

September 30, 2016

Reason, Expression, and Perspective

Three Leibnizian Master-Ideas, Then and Now¹

In this talk I consider three of Leibniz's master-ideas. Among his most innovative and important ideas, they are integral elements of the framework within which all of his philosophical thought proceeds and develops. They articulate his central contributions to (what we would now call) *semantics*, *logic*, and *metaphysics*. Under the heading of "reason", the first idea is his understanding the intentional contentfulness of ideas and perceptions, indeed, meaningfulness generally, most basically in terms of *inference* rather than *representation*. Under the heading of "expression", the second idea is his thinking of logic principally as a means of perspicuously *expressing* right reasoning, and thereby and as a consequence as a means of *assessing* and *rectifying* reasoning, rather than principally as the source of a distinctive kind of *a priori truth*. Under the heading of "perspective", the third idea is his resolution of the perennial metaphysical problem of the One and the Many, his reconciliation of holism and atomism. The most perfect expression of this view is presented in his *Monadology*. It combines a vision of a unified block-world, in which every part is necessarily as it must be according to the whole comprising it, and in which each atomic element and its contribution to the whole is distinguished by the unique *perspective* it provides on that whole.

I. The Representational Revolution

Premodern (originally Greek) epistemological theories understood the relations between appearance and reality in terms of *resemblance*. The idea is the natural one that when all goes well, the way things appear to us resembles the way things really are. That is how we are able to know something about reality. The paradigm of resemblance is the relation between a good picture and what it pictures. Resemblance in this sense is a matter of sharing properties. A

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portrait resembles the one portrayed insofar as it shares with its object properties of color and shape, for instance of nose, ear, and chin (perhaps—and crucially for later parts of my story—as seen from some perspective). The thought behind the resemblance model is that appearance is veridical insofar as it resembles the reality it is an appearance of. Insofar as it does not resemble that reality, it is a false appearance, an error. Each in his own way, Plato and Aristotle understood what was shared between appearance and reality in the case of genuine knowledge as a kind of *form* exhibited by both. Medieval scholastic philosophers further develop this picture-picture, articulating intricately detailed new accounts (realism, nominalism, conceptualism) of the nature of the shared universals that characterize both thoughts and things.

The rise of modern science made this picture unsustainable. Copernicus discovered that the reality behind the appearance of a stationary Earth and a revolving Sun was a stationary Sun and a rotating Earth. According to him, in this most fundamental case, motion appears as rest, and rest appears as motion. No resemblance, no shared properties there. The relationship between reality and its appearance here would have to be understood in a much more complicated way. Galileo produces a massively productive and effective mathematized way of conceiving physical reality, in which periods of time appear as the lengths of lines and accelerations as the areas of triangles. The model of resemblance is of no help in understanding *this* crucial form of appearance. The notion of shared property that would apply would have to be understood in terms of the relations between this sort of mathematized (geometrized) theoretical appearance and the reality it is an appearance of. There is no antecedently available concept of property in terms of which that relationship could be understood.

Descartes came up with the more abstract metaconcept of representation required to make sense of these scientific achievements—and of his own. The particular case he generalized from to get a new model of the relations between appearance and reality (mind and world) is the relationship he discovered between algebra and geometry. For he discovered how to deploy algebra as a massively productive and effective appearance of what (following Galileo) he still took to be an essentially geometrical reality. Treating something in linear, discursive form, such as “ $ax + by = c$ ” as an appearance of a Euclidean line, and “ $x^2 + y^2 = d$ ” as an appearance of a circle allows one to calculate how many points of intersection they *can* have and what points of

intersection they *do* have, and lots more besides. These sequences of symbols do not at all *resemble* lines and circles. Yet his mathematical results (including solving a substantial number of geometrical problems that had gone unsolved since antiquity, by translating them into algebraic questions) showed that algebraic symbols present geometric facts in a form that is not only (potentially and reliably) *veridical*, but conceptually *tractable*.

In order to understand how strings of algebraic symbols could be useful, veridical, tractable appearances of geometrical realities (as well as the Copernican and Galilean antecedents of his discoveries), Descartes needed a new way of conceiving the relations between appearance and reality. His philosophical response to the scientific and mathematical advances in understanding of this intellectually turbulent and exciting time was the development of a concept of representation that was much more abstract, powerful, and flexible than the resemblance model it supplanted. He saw that what made algebraic understanding of geometrical figures possible was a *global isomorphism* between the whole system of algebraic symbols and the whole system of geometrical figures. That isomorphism defined a notion of form shared by the licit manipulations of strings of algebraic symbols and the constructions possible with geometric figures. In the context of such an isomorphism, the particular material properties of what now become intelligible as representings and representeds become irrelevant to the semantic relation between them. *All* that matters is the correlation between the rules governing the manipulation of the representings and the actual possibilities that characterize the representeds.

In the old picture, one could compare a thought and thing thought about individually, to see whether they share any properties and in so far such resemble one another. Resemblance makes sense atomistically, case by case. In the new picture, one will get nowhere by comparing a particular discursive equation with the extended geometrical figure it represents. For the relation between them is in principle intelligible only globally, holistically, by looking at the systematic structural relations between *all* the representings and *all* the representeds. Inspired by the newly emerging forms of modern scientific understanding, Descartes concluded that this *representational* relation (of which resemblance then appears merely as a primitive species) is the key to understanding the relations between mind and world, appearance and reality, quite generally. The shift from local, atomistically assessable resemblances to global, only holistically

assessable isomorphisms is what opens up for the first time the possibility of global skepticism—the question of how we could *know* whether our thoughts stand in such an abstract representational relation to the things we aspire to be thinking about.

