

A Reply to Anja Jauernig's article, 'Leibniz on Motion and the Equivalence of Hypothesis,' *The Leibniz Review*, Vol. 18, 2008<sup>1</sup>

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I. Jauernig's claim

In her article 'Leibniz on Motion and the Equivalence of Hypotheses' Anja Jauernig argues that a common discomfort concerning Leibniz's alleged commitment to two different perspectives on motion, i.e., as something relative and as something absolute, prompted many commentators to suggest that Leibniz actually upheld just one of these perspectives while defending the other only apparently. Jauernig's alternative suggestion is that Leibniz,

is indeed both a relativist and absolutist, as the textual evidence suggests, but this is no problem, because he is a relativist about motion at the *merely phenomenal* level and an absolutist about motion at the dynamical level. *There are no real or absolute motions at the merely phenomenal level*, according to Leibniz, because there is no empirical criterion that would enable us to decide which one of the relatively moving bodies is truly in motion.<sup>2</sup>

Jauernig's suggestion is that Leibniz's relativism concerns the motion of physical bodies at the merely phenomenal level, while his absolutism concerns motion of corporeal substance at a deeper, dynamical, level.<sup>3</sup> Jauernig thus leans on a distinction between the physical and the dynamical levels to settle Leibniz's dual analysis of motion: "The real motions in the world are the motions of corporeal substances that possess active forces,"<sup>4</sup> she writes.

What kind of forces does Jauernig recognize as enabling real and absolute motion at the dynamical level? In Leibniz's classification of forces he suggests that there are active and passive forces, each with a primitive mode and a derivative mode. The primitive active force is,

inherent in all corporeal substance as such since it is contrary to the nature of things that there should be any body which is wholly at rest ... Primitive force—which is none other than the first entelechy—corresponds to the *soul* or *substantial form*.<sup>5</sup>

Derivative active force is the "limitation of primitive force brought about by the collision of bodies with each other."<sup>6</sup> In general, the derivative active forces involved in local motions are *vis viva* (the living force, expressed as  $mv^2$ ), *vis*

*mortua* (the dead force to which Leibniz refers also as *conatus*, which indicates momentary velocity taken with direction), and *impetus* (the quantity of motion, i.e., the product of a body's mass and its velocity).

Let us return to Jauernig's reading. According to it, the forces that constitute motion as real and are ascribed to the corporeal substance are physical forces or, to put it in Leibniz's terms, are *derivative* forces. Jauernig emphasizes that "when Leibniz advertises his physics as being superior to Descartes' purely kinematic mechanics he is not proposing to replace Cartesian physics with his monadology."<sup>7</sup> The essence of her criticism of Richard Arthur, to which I shall turn in section III, is that it is not the metaphysical forces that constitute motion as a real phenomenon. Jauernig's wish to preserve the separation among the ontological levels, and respectively, among different kinds of forces, also underpins the criticism she levels against Daniel Garber, which I discuss in section II.

## II. The ontological subdivision and the idea of well-founding

As Jauernig notes, many expositions of Leibniz's ontology focus on three main levels--the actual, the phenomenal and the ideal--whereas she points at a subdivision of the middle level.<sup>8</sup> The phenomenal and the dynamical levels are both in the middle, between the actual level, which consists of monads and their perceptions, and the ideal level, that of abstract, mathematical and continuous magnitudes. Again, this subdivision Jauernig suggests is at the base of her argument that Leibniz is both a relationalist and an absolutist with regard to motion. It should be noted that this is not Leibniz's own terminology. Each of these two issues (the ontological distinction among levels and his classification of forces) presents many interpretative difficulties even before one considers the relations among them. Jauernig understands the relation among the levels in terms of correspondence; to each body at the merely phenomenal level corresponds a corporeal substance or an aggregate of corporeal substances at the dynamical level that the body in question can be said to 'express' or 'to appear as.'<sup>9</sup> In the final analysis, she explains the well-foundedness of phenomena – grounding--on a more fundamental level on the basis of monadic representation. According to this idealistic reading of well-founding, the phenomena are understood as "the common intentional objects of the coherent perceptions of all monads"<sup>10</sup> and,

The three listed phenomenal levels differ with respect to the criteria of 'reality' or 'well-foundedness' that their phenomena conform to, in the degree of

'distinctiveness' of the representations describing these phenomena.<sup>11</sup>

