686, in a letter to the Landgrave Ernst von Hessen-Rheinfels, a Catholic convert with whom Leibniz had been exchanging views for some time, Leibniz remarks that he had been "at a place where for some days I had nothing to do," and took the opportunity to compose "a short discourse on metaphysics." [G II 11] The work in question was, of course, the famous *Discourse on Metaphysics*, which seems to have been drafted in just a few days. This, in turn, was the starting point of his correspondence with Antoine Arnauld. Arnauld was, at that moment, one of the most celebrated philosophers in Europe. He had known Descartes, commented on the *Meditations*, and had corresponded with him when only a very young man. (His *Objections* to the *Meditations* were written before he was thirty.) Though initially skeptical, he became converted to Descartes' philosophy. Arnauld had, in later years, been the co-author of the Cartesian logic, *La Logique, ou l'art de penser* (known as the *Port-Royal Logic*) (published in 1662, with many later editions), which would be widely read for almost two centuries after its first publication. He was also a participant on a celebrated controversy with Nicolas Malebranche, which was the talk of philosophical circles in the early 1680s. It could not have been unproblematic for Leibniz that Arnauld was also associated with the Jansenist movement, and for that reason not entirely representative of Catholic orthodoxy. But even so, Arnauld's fame and accomplishments made it highly desirable for Leibniz to link his name with Arnauld's. It is in the correspondence with Arnauld that we find the most developed statement of this central thread of Leibniz's thought, the emphasis on unity and the way in which unity requires us to posit substantial forms in bodies.

Leibniz first started writing to Arnauld in 1671, when he was also cultivating other celebrated people, such as Hobbes, Oldenburg, the secretary of the Royal Society, and the Duke Johann Friedrich. Leibniz had little to offer then, as a young unknown kid of 25 years from the wilds of Germany. Now, in 1686 Leibniz was a well-known mathematician, the author of the first published article on the differential calculus, and the counselor to the House of Hannover. Leibniz the Lutheran had hoped to convince Arnauld the Catholic of the truth of his own philosophy, as part of a campaign to unify the Churches in Europe. This is the important subtext behind their exchanges.

The correspondence begins rather inauspiciously. To the best of our knowledge, Arnauld never saw the complete *Discourse on Metaphysics*; in his first letter destined for Arnauld, sent to the intermediary in the correspondence, the Landgrave Ernst von Hessen-Rheinfels on 1/11 February 1686, Leibniz sent him only a summary of each of

the thirty-seven articles into which it was divided. But the summary was enough to disturb Arnauld deeply. In a letter of 13 March, 1686 to Hessen-Rheinfels, Arnauld wrote:

> …I find in these thoughts so many things that frighten me and that almost all men, if I am not mistaken, will find so shocking, that I do not see what use such a work can be, which will clearly be rejected by everybody. [G II 15 (M 9)]

Arnauld's frank opinion about Leibniz was not flattering. Writing, again to Hessen-Reinfels, presumably not for Leibniz's eyes, he remarked:

> Would it not be better if he abandoned these metaphysical speculations which cannot be of any use to him or to others, in order to apply himself seriously to the greatest business that he can ever have, the assurance of his salvation by returning to the Church …. [G II 16 (M10)]

In the letters that immediately follow, Leibniz attempted to defend himself against the charge of necessitarianism that Arnauld (not to mention many later readers) saw in the position that he was advancing. But Leibniz was obviously frustrated that some themes that he thought were important were passing by without mention. So, at the very end of a letter from 4/14 July 1686, Leibniz abruptly changed the subject:

> If the body is a substance and not a simple phenomenon like the rainbow, nor an entity united by accident or by aggregation like a heap of stones, it cannot consist of extension, and one must necessarily conceive of something there that one calls substantial form, and which corresponds in a way to the soul. I have been convinced of it finally, as though against my will, after having been rather far removed from it in the past. [G II 58 (M 66)]

Arnauld took the bait. In the next letter he sent Leibniz, on 28 September 1686, Arnauld responded to Leibniz's proposal to revive substantial forms with numerous criticisms, many of them standard to the new philosophy, exactly as Leibniz had no doubt expected. The letters that follow give Leibniz the opportunity to develop his position in greater detail.