The conceptual sea-change from thinking in atomistic terms of local *resemblance* to thinking in holistic categories of global *representation* was a fabulous, tradition-transforming idea, and everything Western philosophers have thought since (no less on the practical than on the theoretical side) is downstream from it, conceptually, and not just temporally—whether we or they realize it or not.² But the representational revolution was a house of many mansions. Enlightenment epistemology was always the home for two somewhat uneasily coexisting conceptions of the conceptual. The fundamental concept of the dominant and characteristic understanding of cognitive contentfulness in the period initiated by Descartes remained *representation*. However there is a minority semantic tradition that takes *inference* rather than representation as its master concept.

Rationalists such as Spinoza and Leibniz accepted the central role of the concept of representation in explaining human cognitive activity. But they were not prepared to accept Descartes' strategy of treating the possession of representational content as an unexplained explainer—just dividing the world into what is by nature a representing and what by nature can only be represented. From their point of view, Descartes failed to follow up appropriately on his original holistic insight. Perhaps frightened by the spectre of skepticism the representational revolution raised, he ended up treating the possession of representational content as a primitive inexplicable feature of a special kind of stuff: mental stuff. Inert stuff like marks on paper, which did not have the special ontological property of self-conscious representationality, only got to have representational features by inheriting them from the thinkers who used them.

Spinoza and Leibniz each developed instead an account of what it is for one thing to represent another, in terms of the *inferential* significance of the representing. They were

² The idea of couching this story as the transition from a model of *resemblance* to one of *representation* is from the first chapter of my long-time colleague John Haugeland's *Artificial Intelligence: The Very Idea* [MIT—Bradford Press, 1989].

explicitly concerned, as Descartes was not, to be able to explain what it is for something to be understood, taken, treated, or employed *as* a representing *by* the subject: what it is for it to be a representing *to* or *for* that subject (to be "tanquam rem", as if of things, as Descartes puts it). Their idea was that the way in which representings point beyond themselves to something represented is to be understood in terms of *inferential* relations among representings. States and acts acquire content by being caught up in inferences, as premises and conclusions. In the order of explanation they pursued, there is something more fundamental than representational relations, in terms of which such relations are to be understood. What is more fundamental, for them, is *reason*, in the form of the activity of *reasoning*.

Thus a big divide within Enlightenment epistemology concerns the relative explanatory priority accorded to the concepts of representation and inference. The British empiricists were more puzzled than Descartes about representational purport: the property of so much as seeming to be *about* something. But they were clear in seeking to derive rational inferential relations from the contents of representings, rather than the other way around. In this regard they belong to the still-dominant tradition that reads inferential correctnesses off from representational correctnesses, which are assumed to be antecedently intelligible. That is why Hume could take for granted the contents of his individual representings, but worry about how they could possibly underwrite the correctness of inductive inferences. The post-Cartesian rationalists, the claim is, give rise to a tradition based on a complementary semantically reductive order of explanation. (So Kant, picking up the thread from this tradition, will come to see their involvement in counterfactually robust inferences as essential to empirical representations having the contents that they do.) These *inferentialists* seek to define representational properties in terms of inferential ones, which must accordingly be capable of being understood antecedently. They start with a notion of content as determining what is a *reason* for what, and understand truth and representation as features of ideas that are not only manifested in, but actually *consist* in their role in reasoning. I actually think that the division of pre-Kantian philosophers into representationalists and inferentialists cuts according to deeper principles of their thought than

does the nearly coextensional division of them into empiricists and rationalists, though it goes far beyond my brief to argue for that thesis here.³

II. Leibniz as Semantic Inferentialist

The concept of representation is at the center not only of seventeenth-century theories of knowledge but of their corresponding ontologies as well. Descartes was impressed and illuminated by mathematical innovations that enabled, on the one hand, a precise geometrical account of the optical transformations of figures and images in vision and, on the other, the formally adequate representation of such geometrical situations by nonspatial, discursive expressions in coordinate algebras. God aside, the real was for him accordingly divided into the purely geometrical realm of extension and the realm of thought (taking algebra as its model), which represents what is extended. Leibniz, with a reservation of profound consequence for subsequent German idealism, would deny metaphysical reality to what is representable but not itself a representing.

Leibniz defines perception as:

“the representation or expression of the many in the one.”⁴

On this basis, he adumbrates a metaphysical system whose primary features follow from the doctrine that to be is to perceive. Put in his inherited terminology, monads alone are true substances, and perception is their fundamental attribute. Perceivings, the modifications of substances in that attribute, are monadic properties.⁵ Relations, for example, spatial ones, cannot *be* perceivings, but are rather merely perceivable, as features of the multiplicity that is unified in

³ I discuss the topics of the title in “Semantic Inferentialism and Logical Expressivism,” which is Chapter One of *Articulating Reasons* [Harvard University Press, 2000]. This discussion includes further ideas about what to make of these Leibnizian ideas in contemporary philosophical theorizing.

⁴ G, 2:121,311; 3:69, 574; 6:598, 608; 7:317, 529.

⁵ I ignore here appetitions, which while also modifications of the attribute of perception, as differentials of perceivings (their tendencies to give rise to one another) are in a double sense *derivative* modifications.

a single perception. As nonperceiving creatures of perception, space, time, and matter—no less than color and odor—are relegated to the second-class metaphysical status of “true phenomena.”⁶ As merely represented and not representing, they are appearances, and not real.