Although the corporeal substances are "the phenomenal expressions or appearances"<sup>12</sup> of a higher level, the primitive forces are not ascribed to them. Many complexities arise when one considers Leibniz's classification of forces along with the distinction among ontological levels. The question then becomes: *how (if at all) do primitive, metaphysical, forces relate to phenomena? How intimate is the connection between forces of different levels, and what is meant by the 'limitation' (also called 'modification') to which Leibniz refers in his classification of forces?* Jauernig maintains a strict ontological distinction among the levels, allowing primitive forces to participate only within the monadic domain. Her criticism of Garber's realistic reading is thus understandable.<sup>13</sup> Jauernig claims that the position that claims the physical and the dynamical levels are not so sharply distinct turns Leibniz's relativism into a merely epistemological position.

In Garber's interpretation the primitive forces pertain quite directly to the level of physical bodies and somehow intimately interact with physical phenomena. The primitive and derivative forces reside in the body, or, the body itself contains the metaphysical Aristotelian features of form and matter. The derivative forces involved in actual motion, "though not substantial themselves [...] nevertheless pertain directly to the corporeal substance, the basic metaphysical unit in Leibniz's world."<sup>14</sup> Garber further claims,

At the metaphysical ground are corporeal substances, unities of form and matter, primitive active and passive forces. These, in turn, ground derivative forces, the modes or accidents of these primitive forces ... The derivative forces, active and passive, in turn, are the immediate cause of motion, following certain laws.<sup>15</sup>

Thus, while Garber holds that, *in principle*, there can be absolute motion at the phenomenal level, though we could never identify it, Jauernig insists that at the phenomenal level "there *is* no such correct frame and there *are* no absolute motions, precisely because such a frame could never be identified."<sup>16</sup> There is 'really' no real motion at the phenomenal level.

At the dynamical level, on the other hand, she does recognize real motions. These are explained on the basis of active forces of corporeal substance that function as intrinsic agents and, thus, (absolute) "motions can be attributed to particular corporeal substance without any reference to other entities."<sup>17</sup> Referring to 'real' as an intrinsic property that characterizes the object independently of other entities, Jauernig claims that she uses 'real' and 'absolute' interchangeably.<sup>18</sup> Note, however,

that previously she claimed that “there are no real or absolute motions at the merely phenomenal level, according to Leibniz, *because there is no empirical criterion* that would enable us to decide which one of the relatively moving bodies is truly in motion.”

At least two different explanations are possible here. Real motion can be explained on the basis of the *internal operation* of force (in this case unreal motion would lack such an operation). It can also be explained on the basis of an *empirical criterion* that might help us to detect it (in this case unreal motion would lack such a criterion). But Jauernig understands real motion at the dynamical level as based on the internal action of force and unreal motion as based on the absence of an empirical criterion. Motion at the phenomenal level is thus considered separately from the intrinsic operation of force, and absolute motion becomes possible only “in the abstract, in the sense that the concept of absolute motion is meaningful, but it is not physically possible.”<sup>19</sup>

But if the criterion for absolute motion is force as an intrinsic property, as Jauernig herself claims, it is still not clear why one can assume that the forces are intrinsic at the dynamical but not at the phenomenal level. The idea that absolute motion can be attributed to the phenomenal level due to the internal operation of force can be further elaborated in terms of the distinction between different meanings of the term ‘absolute.’<sup>20</sup> Of course, Leibniz’s picture is relational, as he denies the independence of space and time, claiming that motion is recognized in relation to a body or set of bodies assumed to be at rest.<sup>21</sup> However, his relationalism does not exclude the absoluteness of motion in another sense. There might be an absolute quantity of motion alongside the relationalism of space and time.<sup>22</sup> If we understand Leibniz’s absolute motion in this context, as something that can be defined on the basis of its intrinsic properties, then it is not clear why there is no real motion at the phenomenal level. The idea of force as intrinsic seems to be a thread that connects the ontological levels (except, of course, the ideal level), and this is precisely what constitutes phenomena as real. Of course, there is a tension in Leibniz’s account, i.e., the question of how the absolute aspects of motion that relate to force accord with the relative character of local motion at the phenomenal level. But the relativity of motion that prompted Huygens, and Leibniz in his footsteps, to reject Descartes’ laws of impact was also the reason why Leibniz developed his concept of *vis viva* as a metaphysical factor for physics in order to avoid the illusory character of motion entailed by its relativity. The modification of force becomes a particular case of the well-founding of motion and it points to something *beyond representation*.