Leibniz's main motivation for introducing substantial forms and the corporeal substances that, together with body they make up is an argument that I shall call the *aggregate argument*. Leibniz writes:

> I believe that where there are only entities through aggregation, there will not even be real entities; for every entity through aggregation presupposes entities endowed with a true unity…. I do not grant that there are only aggregates of substances. If there are aggregates of substances, there must also be genuine substances from which all the aggregate result. One must necessarily arrive either at mathematical points from which certain authors make up extension, or at Epicurus's and M. Cordemoy's atoms (which you, like me, dismiss), or else one must acknowledge that no reality can be found in bodies, or finally one must recognize certain substances in them that possess a true unity. [L to Arnauld, 30 April 1687; G II 96][1]

The claim is a rather simple one: the reality that an aggregate of individuals has derives from the reality of its parts. To use an example Leibniz often appeals to, a pile of stones can only be real if the stones of which it is composed are real. As Leibniz puts it, "I

[1] See also GII 58, 72, 97, 118.

deduce that many entities do not exist where there is not a single one that is genuinely an entity and that every multiplicity presupposes unity."[2] Leibniz takes this general argument to have an obvious application to bodies. If we conceive of extended bodies, as the Cartesians argued, as indefinitely divisible and as containing extended parts which, in turn, contain further extended parts, *ad infinitum*, then it follows that bodies must therefore have no reality (in a sense we shall later discuss). But *if* a body is to be real, if, as he puts it, body is to be more than "a phenomenon, lacking all reality as would a coherent dream,"[3] then "one must recognize certain substances [in bodies] that possess a true unity."[4] These are what Leibniz calls corporeal substances.

The model for corporeal substances that Leibniz presents is ourselves, a soul connected with a body. In human beings, Leibniz thinks, "the soul is truly the substantial form of our body."[5] Or, as Leibniz tells Arnauld at somewhat greater length:

> … man … is an entity endowed with a genuine unity conferred on him by his soul, notwithstanding the fact that the mass of his body is divided into organs, vessels, humors, spirits…[L to Arnauld, 9 October 1687; G II 120]

An obvious suggestion is that the human body, despite its complex parts, is unified and enters into a genuine substance by virtue of the fact that it is appropriately connected to an immaterial substance, a soul: It is in this way, it seems, that the soul brings about unity; it is in this way that, for human beings, at least, "substantial unity requires . . . a soul or substantial form."[6] The soul is, as it were, a kind of incorporeal glue that unites the different parts of the body and makes them all belong to one genuine individual, one genuine substance. And, consequently, a corpse, a human body not so connected with a soul cannot be a substance, properly speaking, as Leibniz tells Arnauld.[7] But, Leibniz tells Arnauld,[8] it is similar in the world of non-human corporeal substances. That is, the substantial form can provide a non-human body with substantial unity in just the way our soul does so for us, by being appropriately connected to that body. Leibniz writes:

> I accord substantial forms to all corporeal substances that are more than mechanically united …. [E]very part of matter is actually divided into other parts as different as the diamonds [of the Grand Duke and the Grand Mogul]; and since it continues endlessly in this way, *one will never arrive at a thing of which it may be said: 'Here really is an entity,' except when one finds animate machines whose soul or substantial form creates substantial unity independent of the external union of contiguity*. And if there are none, it follows that apart from man there is apparently nothing

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[2] GIII 118.

[3] GII 97. We shall discuss what Leibniz means by phenomenal in this context below in sect. 11.

[4] GII 96.

[5] GII 75. The position is attributed to the "last Lateran Council" in this text, but clearly with Leibniz's approval.

[6] GII 76.

[7] See GII 73, 75.

[8] See GII 120.

> substantial in the visible world. [L to Arnauld, 28 Nov./8 Dec. 1686; G II 77][9]

So, it seems, corporeal substances, the unities of which the bodies of everyday experience are composed, are to be understood on analogy to human beings, a mind or something mind like (a substantial form), connected with a body. These corporeal substances are the basic building blocks of the world, the ultimate individuals.