Leibniz says that in general,

“One thing expresses another. . .when there is a constant and regulated relation between what can be said of the one and of the other.”⁷

Favorite examples are the relations between a map and the corresponding geographical region and between a miniature model of a machine and the machine itself. As indicated above, the specific difference defining *perceptual* representations is that in perception a multiplicity is expressed in a unity. Another key claim is that

Each monad (indeed, each set of contemporaneous perceptions of any monad) expresses its whole world.⁸

This is the Tennysonian “flower in the crannied wall” doctrine occasionally glossed by the claim that a perfect intelligence could deduce every feature of the universe from consideration of the perceptions of a single monad. A fourth structural claim is that

Perception comes in *degrees*, variously referred to as degrees of perfection or distinctness.

It is these “degrees of distinctness of perceptions” that distinguish each monad from every other. They all “express the whole world,” but each does so differently.

So the last of these features is of cardinal metaphysical importance, since it is explanatorily responsible both for the diversity of points of view of the monads and for the pre-established harmony between them that is Leibniz’s systematic synthesis of the principles of

⁶ See J. Earman, “Perceptions and Relations in the Monadology,” *Studia Leibnitiana* 9, no. 2 (1977): 212-30.

⁷ *G*, 2: 112, a letter to Arnauld. See also M. Kulstad, “Leibniz’ Concept or Expression,” *Studia Leibnitiana* 9, no.2 (1977): 55-76.

⁸ *D*, 9; *M*, 62.

unity and of maximal multiplicity. Leibniz explains the relation between the diversity of monadic perspectives and the expression by each of its whole world in the *Monadology*:

The nature of the monad being to represent, nothing can limit it to representing only a part of things, though it is true that its representation is merely confused as to the details of the whole universe, and can be distinct for a small part of things only.... they are limited and distinguished from each other by the degrees of their distinct perceptions.⁹

In this passage, the metaphysical differentiation of the monads is displayed as rooted in *epistemic* differences between perceptions, ranged along a dimension from “distinct” to “confused.”¹⁰ The same doctrine is put in slightly different terminology in the *Discourse*, twenty-eight years earlier:

Thus a substance, which is of an infinite extension insofar as it expresses all, becomes limited in proportion to its more or less perfect manner of expression.¹¹

As I understand Leibniz, the expressive or representative nature of perception consists in the fact that from the existence of the modification of some monad which is a perceiving can be *inferred* the existence of various modifications of its own monad and of others.¹² That the relation between expression and expressed is an inferential one is suggested by several of Leibniz’s formulations, for instance, his earliest definition of mathematical expression:

What is common to all these expressions is that we can pass from a consideration of the relations in the expression to a knowledge of the corresponding properties of the thing expressed.¹³

⁹ *M*, 60.

¹⁰ The home language-game of the distinct/confused distinction, perhaps more in Leibniz scholarship even than in Leibniz himself, applies to *ideas*, not *perceptions*. That distinction is qualitative, whereas it is of the essence of the view I am attributing to Leibniz that when those terms are applied to perceptions the distinction is quantitative in admitting of degrees. (It does not, however, induce a total ordering on the expressive ranges of perceptual modifications.) I am here summarizing the story I develop and argue for in more detail in “Leibniz and Degrees of Perception,” Chapter Five of my *Tales of the Mighty Dead: Historical Essays in the Metaphysics of Intentionality* [Harvard University Press, 2002].

¹¹ *D*, 15.

¹² See “Leibniz and Degrees of Perception,” *op. cit.*.

¹³ *G*, 7:263.

It is natural to take such “passage” from one consideration to knowledge of something else as inference. What is important about a map or a model is that we can make appropriate inferences concerning features of the mapped or modeled thing from observations concerning the features of the map and model.

I take it that the many-in-one formula also means that *each* perception expresses a variety of facts about its universe. Expressive content is an intrinsic feature of perceptions, each of which has its own content or set of attributes deducible from its occurrence. Deductive relationships in Leibniz’s universe are always an expression of its fundamental *lawfulness*. For Leibniz, whenever an inference can be made, it is according to an underlying rule or regularity. For conic sections, laws of geometrical projection underwrite the inferences in virtue of which one expresses another. For perceptions, the pre-established harmony of the modifications of one monad with the modifications of others makes possible the inferences that give perceptions their expressive contents.

So a perception provides its monad with information about the rest of the world only insofar as the pre-established harmony provides principles (laws of Nature) which permit inferences from the occurrence of this particular perception, rather than any other possible one, to conclusions about facts outside that monad. Leibniz’s phenomenalism entails that the deductive relations between perceptions implied by the pre-established harmony are reflected by deductive relations between those perceptions and features of the phenomenal things which appear to the perceiving monad as their objects. These perceptions are distinguishable, since no two of them have the same expressive range. The monads these perceptions modify are accordingly distinguishable as well, since they are qualified by distinguishable modifications. Yet each monad expresses *every* feature of its world, since for each monad there is no accident not expressed by some one of its perceptions. Each complete set of monad’s contemporary perceptions has the whole set of its world’s real accidents as the union of the expressive ranges of its perceptions. But the distribution of more and less inclusive expressive ranges over that set of perceptions differs from monad to monad. It is these differences in the distinctness (inferential potential) of the individual perceptions that jointly express the whole world, which distinguish the various monads.