A reading similar to Jauernig's was suggested by Richard Gale, who also favors a subdivision of the middle level of Leibniz's ontology.<sup>23</sup> Gale offered to bridge Leibniz's physics and metaphysics with an explanatory level and a view of Leibniz's concept of corporeal substance as his classification of forces in this context. He refers to this additional explanatory level as "the metaphysics of physics,"<sup>24</sup> as something between the metaphysical monad and the bodies of everyday experience. Like Jauernig, Gale suggests that we should understand the relation between the levels in terms of correspondence,

in the sense of well-founding, Leibniz's observable world is well-founded in a consistent explanatory model of underlying substantial physical entities ... the well-founding relation is a relation of strict correspondence between properties on the metaphysical level and properties on the explanatory level.<sup>25</sup>

But here the similarity between Gale and Jauernig ends. In Gale's account the explanatory level that consists of individual corporeal substances, i.e., monadic aggregates, is endowed with *primitive* forces. These are grounded in the level of monads and, in turn, produce the derivative forces of the phenomenal level. In other words, primitive forces pertain not only to the metaphysical level, even though they are grounded in or well-founded on them. In the final analysis, Gale's explanation means to ensure the reality of motion, as elsewhere he writes, "if something, e.g., motion, is in even the most extended phenomenal sense real, it must ultimately be well founded upon a metaphysical reality."<sup>26</sup>

Even in Adams' idealistic reading the notion of representation is not comprehensive. The modification of the primitive forces, resulting in derivative forces, is directed toward the well-founding of motion. Such well-founding involves more than the analogy that Leibniz draws between different ontological levels. There is *actual derivation* from the metaphysical to the phenomenal, and the latter, in Adams' words, is causally grounded in the former.<sup>27</sup> This description adds another dimension to Leibniz's pre-established harmony on which Jauernig focuses. It does not mean that metaphysical and phenomenal levels interact, but it does allow seeing them as less detached from one another. Adams claims,

if we ask Leibniz what, in reality, are the causes of the motions studied by physics, the answer he suggests here (and I think he must give) is that the motions are phenomena caused, at bottom, metaphysically, by the current tendencies of substances to pass from current perceptions to future ones. So if we can say that the derivative forces of physics are by definition the causes of physical motions, we can conclude that they are identical with the

intrasubstantial derivative forces that are modifications of primitive forces. Thus one and the same derivative force would have both an intrasubstantial effect, the passage from current to future perceptions, and a phenomenal effect, the physical motions.<sup>28</sup>

This perspective allows us to conceive not only of the derivative forces as real but, furthermore, of phenomenal motion as leaning on these intrinsic properties. It seems that the role of real motion at the dynamical level, if this level is considered separately, is precisely to constitute motion as real at the phenomenal level. There are many ways to put this claim. For example, G. M. Ross writes, “if as realism maintains, the reality of phenomena is to consist in their correspondence with underlying real substances, then Leibniz’s phenomena are as real as any realist could demand.”<sup>29</sup> Arthur notes, “in Leibniz’s system, real (i.e., well-founded) phenomena are distinguished from imaginary phenomena by being founded on the monadic level.”<sup>30</sup> And here is Crockett’s phrasing,

Leibniz fairly consistently classifies bodies and their motions as real and actual ... [T]his is not to say that the phenomena are real as the monads ... but phenomena nonetheless have reality because they are well-founded in some set of monads.<sup>31</sup>

While these commentators leave room for ‘limitation’ or ‘modification’ of force, Jauernig relies on pre-established harmony and the idea of correspondence instead, concluding that the merely phenomenal level is not real, nor is, therefore, phenomenal motion.

However, at the end of her article she seems to try to ‘save’ motion in another manner. She writes, “[if we take] into account that the actual world is the best of all possible worlds, it has the best chance of corresponding to the actual distribution of motion among the relevant corporeal substances at the dynamical level of reality.”<sup>32</sup> She argues,

To be sure, these physical forces are grounded in the forces of simple substance (with the help of the pre-established harmony) but this does not mean that Leibniz must have the latter kind of forces in mind when he asserts that the real in motion is force.<sup>33</sup>