This resolution of the bodies of everyday experience into fundamental unities, corporeal substances, suggests a kind of atomism, what Leibniz sometimes calls *metaphysical* or *substantial* atomism to distinguish it from the more familiar Epicurean atomism of Cordemoy, for example, a world of basic things distinguished by virtue of their extreme hardness. But there is a crucial difference between Leibniz's substantial atomism and any other atomism current in the seventeenth century. For the physical atomist, there is a rock-bottom level of analysis; when we divide a body into its ultimate parts, we arrive at atoms, beyond which we cannot go. But not so for Leibniz's metaphysical atomism. When the Leibnizian divides a real body into its ultimate constituents, the corporeal substances, we can stop there; that is sufficient to ground the real existence of the body in question. But, it is important to note, we needn't stop with the first layer of corporeal substances we come upon. Leibniz's basic building blocks themselves contain further corporeal substances, and so on *ad infinitum*. Thus, even an individual organism, a corporeal substance, a body united by a form or soul, must *itself* contain other organisms. So, Leibniz writes about human beings, in a passage that we have already seen in part:

> … man … is an entity endowed with a genuine unity conferred on him by his soul, notwithstanding the fact that the mass of his body [*la masse de son corps*] is divided into organs, vessels, humours, spirits, *and that the parts are undoubtedly full of an infinite number of other corporeal substances endowed with their own entelechies*. [L to Arnauld, 9 October 1687; G II 120]

But even though these corporeal substances are complex and made up of smaller substances, bugs in bugs, they are, nevertheless, indivisible. Arnauld raises an interesting objection to this claim:

> For what reply can one make about those worms which are cut into two, each part of which moves as before? [Arnauld to L, 4 March 1687; G II 87]

Arnauld seems to have in mind here planarian worms, which when split, are capable of growing new heads. Leibniz answers:

> As regards an insect which one cuts in two, the two parts do not necessarily have to remain animate, although a certain movement remains in them. At least the soul of the whole animal will remain only in one part…. [L to Arnauld, 30 April 1687; G II 100][10]

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[9] See also GII 72-73, 75, 76-77.

[10] See also Arnauld's similar objection from the fact that plants can be propagated from cuttings and tree limbs can be grafted (GII 85) and Leibniz's answer (GII 92).

Leibniz's position seems to be that when we are dealing with a genuine corporeal substance, like he supposes Arnauld's worm to be, then it must be indivisible, one cannot split one living thing to make two living things, Leibniz claims. When the body of a living thing is split, its soul, that which makes it the corporeal substance it is, must remain in one half or the other. Thus, in the case of Arnauld's worm, at most one half of the worm divided can remain animate and substantial; the motion that remains in the other half cannot be the motion of an animate creature.[11] Leibniz is in no way intending to deny that one can divide the body of a corporeal substance into smaller parts; one can take out a person's appendix, cut a flower off of a rose bush, or split a worm into two wriggling parts. But dividing the body of a corporeal substance is altogether different from dividing the *substance* itself; hard as one may try, Leibniz insists that the knife cannot make two living worms from one, two *substances* out of one. That is, corporeal substances are indivisible in the sense that one cannot take a corporeal substance and split it into two parts, each of which is equally well a corporeal substance, soul or form unifying a body.

It is important to note here that these corporeal substances, the basic units of Leibniz's metaphysics are extended and, in one sense divisible, though not in another sense. In this way they are *not* the simple substances of Leibniz's later thought. I shall talk at more length about the notion of simplicity in Leibniz's metaphysics of substance in later lectures. The simplicity of substance for Leibniz will later entail the fact that substances are non-extended. But the basic corporeal substances of the Correspondence with Arnauld are *not* simple. (I say that they are extended, and, in a sense they are. But, as we shall see, in another sense they are not. More later on this.) The fact that corporeal substances are both real unities, and in another sense divisible allows Leibniz to hold, at the same time, that bodies are made up out of genuine unities—the corporeal substances, conceived on the model of little animals—while at the same time the extended world is divisible *ad infinitum*. And, furthermore, when we divide the world into smaller parts, those parts are *also* made up out of unities! And so to infinity. It is a neat trick.

Let me add one more remark about the corporeal substance view in these texts. It may look here as if Leibniz's solution to the problem of unity in Cartesian bodies is simply to add forms to Cartesian matter: it may look as if Leibnizian bodies are just Cartesian animal bodies, complex machines to which a soul has been added to transform them into single corporeal substances. This is not quite right. As we shall later see, when Leibniz revives Aristotelian forms, he means to revive an Aristotelian conception of matter as well. Leibniz's larger point is not merely that we have to add form to extended bodies, but that the extension of bodies must be understood as arising from something more basic, from passivity, resistance and impenetrability, which he will identify with the primary matter of the schoolman, properly and more intelligibly understood. We will see this in more detail when we get to some consequences of the arguments for reintroducing substantial forms that are more directly connected with Leibniz's physics in the next lecture. But for the moment, I want to leave you with a warning about this.