Bertrand Russell famously thought of Leibniz as having developed to the fullest extent possible the traditional logic of subject and predicate, corresponding to a world construed in terms of substances and their monadic properties.¹⁴ He contrasted that logic with the new quantificational logic of polyadic relations. Because of his benighted logic, Russell thought, Leibniz could not construe *any* relations as metaphysically real. We are now in a position to see that he was only half right. To be sure, Leibniz presents us metaphysically with a world consisting of monads and their monadic attributes or perceptions. But what makes them *real*, in a way that spatial and temporal relations and secondary qualities like colors are not, is precisely that they stand in representational perceptual relations to one another. They are real *as* perceivers, *as* representationally related to everything else that is real. What is true is that the *only* metaphysically fundamental relations are *rational* relations among perceptions, in particular, the *inferential* or *consequential* relations between the perceptions of one monad and all the perceptions of all the monads. Those relations are codified in the *system of laws* that would permit God to *deduce* the modifications of all the monads from the modifications of any one of them (what he called its “individual concept”). Leibniz’s metaphysics is thoroughly and essentially representational, and he understands representational contentfulness, the way representings point beyond themselves to something represented, in *semantic inferentialist*, hence holistic relational, terms. It is not that Leibniz cannot make sense of relations, it is that he takes only *rational, inferential* relations to be ultimately real, as articulating the *representational* character of the various degrees of mindedness exhibited by monads.

III. Leibniz’s Perspectivism

Leibniz’s rationalism as semantic inferentialism is developed into a distinctive and original resolution of the Parmenidean metaphysical problem of the Many and the One. Leibniz’s universe is a *universe*, a unity whose parts, the individual monads, are indissolubly bound to one another. But his is neither the extreme atomist’s “bucket of shot” model nor the extreme monist’s “bowl of jelly” model. We can distinguish four grades of metaphysical relational involvement, and we will find that Leibniz endorses the most committive of these. But he

¹⁴ In his book, *A Critical Exposition of the Philosophy of Leibniz*, [Cambridge University Press, 1900].

neither dissolves the whole into its parts nor the parts into the whole. If we transpose what I am calling “grades of metaphysical relational involvement” into a semantic key (in keeping with my suggestion that his semantic inferentialism is at the base of Leibniz’s rationalist metaphysics), they take the form of four grades of intensionality.

Modal intensionality: What is true at *one* point of semantic evaluation (in Leibniz’s case, what attributes or perceptions one monad has) can depend on, and so conveys information about, something that is true at some *other* point of semantic evaluation.

Holistic intensionality: What is true at *one* point of semantic evaluation can depend on, and so convey information about, what is true at *any other* point of semantic evaluation.

Holographic intensionality: What is true at *one* point of semantic evaluation depends on, and so conveys information about, what is true at *lots of other* points of semantic evaluation.

Monadological intensionality: What is true at *one* point of semantic evaluation depends on, and so conveys information about, *everything* that is true at *every other* point of semantic evaluation.

We can see that Leibniz is thinking about *all* of these, because his reading, generalization, and development of Descartes’s global isomorphism claim is monadological, encompassing *all* of the lower grades. In fact (though I will not give examples) he argues for each of the intermediate claims, on the way to the *Monadology*. The rational laws that articulate the universe would permit God to infer everything that is true of *every* monad, all its attributes or modifications, from what is true of *any* one of those monads. If *any* monad had *any* perception other than the ones that it actually has, *every* monad would have different perceptions than it actually has (though perhaps so confusedly and indistinctly that *it* could not tell the difference, God would still be able to do so). This claim is in principle compatible with its being the *same* set of laws inferentially relating all those representings-of-representings in every other possible world.

What keeps the monads that are the parts of the universe from dissolving into that tightly bound whole is that they are distinguished from one another by the different *perspectives* on the whole that each affords. In virtue of representing some aspects of the universe more distinctly, and others less so, each constitutes a unique *point of view* on the whole. Each is a view *of the whole*, but each is a *different* view of it.

It is true that the same thing may be represented in different ways; but there must always be an exact relation between the representation and the thing, and consequently between the different representations of one and the same thing. The projections in **perspective** of the conic sections of the circle show that one and the same circle may be represented by an ellipse, a parabola and a hyperbola, and even by another circle, a straight line and a point. Nothing appears so different nor so dissimilar as these figures; and yet there is an exact relation between each point and every other point. Thus one must allow that each soul represents the universe to itself according to its **point of view**, and through a relation which is peculiar to it; but a perfect harmony always subsists therein.¹⁵

Each substance expresses the universe as a whole, but one does it more distinctly than another, each one pre-eminently with regard to certain things and according to its **point of view**.¹⁶

[E]ach substance by itself expresses in itself the whole universe; it mirrors perfectly, from its own position or point of view, even though this combining of an infinite number of things in each one prevents it from having a distinct understanding of them.¹⁷

¹⁵ *Theodicy* (1710), §357.

¹⁶ Leibniz to Arnauld (1690), L 360.

¹⁷ Draft of New System of the Nature of Substances, (NS 25). Consider also this, from the 1704 *New Essays on Human Understanding*:

“This knowledge of insensible perceptions also explains why and how two souls of the same species, human or otherwise, never leave the hands of the Creator perfectly alike, each of them having its own inherent relationship to the **point of view** which it will have in the universe. But that follows from what I have already said about to individuals, namely that the difference between them is always more than numerical” (58).

In a letter from Leibniz to Sophie Charlotte of 1706:

“Each soul is a world in miniature, representing external things according to its point of view, and confusedly or distinctly according to the organs that accompany it, in contrast to God who contains everything distinctly and eminently,”

“Thus through souls, which are so many mirrors, the author of things has found the way to multiply the same universe, so to speak, that is to say to vary the views: as a single city appears differently according to the different places from which one can view it” (GP VII 566-67).