Jauernig’s reading, which relies on a strict distinction between ontological levels, emphasizes Leibniz’s main motivation as that of defending the relativity of motion at the phenomenal level. Absolute motion is not physically possible, as she emphasizes throughout her article. On this basis, Jauernig explains Leibniz’s objection to Newton’s proposal that the observable effects of inertial forces allow

us to distinguish absolute from relative motion. Leibniz holds that all motion, including rotations, are composed of uniform rectilinear motion, and so, in Jauernig's words, he 'go[es] on to insist that centrifugal forces are relative forces, and that the observable inertial effects do not permit us to introduce a distinction between absolute and relative motions at the merely phenomenal level'.<sup>34</sup> My emphasis is on the intrinsic operation of force. If we take the position that absolute motion should be understood in terms of its cause, a position that Jauernig herself supports, then it is clear why Leibniz believes that there is no mathematical criterion that helps detect absolute motion. Focusing on the intrinsic operation of force that results in absolute motion – an idea that does not yield a criterion applicable to physics – means moving away from the physical aspects of relative motion at the phenomenal level. As John Cook remarks, the intrinsic operation of force shows that the debate concerning absolute motion is a metaphysical one designated to solve metaphysical issues, such as the problem of continuity and the nature of bodies. Yet, as Cook adds, many physicists and historians of science blame Leibniz and, Like Clarke, they take the view that our rightly rejecting the metaphysical concept of absolute space is contingent upon having in hand an explanation of the bucket-effect and other such inertial phenomena. In this way a metaphysical issue is apparently made to fall within the province of science.<sup>35</sup>

### III. The concept of *conatus*

Jauernig's elimination of primitive forces and their modification in her analysis of motion in effect is a criticism at Arthur's position:

When Leibniz says that what is real in motion is force, he is not referring to the phenomenally manifested *vis viva* ... but to the *endeavour* or *conatus* to change state that takes a substance through its own series of states.<sup>36</sup>

I would like to return to the ideas of *conatus* and of dead force, *vis mortua*, a kind of derivative active force which entails the *vis viva*, the living force. Already in his earlier writings Leibniz introduces this idea through his concept of *conatus*. The later concept of *conatus* preserves its original meaning, namely, the striving of the body toward motion. A metaphysical element related to internal activity, it is called dead force and used also in a more technical sense. In other words, the *vis mortua* of Leibniz's mature work is a metamorphosis of the early *conatus*; both share the same meaning of effort, of endeavor. In all phases this concept is necessary for preserving the idea of true, absolute motion. As Russell notes, "momentary increment was

real in some way ... force was called to supply some reality other than motion out of which motion might be supposed to spring.”<sup>37</sup> And as Bernstein remarks with regard to Hobbes’ concept of *conatus*, which Leibniz borrowed: it points to a “dynamical component in the *conatus* idea not contained in the relinquishing and acquiring of places or in local motion *per se*.”<sup>38</sup> This would mean that *conatus* is not only a kinematical, but also a dynamical component, “a force related idea,”<sup>39</sup> and functions as the metaphysical basis of motion.

Loemker’s statement – that Leibniz’s primary interest is “the need to analyze motion to prove the existence of God”<sup>40</sup> – helps explain why the mature Leibniz does not develop the physical description of dead force, yet insists that it is metaphysically necessary. What is interesting in Leibniz’s dynamics are the *reasons* that led him to *preserve* the idea of dead force, rather than the reasons for not developing this concept further. Leibniz preserved *conatus* in dead force because he saw no other way to assure that motion exists. Consequently, in search of the elemental component that grounds motion as a real phenomenon, we reach the concept of dead rather than living force, the latter being the consequence of the former. Dead force is intimately related to the metaphysical level, ensures activity and manifests itself as *vis viva*. Analyzed metaphysically, it is more important than the living force. Loemker thus remarks that Leibniz “later regarded it [*conatus*] as momentary force, which mediates between the metaphysical source and the resulting motion.”<sup>41</sup> This is why Leibniz insists on maintaining *conatus*, although with regard to the elementary components, i.e., *impetus* and dead force, he argues “I am not therefore claiming that these mathematical entities as such are actually to be met with in nature but only that they are useful as mental abstractions for making accurate calculations.”<sup>42</sup> In 1689 he writes,

I considered that the difference at every moment between a stationary body and a moving body to consist in this, that the moving body possesses a certain *conatus* or tendency to start its course ... I did not see how *conatus* can be destroyed in nature or remove from a body.<sup>43</sup>

Some years later, in 1694, Leibniz still maintains that “active force involves an entelechy or an activity; it is half way between a faculty and an action, and contains in itself a certain effort or *conatus*.”<sup>44</sup> In his letter to Des Bosses in September 1706 Leibniz writes,