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[11] It is possible, too, that neither half of the worm is animate, strictly speaking. That is, it is possible that splitting kills the worm and that the motion of both parts is purely mechanical.

We now have enough of Leibniz's thought on the table to make a provisional remark about what exactly Leibniz is up to in his writings. In my first lecture, I talked about what we might be able to learn from the history of philosophy, how by reading it in a seriously historical way we can put ourselves in contact with alternative ways of viewing the subject matter of philosophy, alternative conceptions of what the philosophical enterprise is. I also noted that for Leibniz and his contemporaries, the intellectual geography was radically different than what it is for us. The notion of philosophy as we now understand it, as something distinct from philosophy simply did not exist. What was called philosophy encompassed a great deal of what we now include among the sciences. It is very important to keep this in mind when examining these arguments that Leibniz is giving. A number of years ago, Jonathan Bennett made the following claim about Descartes' arguments against the vacuum: "…when he [i.e. Descartes] says that there is no vacuum, he is not predicting what you will find if you ransack the physical universe. His point is a conceptual one…."[12] I think that Bennett was wrong about Descartes: that is *exactly* the spirit in which he made those claims. And that is *exactly* the spirit in which Leibniz is making the claims that he is making about corporeal substances. Leibniz wants to claim reality is made up of tiny corporeal substances that go down to infinity, and that if we were go to experience, that is exactly what we would find. Indeed, Leibniz thinks that the empirical investigations of contemporary microscopists confirm the position that his metaphysics has let him to.[13] Similarly, writing to Johann Bernoulli about ten years after his letters with Arnauld, Leibniz writes: "I hardly know how far the flint should be divided so that organic bodies … might occur; but I readily declare that our ignorance on the matter has no effect on nature." [AG 168] It may sound strange to put it this way, but in some ways what Leibniz was doing is more like contemporary particle physics than it is like contemporary analytic metaphysics. It is not unfair to say that Leibniz uses metaphysical arguments to limn the ultimate nature of the physical world in the way in which a contemporary physicist might use mathematics or symmetry arguments for the same purpose. But putting it in that way distorts the project as well: what Leibniz is doing is a kind of enterprise that we don't do today, either in physics or in philosophy. It is philosophy as Leibniz and his contemporaries understood the enterprise.

The argument for unity is one of the most important in Leibniz's arsenal. A few years later, in 1695, when Leibniz decides to present his philosophical views on body and substance to the world for the first time in his "New System" it is this argument that gets pride of place. It is also a much altered version of this argument that will open the "Monadology" in 1714.

But Leibniz has other reasons for introducing substantial forms into the world. Let me return briefly to the passage from the "Conspectus libelli" that has been guiding this discussion to pick up our next theme:

> There follows now a discussion of incorporeal things. Certain things take place in body which cannot be explained from the necessity of matter alone. Such are the laws of motion, which depend upon the metaphysical principle of the equality of

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[12] Bennett, *Spinoza*, p. 101.

[13] See Wilson 1997.

> cause and effect. Therefore we must deal here with the soul and show that all things are animated. Without soul or form of some kind, body would have no being, because no part of it can be designated which does not in turn consist of more parts. Thus nothing could be designated in a body which could be called 'this thing,' or a unity. [A6.4.1988; L 278-9.]

When I originally noted this passage, I observed that there were two basic reasons for reviving forms:

(1) If bodies were purely material, they would not be genuine individuals: "nothing could be designated in a body which could be called 'this thing,' or a unity." Forms are introduced to deal with that apparently metaphysical problem.
(2) "Certain things take place in body which cannot be explained from the necessity of matter alone." Forms must be introduced into bodies in order to ground an adequate natural philosophy, in particular, by introducing a source of activity into the world.

We have talked about unity. Now it is time to turn to activity, the second main theme.