And from the *Metaphysical Consequences of the Principle of Reason*, around. 1712:

“[§10] Therefore, since every organic body is affected by the entire universe by relations which are determinate with respect to each part of the universe, it is not surprising that the soul, which represents to itself the rest in accordance with the relations of its body, is a kind of mirror of the universe, which represents the rest in accordance with (so to

This metaphysical construal of the *parts* of the universe as consisting of *perspectives* on it, each from its own *point of view*, is distinctively Leibnizian. It characteristically both develops an intellectual preoccupation of his time and opens the door to a host of ideas pursued by later thinkers.

Achieving mastery of the theoretical and practical intricacies of visual perspective is one of the landmark events in the intellectual history of the West. For those who brought it about, this development had the significance of an advance on all fronts, a transformation of sensibilities and possibilities—the opening of a portal wide enough for a mathematized optical theory and a humanized artistic practice to pass through abreast. (When since have the occupants of something like these corners of the culture commonly felt themselves to be pulling in the same direction and working on the same problems?) The spectacular success of microscopes and telescopes in extending our perceptual reach led seventeenth century thinkers to renewed emphasis on sight as a metaphor for cognition, a conception familiar already from Plato. Although perennially suspect in theory, ocular models of knowing and understanding have played central roles in epistemological practice and discourse ever since.

The systematic understanding of visual perspective offers philosophers a permanent invitation to use it as a model for other things—as Leibniz’s example shows. In the centuries after his inaugural effort, philosophers have found it particularly tempting to use visual perspectives as the basis for the development of an account of cognitive or conceptual perspectives, more generally—an undertaking which, if successful, would redeem in detail the epistemological promise of exploiting seeing as the archetype of knowing. People have found it retrospectively irresistible to appeal to this model in understanding Leibniz’s admirer Kant, for instance.¹⁸ One possible benefit of cognitive perspectivism lies in the prospect that this quintessentially renaissance trope could serve as a template for reconciling enlightenment universalism (one world viewed by all) with romantic particularism (each of us with our own view of it). Though visions are many, the visible may yet be one. Nietzschean perspectivism

speak) its point of view—just as the same city presents, to a person who looks at it from various sides, projections which are quite different” (176).

¹⁸ A relatively recent example is A.W. Moore’s *Points of View* [Oxford University Press, 1997].

predictably rejects this irenic aspiration, in favor of a picture that is conceptual perspectives all the way down, unanchored in any nonperspectival realm of fact.

The theorist who wants to extend the well worked out perspectival model of *visual* appearings to another realm, in particular to explain the relationship between reality and its *conceptual* appearings in thought and language incurs certain fairly determinate conceptual obligations. Making that analogy work requires an account of the structure of the space of possible ‘points of view’ that explains how the cognitive or conceptual ‘appearance’ of things—how they are taken to be by believers occupying different points of view—both depends on how they really are, and varies systematically from one point of view to another. Gombrich taught us a generation ago that perspectival painting is not in principle truer, more informative, or less conventional, than medieval or oriental painting. It is distinguished rather by strict adherence to the convention that it convey all and only the visual information made available at a time to an observer by lines of sight that converge on a single point in space. Mastery of the conventions of perspectival drawing is precisely mastery of the systematic variations in that information, within lines of sight available from one point of view, and across lines of sight from different points of view that nonetheless converge on a single viewed object. A notion of perspective or point of view extended analogically from vision to thought or belief will be contentful just to the extent to which it tells us how the ‘place’ one occupies in the structured space of believers systematically affects what sort of beliefs are accessible.

Leibniz is fully aware of these obligations as they concern the use that he makes of the model—not just the metaphor—of visual perspectives. Using the precisely if abstractly structured model of perspectives or “points of view” obliges one to make sense of the *function* that maps different points of evaluation (in Leibniz’s case, monads) onto the different perspectives they occupy. This means saying what information about the objects on which they have a perspective is available from their perspective. This is exactly what Leibniz’s story about monads as individuated by the degrees of distinctness of the expressive ranges of each of their perceptual modifications does when it is combined with a story about the inferential derivability relation that relates those occupied perspectives to the *other* points of evaluation (likewise individuated by the characteristic expressive ranges of *their* representings) *on* which they thereby

count as perspectives. The “space” in which the various “locations” of points of view and objects on which they are points of view (in Leibniz’s case, both being monads) are to be found is structured by the system of laws that permit inferences to be made (perhaps only by God) from the properties of one monad to the properties of all the monads. The “space” occupied by Leibniz’s monads *is* what Wilfrid Sellars called the “space of reasons.” For it is those inferential relations in virtue of which the modifications of monads stand in *representational* relations to the modifications of other monads, just as it is the possibility of making inferences from map-facts (there is a wavy blue line between these two black dots) to terrain-facts (there is a river between Pittsburgh and Philadelphia). Leibniz’s rationalism in the form of semantic inferentialism about representational relations provides him the cash needed to turn the *metaphor* of many visual perspectives on one object into a working conceptual *model* of how a multiplicity of monads should be understood as related to the unified world that they each in their distinctive way represent.

It is then ironic, in a deep, metaphysical sense of ‘ironic’, a sense that would reverberate through some of the most interesting philosophy of the coming ages, that the upshot of Leibniz’s perspectival rationalism should be to relegate the physical space in which visual perspectives are made intelligible, the fixed end of his metaphysical analogy, to the realm of mere appearance. *Spatial* relations are mere dark, confused shadows in the realm of appearance of the *rational* inferential relations (underwriting abstract representational ones) that articulate the perceptual attributes that individuate the monads in the realm of reality. One and a half centuries later, after Kant’s designation of Newtonian space and time as only empirically real and transcendently ideal, Hegel would understand Natur as the body of Geist, the flattened and obscured immediate image of a reality that is through and through *conceptually*, which is to say *rationally* in the sense of “inferentially” structured (“mediated”) reality.