It is true that all natural phenomena of bodies (besides perceptions) can be explained through size, shape and motion. But motions themselves (which are the causes of shapes) cannot be explained except by invoking entelechies.<sup>45</sup>

Therefore, the idea of striving, *conatus* or dead force, has a special role in bridging physics and metaphysics. This is the idea that Arthur defends in his 1994 article.<sup>46</sup>

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Notes

<sup>1</sup> In the following I use the following abbreviations: *NI*=Nature itself, *RTM*=Reflections on True Metaphysics, *SD*=*Specimen Dynamicum*, all in WFP.

<sup>2</sup> Jauernig 2008, 12; emphasis added.

<sup>3</sup> Jauernig understands the corporeal substance through an inversion of Cassirer's *qualified monad conception*. In her version, the corporeal substance is a phenomenal body, "insofar as there is a monad that perceives the body most distinctly" (p. 11).

<sup>4</sup> Jauernig 2008, 6.

<sup>5</sup> *SD*, 155-6.

<sup>6</sup> *SD*, 156.

<sup>7</sup> Jauernig 2008, 9.

<sup>8</sup> Jauernig 2008, 10.

<sup>9</sup> Jauernig 2008, 12.

<sup>10</sup> Jauernig 2008, 11. Jauernig further understand the notion of corporeal substance itself in terms of representation, see fn. 44 in her article.

<sup>11</sup> Jauernig 2008, 11.

<sup>12</sup> Jauernig 2008, 11.

<sup>13</sup> In general terms, a realistic reading of corporeal substance suggests that it is an Aristotelian entity, a union of matter and form, Jauernig refers to it as corporeal substance of the first kind (2008, 10).

<sup>14</sup> Garber 1985, 85.

<sup>15</sup> Garber 1995, 293.

<sup>16</sup> Jauernig 2008, 14.

<sup>17</sup> Jauernig 2008, 6.

<sup>18</sup> Jauernig 2008, 6.

<sup>19</sup> Jauernig 2008, 23.

<sup>20</sup> See Rynasiewicz, 2000.

<sup>21</sup> However this assertion must be read carefully, since Leibniz argues that there is never any true rest in bodies. **Therefore, no body is truly at rest even in relation to another** (see Arthur 1994, 232).

<sup>22</sup> See Belkind (forthcoming).

<sup>23</sup> Gale, 1970.

<sup>24</sup> Gale 2002.

<sup>25</sup> Gale 1994, 235-6.

<sup>26</sup> Gale 1994, 266.

<sup>27</sup> Adams leaves room for a real connection between the primitive forces of substance and the derivative force studied in physics (see Adams 1994, 382). While discussing Leibniz's correspondence with Wolff from the years 1710-1711, Adams suggests that the relation between the primitive and derivative forces is one of expression. However, he adds that expression is insufficient for the explanation of the modification of primitive forces and cites Leibniz's 1711 letter to Wolff in which Leibniz characterizes the primitive active force as the *reason* for the phenomena. This suggests 'an important step beyond expression' and Adams holds that 'this causal relation may make possible a sort of identity of intermonadic and physical derivative forces' (1994, p. 385) and thus eventually, the dual treatment of derivative

forces is only apparent and ‘the two views represent different ways of carving up, conceptually, the same fact’ (1994, p. 386)

<sup>28</sup> Adams 1994, 385-6.

<sup>29</sup> Ross 1984, 93.

<sup>30</sup> Arthur 1985, 165.

<sup>31</sup> Crockett 1998, 123.

<sup>32</sup> Jauernig 2008, 30.

<sup>33</sup> Jauernig 2008, 9.

<sup>34</sup> Jauernig 2008, 29.

<sup>35</sup> Cook 1994, 44.

<sup>36</sup> Arthur 1994, 234.

<sup>37</sup> Russell, 1992, 104.

<sup>38</sup> Bernstein 1980, 30.

<sup>39</sup> Bernstein 1980, 26.

<sup>40</sup> *L*, 32.

<sup>41</sup> *L*, 32.

<sup>42</sup> *SD*, 158.

<sup>43</sup> In Costabel 1973, 21.

<sup>44</sup> *RTM*, 141.

<sup>45</sup> Leibniz 2007, 51.

<sup>46</sup> I would like to thank Richard Arthur and Glenn Hartz for their comments.