There are, actually, a number of different considerations that are at issue here. One has to do with the (apparent) resistance that bodies have with respect to acquiring new motion. Let me briefly review the state of the physical world in the early and mid-1670s, which we discussed in the last lecture. For Leibniz at this moment, the world seems to be made up of extended bodies, actually divided to infinity, along with minds. And like Hobbes before him, the only kind of activity that Leibniz recognized was motion. In particular, bodies had no resistance to motion from other bodies, so the laws of impact, at the most basic level, were just the laws of the composition of velocity. There were certain obvious inconveniences with this view. For one, it seemed obviously at odds with what we experience in the world. For example, if this picture of the physical world is right, then there when a small body (say a pea shot from a pea shooter) hits a large body at rest (say a giant boulder), then it would set the larger body into motion at whatever speed it hit, without losing any of its own speed. This is certainly not what we experience in everyday life. Leibniz's solution was to reconcile experience and theory by way of hypotheses about the make-up of the world that served to allow size to play a role. A second kind of problem comes from the fact that on this view of basic physics, motion can be lost in the world when, say, two bodies collide directly with one another. Leibniz was not shy to deny the Cartesian law of the conservation of quantity of motion that this entails, as he generally did in his earlier physics. Despite the evident problems, though, Leibniz was generally satisfied with this conception of the physical world through much of the decade of the 1670s.

But by the mid-1670s, Leibniz began to worry about some of the consequences of his Hobbesian physics of bodies without resistance, and began to question his own rejection of conservation principles in physics.[14] In a fragment dated December 1675, he wrote:

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[14] This isn't entirely accurate. In the comments on Descartes from 1675 he had denied the conservation of quantity of motion while asserting the conservation of conatus:

> God always conserves the same quantity of motion in the universe. It seems to me that he conserves the same quantity of endeavour [*conatus*], impetus, or action;

> That the same quantity of motion is conserved, i.e., that if the magnitude of a moving body is increased, its speed is diminished, has been observed by Galileo, Descartes, and Hobbes, and even by Archimedes. [A6.3.466; Arthur 31]

But, he continues: "We have assumed by a kind of prejudice that a greater body is harder to move, as if matter itself resisted motion." [*Ibid.*] Leibniz's first impulse is to try to hang on to the claim that bodies have no inherent resistance and derive the conservation law from some other considerations, in this case, from considerations relating to the motion of bodies in a plenum. In a passage from a few months later, in April 1676, Leibniz takes a different strategy. He writes:

> The nature of body or matter … contains a secret marveled at until now: namely, that magnitude compensates for speed, as if they were homogeneous things. And this is an indication that matter itself is resolved into something into which motion is also resolved, namely, a certain universal intellect. For when two bodies collide, it is clear that it is not the mind of each one that makes it follow the law of compensation, but rather the universal mind assisting both, or rather all, equally.[15]

Here it is God who adjusts speed to mass and conserves quantity of motion. In another fragment, probably from the same period, Leibniz makes an attempt to save the conservation law through physical hypotheses about elasticity and the division of matter into smaller parts. But at the end of the fragment, Leibniz makes an interesting suggestion, one quite different than anything he had been willing to admit before: "However, everything would proceed more simply if we assumed the inertia of matter, namely that a greater thing would resist more." [16] But at that moment he is not yet willing to take up that suggestion.

> for endeavours are never destroyed, but are instead compounded with each other. And in fact it can happen that from two equal and opposite endeavours rest will follow, or at least a slower motion, if they are not equal; but with the quantity of actions, i.e. endeavours, nevertheless conserved. [A6.3.215-6; Arthur 25-7.]

(The Akademie edition dates this as coming from winter 1675/6 or early 1676. But given that Leibniz asserts the conservation of quantity of motion in December 1675, as I shall note, I suspect that it comes from rather the earlier part of this period.) Endeavor here is just "the beginning of motion" [A6.3.95; Arthur 21], and the law of impact that he alludes to here is simply the composition of velocities. But I don't understand how in this passage he can assert the conservation of conatus, given that it is lost in direct collision.

[15] A6.3.493; Arthur 77. The continuation of the passage suggests that while Leibniz admits a conservation law, it may not be exactly the Cartesian conservation of quantity of motion that he has in mind here: "On the other hand, it is not necessary for the same quantity of motion always to be conserved in the world, since if one body is carried by another in a certain direction, but is moving of its own accord equally in the contrary direction, it will certainly come to rest, i.e. it will not leave its place. From this it follows that the conservation of the quantity of motion must be asserted of the action, i.e. relative motion by which one body is related to or acts on another."

[16] A6.4.1960. The Akademie editors date this fragment from 1677, entirely on the basis of content. However, it seems to me more plausible that this fragment should precede the fragment from summer 1676 that I am about to discuss.