IV. Leibniz’s Logical Expressivism

I have been talking so far about the intimate relations between two of the Leibnizian master-ideas of my title: *semantic inferentialism* about representational content and *metaphysical perspectivism* about the relations between the unity of the universe and the multiplicity of its parts. Leibniz combined them with a third innovative idea: an *expressivist* approach to the nature and function of logic. By “*logical expressivism*” I mean the view that the characteristic role distinguishing logical concepts and logical vocabulary is an expressive one. More specifically, the distinctive expressive role of logical language is to make explicit what is implicit in practices of reasoning, paradigmatically inferential practices. Leibniz’s most explicit development of this idea comes in the form of his project for a “*characteristica universalis*.” This would be a perspicuous formal language that presents a full analysis of each concept into its components. The perspicuous *language* is to be mathematical, but it is envisioned as being capable of expressing *all* concepts (hence its “universality”)—or at least all concepts that are sufficiently distinct, such as those of physics, metaphysics, morality, and theology—not just mathematical ones. Leibniz thinks that a broadly algebraic language can in principle achieve in his time what Raymond Lully had imagined as the *ars magna* four hundred years earlier.

A longstanding puzzle and controversy among readers of Leibniz concerns the relation between this project of using a logical language to express and analyze the contents of concepts generally, on the one hand, and another project central to Leibniz’s conception of logic. This is the idea of logic as formalizing a canon of right reasoning. It is Leibniz’s idea of logic as a “*calculus ratiocinator*.” This calculus would “allow us to reason in metaphysics and morals as we do in geometry.” Rational consequences would be derived computationally, so that if a disagreement arose, the parties could resolve it with the same certitude as they would expect in an arithmetical dispute, advancing under the slogan “Let us calculate.” The question is exactly how the conception of logic as providing a *characteristica universalis* should be understood as fitting together with the conception of logic as affording a *calculus ratiocinator*. Husserl, for instance, denies that they can be combined at all, accusing Leibniz of a fundamental confusion on this point.¹⁹ Jaakko Hintikka seconds this view, and sees the disjunction and disconnection

¹⁹ In his review of Schröder’s *Lectures on the Algebra of Logic*, (in Edmund Husserl. *Aufsätze und Rezensionen (1890-1910)*, *Husserliana XXII*. Bernhard Rang, ed. [Martinus Nijhoff, 1979]), which he sent to Frege as part of their correspondence.

between them as symptomatic of a continental divide in approaches to logic.²⁰ Others, such as Couturat, Russell, and Rescher, have seen these as two different parts of what Leibniz conceived as a single project, but have disagreed substantially about how to characterize and defend the unity of that project.²¹

The intimate connection between the logical expressivist project of a *characteristica universalis* and the project of a logical *calculus ratiocinator* immediately becomes visible if we keep in mind Leibniz's semantic inferentialism about conceptual content (including its representational dimension). From the one direction, suppose one had a calculus that let one compute the correct inferences in which any concept figured. Since semantic inferentialism claims that conceptual content just *is* inferential role, a calculus that computes inferential roles thereby articulates conceptual contents. The language of the *calculus ratiocinator* must permit the analysis of concepts, in order to determine the correctness of inferences involving them. It must, in short, serve also as a *characteristica universalis*. Coming at things from the other direction, semantic inferentialism counsels that a universal characteristic, a Fregean *Begriffsschrift*, can perspicuously express conceptual contents only by codifying inferential roles. But to do that requires perspicuously sorting inferences into good ones and bad ones. That is, it supports a *calculus ratiocinator*. In both cases, the inferences being codified are not to begin with specifically *logical* inferences, but those pertaining to the particular subject matters of the concepts involved—be they those of physics, metaphysics, or morals. The job of logical vocabulary is to *express* those semantogenic inferences. Doing that provides *both* a universal characteristic and a calculus for reasoning that makes explicit what otherwise remains implicit in practices of right reasoning about every sort of *nonlogical* topic.

²⁰ In *Lingua Universalis vs. Calculus Ratiocinator: An Ultimate Presupposition of Twentieth Century Philosophy* [Springer, 1996]. See also Peckhaus, Volker "Calculus Ratiocinator Versus Characteristica Universalis? The Two Traditions in Logic, Revisited" *History and Philosophy of Logic*, 25:3-14.

²¹ Louis Couturat, *La Logique de Leibniz* [F. Alcan, Paris, 1901]. Bertrand Russell, op. cit.. Nicholas Rescher, 1954, "Review of *On the Project of a Universal Character* by Jonathan Cohen," *Journal of Symbolic Logic* 19: 133.]: "Leibniz's program of a universal science (*scientia universalis*) for coordinating all human knowledge into a systematic whole comprises two parts: (1) a universal notation (*characteristica universalis*) by use of which any item of information whatever can be recorded in a natural and systematic way, and (2) a means of manipulating the knowledge thus recorded in a computational fashion, so as to reveal its logical interrelations and consequences (the *calculus ratiocinator*)."

V. Now: A Perspectival Monadologic

So far I have been talking about the three Leibnizian master-ideas of my title, semantic inferentialism, logical expressivism, and metaphysical perspectivism, as they show up in their native Leibnizian forms. My interest in them is not merely antiquarian, however. I am also interested in how those ideas might be pursued today, to further illuminate the topics they address. For those *topics* are, I think, of perennial interest. Are Leibniz's ideas those topics still of value? What could be made of them today? In the remainder of this essay I want to sketch one way forward, a way of working out these ideas that has already led to some results that might be of interest. I will focus on a way of applying logical expressivist ideas against the background of semantic inferentialism that turns out to have a surprising perspectivist outcome.

A contemporary heir of the semantic inferentialist idea need not adopt it in the strong rationalist form Leibniz endorses, which takes inferential role to characterize semantic content exhaustively, including its representational dimension. A weaker semantic inferentialism takes it that the inferential role of a concept is an essential component of its conceptual content. Even that weaker thesis encourages the thought that *mathematically codifying inferential roles* is a core project of formal semantics. Logical expressivism urges us not to think of the inferences that articulate those roles as themselves *logical* inferences. They are *rational* inferences, embodying what is a reason for what. But they are in general the inferences that articulate the conceptual content expressed by *nonlogical* vocabulary: the vocabulary of physics, or horticulture, or geography. Inferences like that from "The coin is pure copper," to "It will melt at 1085° C.," or from "That boat is a ketch," to "Its foremast is taller than its mizzenmast," are not *logically* good inferences. Their goodness depends on the content of the nonlogical concepts copper and ketch. They are, in Wilfrid Sellars's phrase, "*materially* good inferences."

The weak semantic inferentialist then thinks of at least a central dimension of conceptual content as articulated by a generalized material consequence relation. If a conclusion A stands in that relation to a set of premises Γ , we can express that by writing $\Gamma \sim_0 A$. Logical expressivism is the idea that the expressive role distinctive of logical vocabulary is to make explicit within the language the broadly inferential relations in virtue of which *nonlogical* vocabulary has the

conceptual content it does. The bit of logical vocabulary that most immediately expresses relations of inferential consequence or implication is the *conditional*. We can extend a nonlogical base language by recursively adding conditional sentences of the form $A \rightarrow B$, and can extend the original consequence relation according to the rule $\Gamma \sim A \rightarrow B$ if and only if $\Gamma, A \sim B$. That is, a premise-set implies a conditional just in case the result of adding the antecedent of the conditional to the premise-set implies the consequent of the conditional.²² We can also add conjunction, by the rules that $\Gamma \sim A \& B$ if and only if $\Gamma \sim A$ and $\Gamma \sim B$, and $\Gamma, A \& B \sim C$ iff $\Gamma, A, B \sim C$. The conditional sentences we have added to the language now make it possible to *say* explicitly *in* the logically extended object language *that* some implications hold—implications that before we could only express in the metalanguage. If, as the semantic inferentialist claims, those relations articulate the contents of nonlogical concepts, then the introduction of the conditional as a bit of *logical* vocabulary perspicuously represents crucial semantogenic implication relations that hitherto were only implicit. A substantial step has been taken in the direction of a *characteristica universalis*.

We can think about the result in terms of the four grades of intensionality I mentioned in expounding Leibniz's views. The *points of semantic evaluation* in this case are just premise-sets Γ . What such a premise-set implies, its consequences, (A such that $\Gamma \sim A$) can be thought of as what is *true at* that point of semantic evaluation. Then the conditional is *modally intensional*. For whether a conditional $A \rightarrow B$ is true at (implied by) Γ depends not just on what follows from Γ , but also on what follows from Γ together with the antecedent of the conditional. Put otherwise, looking at the conditionals implied by Γ encodes into the implications of Γ information about the implications of Γ 's neighbors in the space of points of semantic evaluation. Everything that is true at Γ 's neighbor Γ, A is codified into the logically complex consequences of Γ , in the form of conditionals with A as their antecedent. So what is implied by

²² If the original material consequence relation is *reflexive*, in the sense that $\Gamma, A \sim_0 A$, conditionals can be added according to this rule so that the resulting, logically extended, consequence relation over the language that has been extended by adding conditionals is still reflexive (in that $\Gamma, A \rightarrow B \sim A \rightarrow B$) and also conservative, so that if Γ_0 and A_0 are both in the original base language L_0 , $\Gamma_0 \sim A_0$ iff $\Gamma_0 \sim_0 A_0$. And this is so even if reflexivity is the *only* structural rule imposed on the generalized consequence relation. In particular, reflexivity and conservativeness are preserved even if the underlying prelogical implication relation is, as material consequence relations in general are, nonmonotonic, in the sense that it does *not* satisfy Weakening: the principle that if $\Gamma \sim_0 A$, then $\Gamma, B \sim_0 A$. All this also holds when we add conjunction.

Γ in the logically extended setting depends on what is true at other points of semantic evaluation. The conditional is in that sense a modal operator.

And it is not only neighboring premise-sets that differ from Γ only by the addition of a single additional premise A whose implications are now encoded in the logically complex consequences of Γ . Conjunction allows the encoding of the implications of premise-sets that are supersets of Γ resulting from the addition of any finite number of additional premises. For Γ together with any such set of additional premises $\{A_1 \dots A_n\}$. For $\Gamma, A_1 \dots A_n \vdash B$ just in case $\Gamma \vdash \sim(A_1 \& \dots \& A_n) \rightarrow B$. It follows that the conditional is not only *modally* intensional, but also *holographically* intensional. For the logically complex consequences of a premise-set Γ now encode information about every superset of Γ that is only finitely different from it. However, it is not *holistically* intentional. For what conditionals are true at (implied by) a point of evaluation (premise-set) Γ does *not* depend on what is true at or implied by any other premise-sets except those that are larger than Γ . Its implied conditionals carry no information about the implications of premise-sets disjoint from Γ , or that merely overlap it, or that are subsets of Γ . *A fortiori* the logic I am describing is not monadological, since the conditionals implied by one premise set do not carry information about *every* other premise-set.