A crucial moment in Leibniz's development came when he discovered a new metaphysical principle governing the physical world, something quite foreign to the Hobbesian world that he had believed in up until that moment. In the summer of 1676, sometime before the end of August, Leibniz wrote a remarkable piece, which he entitled "De Arcanis Motus et Mechanica ad puram Geometriam reducenda."[17] In that piece, Leibniz announces, perhaps for the first time, a kind of conservation law of great generality and depth, his principle of the equality of cause and effect: "Just as in geometry, the principle of reasoning usually cited is the equality between the whole and all of its parts, so in mechanics everything depends on the equality of the whole cause and the entire effect." [p. 203][18] Leibniz went on to offer rather elaborate explanations of his new principle. He noted:

> Hence it is necessary that the cause be able to do as much as the effect and vice versa. And thus any full effect, if the opportunity offers itself, can perfectly reproduce its cause, that is, it has forces enough to bring something back into the same state that it was in previously, or into an equivalent state. [204]

This principle is a metaphysical principle (whatever exactly that means for Leibniz at that moment) which, he thinks, can ground all of mechanics (whatever exactly that means for Leibniz at that moment).

This new metaphysical principle leads Leibniz to adopt what he had been resisting for a number of years, positing a genuine force of resistance in bodies. Leibniz ends the *De arcanis motus* with the following passage:

> It has been established through experience that the cause why a larger body is moved with difficulty even on a horizontal plane is not [always] heaviness, but solidity. Unless body were to resist, perpetual motion would follow, since a body resists in proportion to its mass [*moles*], since there is no other factor that would limit it [*nulla alia ratio determinandi*]. That is to say, since there is no other factor [*ratio*] which would hinder it from rebounding less than to its [original] height, since in itself, without an extrinsic impediment through the impulse of [another] body, it would give [the other body] its whole motion, and retain it as well. [205]

In this way, Leibniz here takes the generalized conservation principle to imply that bodies must contain some force by which they resist the acquisition of new motion in collision.

While Leibniz was grappling with the question of resistance in the mid- and late 1670s, he also seems to have become aware of another problem, that of the reality of motion. The problem of the reality of motion seems first to surface in around 1675 or 1676. In a document from that period,[19] Leibniz is worried about what it means to say that a body is in motion or in rest, and to which body we should attribute motion when faced with two bodies in motion with respect to one another. His general point seems to be that when we can establish the cause of motion, that body which contains the real cause of motion should be the body to which we attribute motion. However, in the general case, he seems to think that we cannot determine the cause of motion, and in that

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[17] It is published in Hess 1978, pp. 202-5. It is discussed, and its significance underscored in Fichant 1978.

[18] Note other early statements of the principle: A6.3.400, Dec 1676 Parkinson 115; A6.3.584 12 Dec 1676 Parkinson 107; 1677-8? [A6.4.1963]

[19] A 6.3.101ff.

thus we have to reject any absolute notions of motion and rest. In this note Leibniz seems to be perfectly happy with the conclusion that motion is simply relational, that there is no real fact of the matter to which of two bodies in motion with respect to one another we should ascribe motion or rest. In other fragments from the period Leibniz plays with this and related ideas, sometimes expressing the view that there is no general way of attributing motion or rest to bodies,[20] sometimes expressing the view that motion is relative.[21] But he did seem to be increasingly worried about the question of the reality of motion.

At about the same time as he is reviving substantial forms, Leibniz returns to the suggestion that he had entertained in 1675 or 1676, that that body is really in motion which contains within itself the cause of its change, and argues that this is something we can use quite generally to say what it means for a body really to be in motion. This idea is set out in a series of fragments that the Akademie editors date from Summer 1678 to Winter 1680/1, exactly the period of the book outline. In these fragments, Leibniz explains and defends the following view:

> A body in motion is one which is the proximate efficient cause for why each of its parts changes position with respect to other bodies; otherwise it is said to be at rest. [A6.4.2011][22]

In another fragment from the series, he gives the cause in question a general name:

> And so we attribute motion to that which has a force for acting [*vis agendi*]. Whence it is also obvious that those who have said that what is real and positive in motion is equally found in both contiguous bodies receding from one another have spoken falsely. For the force for acting can only be in one of them, and therefore it is also the cause [of the change of position.] [A6.4.2019][23]

The ‘vis agendi,’ the force of acting, then, is what will enable us to say that there is a distinction between motion and rest.