We can fix that, however. The difficulty is that our conditional, which is based on the standard Ramsey test, looks only *upward* from a given premise-set, to what is implied by *adding* further premises. We can add a further conditional, the dual of the upward-looking one, which looks *down*, to the implications of premise-sets that result by *subtracting* premises. So we can further expand the language by recursively adding sentences of the form $A \rightarrow B$, and extend the consequence relation by stipulating that $\Gamma \vdash A \rightarrow B$ if and only if $\Gamma - A \vdash B$.²³ (If A is *not* an element of Γ , then $\Gamma - A = \Gamma$, and this last condition is equivalent to $\Gamma \vdash B$, just as if A is an element of Γ , then $\Gamma, A = \Gamma$, and $\Gamma \vdash A \rightarrow B$ if and only if $\Gamma \vdash B$.) In the context of this further logically extended consequence relation, each premise-set Γ now incorporates information not only about what is implied by all its supersets, but also about what is implied by all its subsets. And

²³ I haven't said anything about the rules that determine the significance of either conditional on the left of the implication turnstile, that is, as premises. For a full system addressing this concern, consult the Appendix.

because these two conditionals can not only be iterated, but can be combined in complex conditionals that mix the upward and the downward arrows, the complex conditional consequences of each Γ now contain all the information needed to determine everything that is implied by *any* other premise-set Γ' that is only finitely different from Γ .

Logically extending a nonlogical base language with a material consequence relation by adding upward- and downward-looking conditionals and conjunction yields a true *monadologic*: a logic that is a model of Leibniz's monadological universe. We can think of Γ as a set of sentences specifying the attributes of the monad Γ , and A as a sentence saying what follows rationally (given the laws of the universe) from the fact that Γ has just those attributes. Then if Γ implies something of the form $A \rightarrow B$, that tells us that the monad (point of evaluation) that differs from Γ just in adding the attribute attributed by A has B as a consequence. The conditional thereby codifies some of the *representational* content of Γ , what *follows* from Γ having the content it does. The set of all things of the form $A \rightarrow B$ that Γ implies represents something like the expressive range of the attribute A at Γ : a matter of what can be inferred from the presence of A at Γ , or the addition of A to Γ .

In such a setting, each premise-set provides a perspective on the whole universe of premise-sets and their consequences (both material and logical). For the conditionals with conjunctive antecedents at each (finite) premise-set Γ encode all the information needed to derive the consequences of every other (finite) premise-set. Each premise-set constitutes a *distinct* perspective on the whole, since the conditionals each implies differ from one another. The *law* regulating the relations among the perspectives is just the whole (logically extended) consequence relation, and that whole consequence relation is codified in each and every (finite) premise-set. That it is codified *differently* in each premise-set is what distinguishes them as providing different perspectives on that whole.

So this system is a logical model of Leibniz's universe of glittering individual monads, each at once self-contained and reflecting the reflections of all the others, each expressing and representing from its own perspective all the other perspectives, the whole unified and structured

by laws that permit the inference from what is true of any monad to what is true of every monad in the whole universe. The model is model of Leibniz's system of mirrored spheres, mirroring each other, with the light provided by the consequential relations that are here codified in conditionals. We might note in passing that providing a model, in this case, of Leibniz's metaphysics, is a proof of consistency. But, at the risk of moving from the sublime to the mundane, the point with which I wish to close is that there is potentially great utility today for Leibniz's ideas of holographic and indeed monadological representation of information.

A hologram differs from an ordinary photograph in that each part of the hologram carries information about the whole image. So where if one cuts off the corner of a photograph, removing 10% of the representing, one loses 100% of the information about 10% of the represented scene, doing the same to a hologram removes 10% of the information about 100% of the scene, which just becomes a bit lower-resolution. In a monadological representational system, each representing unit carries 100% of the information carried by all of them—though each from a somewhat different perspective. We can use the paired conditional logical model systematically to create holographic, monadological *database structures*.

A database *structure* is the combination of a *universe* of possible databases together with an *inference engine*. A particular universe of possible databases is defined by a language, thought of as a set of sentences (which can be labels of record-structures as complex as one likes). The possible databases relative to that language are just all the possible sets of sentences drawn from it (its powerset). The inference engine is a function that maps each possible database onto a larger set of sentences that are the *consequences* of what is explicitly entered in the database. Those entries are the *explicit* content of the database. What can be extracted from it, added to it, by the application of the inference engine is the *implicit* content of the database: literally, what is *implied* by it. Such an inference engine allows a suitable query system to use the database to answer questions that go beyond what has been explicitly entered into it as data.

Given a universe of all the possible databases generated by a language and the consequence relation defined by an inference engine on that universe, we can use our rules for conditionals to logically extend each database. Doing that will codify the whole material

consequence relation of the inference engine into the content of each extended database. A complex inference engine has been traded in for more data, which represents what follows from *all* the possible databases. So then using an extremely simple purely logical inference engine, the same for each, each database can be queried not only about what is implicit in *its* content, but also about what is implicit in the content of all of its variants that would result from adding further information to the database, or rejecting some information that had been stored there. Each database then includes the whole consequence relation, and all the information from *all* the possible databases. The information is now stored holographically, indeed monadologically.

I offer this new possibility for the architecture of databases plus inference engines only as one small example of how Leibniz's master-ideas of semantic inferentialism, logical expressivism, and informational perspectivism can still be used to show us a way forward today.

End