Leibniz's discovery of the ‘vis agendi,’ the active force by which motion and rest are distinguished from one another, together with his realization that bodies must have a passive force by virtue of which they resist the acquisition of new motion, led Leibniz to a new view about their nature. Cartesian (or Hobbesian) bodies, the objects of geometry made real, have nothing in them from which such forces could arise. So, Leibniz concludes, *there must be something to bodies over and above their geometrical*

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[20] Comments on Descartes 1675/6, A6.3.217 (Arthur 29).

[21] A6.4.1968-70 (Arthur 225f).

[22] Cf. also: From “Metaphysical Definitions and Reflections”: “When two bodies approach each other, it can only be decided from the cause of motion, not from the motion itself, which of the two is at rest or moves, or whether both are moving. It is the same with several bodies.” [A 6.4.1400; Arthur 249]

[23] Note that the words in brackets at the end are conjectures by the editors. Note also that in the marginal note to the very beginning of the fair copy of *Pacidius Philalethi* (1676), Leibniz remarks: “Still to be treated are, first, the subject of motion, to make it clear which of two things changing their mutual situation motion should be ascribed to, and second the cause of motion, i.e. motive force.” This might be as early as 1676, but it might also be a later addition. [A6.3.529; Arthur 129]

properties. But what is it? Leibniz's answer is simple: to ground these forces in bodies we must revive the forms that the schoolmen had posited, and that the mechanists had rejected. Here is how Leibniz puts it in a document written shortly after his decision to revive substantial forms in 1679:

> … [W]hen I considered how, in general, we could explain what we experience everywhere, that speed is diminished through an increase in bulk [*moles*] as, for example, when the same boat carried downstream goes more slowly the more it is loaded down, I stopped, and all my attempts having been in vain, I discovered that this, so to speak, inertia of bodies cannot be deduced from the initially assumed notion of matter and motion, where matter is understood as that which is extended or fills space, and motion is understood as change of space or place. But rather, over and above that which is deduced from extension and its variation or modification alone, we must add and recognize in bodies certain notions or forms that are immaterial, so to speak, or independent of extension, which you can call powers [*potentia*], by means of which speed is adjusted to magnitude. These powers consist not in motion, indeed, not in conatus or the beginning of motion, but in the cause or in that intrinsic reason for motion, which is the law required for continuing. And investigators have erred insofar as they considered motion, but not motive power or the reason for motion, which even if derived from God, author and governor of things, must not be understood as being in God himself, but must be understood as having been produced and conserved by him in things. From this we shall also show that it is not the same quantity of motion (which misleads many), but the same powers that are conserved in the world. [Summer 1678-Winter 1678/9; A6.4.1980 (AG 249)][24]

Leibniz's idea seems to be this. Resistance and the ability to do work are kinds of activity in bodies, and therefore cannot be derived from bare matter, which is inert. And therefore, to inert extended matter we must add something that can be the source of these kinds of activity, both resistance and the positive ability to do work. That is, to inert matter we must add form. The view that he is trying to articulate seems to be that for there to be activity—both resistance and the positive activity by which one body acts on another—there must be form in bodies. Form is the source of this activity, both resistance and positive activity. And so we reach, again and by a different route the view that the Cartesian view of body as purely extended stuff is inadequate, and that we must add forms to bodies in order for them to have the kind of activity necessary to ground both the laws of motion and the very notion of motion itself.

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[24] Cf. also the following passage from 1680, where Leibniz goes as far as to identify activity and active force with the essence of body: To de La Chaise (May 1680): “[j’ai trouvé…] Qu’il y a des formes substantielles, et que la nature du corps consiste non pas dans l’étendue, mais dans une action qui se rapporte à l’étendue, car je tiens qu’un corps ne sçauroit estre sans effort: d’ou il s’ensuit *non corpus necessario determinata extensionis esse, sed ad eam habendam inclinari nisi superior potentia impediat*. [A2.1.512] See also the notes on Simon Foucher (1676) : L’essence des substances consiste dans la force primitive d’agir, ou dans la loy de la suite des changemens, comme la nature de la *series* dans les nombres. [A6.3.326] But both the textual notes and the contents suggest that this is a later addition.

In this lecture I have tried to set out the two principle arguments which lead Leibniz to reintroduce substantial forms into the physical world in the late 1670s, the argument from unity and the argument from activity. This is just the start, though. In the next lecture I will go more deeply into the view of substance and body that Leibniz presents in these years, and begin to lay out some of the problems that will eventually lead Leibniz further down the path toward the idealism of his later monadology. But, I shall also emphasize, we haven't gotten there yet.

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