Systematicity in Kant & Hegel

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One of the more remarkable features of German Idealism is its insistence that science must be *systematic*. Why is this? Here I discuss the idea of systematicity primarily as it appears in Kant and Hegel.[1]

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1 Proper Science

The systematicity of German Idealism stems in large part from its roots in Greek antiquity's conception of a "proper science" (*haplos* $epistēmē$; *scientia propter quid*; *eigentliche Wissenschaft*). This notion of a "science" or "scientia" is often translated with the English term "knowledge" but it is not a term that obviously tracks the work "knowledge" in its contemporary English sense. Occasionally $epistēmē$ is translated as "understanding". This is perhaps more felicitous, since unlike isolated knowledge, a systemic knowing of things is perhaps more akin to our notion of "comprehension" or "understanding".

The conception of science as "properly" understood is very demanding. It is perhaps best to think of it as a kind of epistemic *ideal*. Robert Pasnau, puts the Greek position as exemplified by Aristotle this way:

[1] See also (Ayers 1991a; Forster 1998; Ferrarin 2001; Guyer 2005; Förster 2012; Pasnau 2013, 2018).

> what is most distinctive about Aristotle's conception of $epistēmē$ is his insistence that it involve a grasp not just of a single isolated proposition, but of the whole causal and inferential network of propositions that lie behind it…what he tells us here is that it is easy to make a contribution to $epistēmē$, but very hard to achieve the complete ideal. (Pasnau 2014, 994–95)

So an articulation of a science, properly so called, is going to require knowledge, not just of single truths or propositions, but of a series of *connected* propositions. Moreover, such connection aims to secure two goals. The first is that all known truths are compatible with one another. There is no scientific knowledge that is incompatible with other such knowledge. Second, that scientific knowledge is *derived* from other knowledge within the science (or system). This fits with Aristotle's characterization of a proper science as one that gives understanding of a truth through its ground.

> We suppose ourselves to possess unqualified scientific knowledge of a thing, as opposed to knowing it in the accidental way in which the sophist knows, when we think that we know the cause on which the fact depends, as the cause of that fact and of no other, and, further, that the fact could not be other than it is….The proper object of unqualified scientific knowledge is something which cannot be other than it is. (Aristotle, *Posterior Analytics*, I.2, 71b; (Aristotle 1993, 2))

This derivational constraint sets out two further characteristics of proper science, viz. that it is demonstrative, and that each part is apodictically certain, in virtue of its relation to its ground(s).

More generally, we can set out the characteristics of proper science as follows:

First, proper science is *demonstrative* (i.e. involving demonstration or "*apodeixis*"), in that it is (a) articulable in logical (syllogistic) form and (b) generates conclusions that "follow from" their premises (or are derived from them with necessity). Second, knowledge in a proper science is apodictically certain, in that it is impossible for the conclusion of any demonstrative element of the science to be false while its premises are true. Moreover, every premise in a demonstratively known judgment of proper science is itself either part of a demonstration, or known from itself.[2] Third, such scientific knowledge is *explanatory*, in the sense that (i) each known proposition is the conclusion of a demonstration that thereby provides

[2] See (APo. 72b21–23). For discussion see (Shields 2015); cf. APo 71b33–72a5, Phys. 184a16–23, EN 1095b2–4 (Aristotle and Irwin 1999, 4).

knowledge why, not merely knowledge that; (ii) there is an asymmetric dependence relation between premises and conclusion, such that the order of the premises displays their (metaphysical) priority with respect to the conclusion; (iii) the fact indicated in conclusion is *caused* by the facts indicated in the premises, such that the conclusion is known to hold through its *sufficient metaphysical ground*.

Spinoza gives a nice articulation of these conditions, which he puts in terms of coming to have the (real or metaphysical) *definition* of a thing:[3]

> If the thing be a created thing, the definition, as we have said, must include its proximate cause. For example, according to this rule a circle would have to be defined as follows: a figure described by any line of which one end is fixed and the other movable. This definition clearly includes the proximate cause. The conception or definition of the thing must be such that all the properties of the thing, when regarded by itself and not in conjunction with other things, can be deduced from it, as can be seen in the case of this definition of a circle. For from it we clearly deduce that all the lines drawn from the centre to the circumference are equal. (Spinoza, *Treatise on the Emendation of the Intellect*, 96)

2 Kant on the Systematicity of Science

2.A Kant on Proper Science

For Kant, the term "science" (*Wissenschaft*; *scientia*) always denotes a systematically organized body of cognitions. As he puts it,

[3] Aristotle emphasizes the importance of definition in science. Understanding in science requires appeal to simple real definitions as opposed to compound nominal definitions. Compound definitions denote pseudo-individuals or kinds in the sense that they name items of different categories, most standardly substances and accidents. Hence "musician" is a compound definition denoting a kind of thing—a musical person—which does not have a genuine essence of its own. Musicians are not the kind of thing which are taken to have a common essence which explains why all things of that kind are the way they are (in contrast, say, to "human" or "animal"). No individual goes out of existence by ceasing to be musical (not even a musician, for there are, unfortunately, tone-deaf musicians) while a (human) musician clearly goes out of existence by ceasing to be human. Nominal definitions, in contrast, do allow for distinguishing genuine (as opposed to pseudo) individuals, but do so in a way that fails either to identify the principle attribute of the thing or effect a proper division of its genus. To use an example from Locke (E III.x.17, p.500, 5-10), we consider rational animal a better definition than two legged animal with broad nails because the latter, though (let us say) extensionally correct, fails either to capture the principle characteristic of being human (rationality) or effect a proper division of its genus (animal). For further discussion see (Ayers 1991b, 2:19 ff).

> Every doctrine that is supposed to be a system, that is, a whole of cognition ordered according to principles, is called a science. (MFNS: 4:467)

But not all science is "properly so-called". This means that there are some sciences in name only, while other (e.g. physics) are genuine or "proper" (*eigentlich*) sciences. What is a proper science (*eigentliche Wissenschaft*)? It is a systematically ordered body of cognitions ordered by a principle or set of principles that:

1. organize the subject matter of the science as a whole and delineate it from other subject matter
2. ground with 'apodeictic' certainty the various cognitions that constitute the subject matter of the science
3. ground/explain the universal reach and necessary application of claims made by the science

Here's Kant again:

> What can be called proper science is only that whose certainty is apodictic; cognition that can contain mere empirical certainty is only knowledge improperly so-called….natural science must derive the legitimacy of this title only from its pure part – namely, that which contains the a priori principles of all other natural explanations – and [that is] why only in virtue of this pure part is natural science to be proper science. (MFNS 4:468-9)

To say that the certainty of knowledge in proper science is "apodictic" is to say that it is not only necessary, but that it is known to be so *from its ground(s)*. For Kant, this means that it is a proposition whose truth is judged/asserted as the outcome of an inference, the premises of which articulate grounds sufficient for the truth of the conclusion. In this sense even contingent empirical truths may be known apodictically, since such truths are the outcome of sufficient determining grounds.

2.B Kant's Architectonic

Kant defines "architectonic" as the "art of systems". He contends that systematicity—i.e. systematic unity—is "that which first makes ordinary cognition into science, i.e., makes a system out of a mere aggregate of it" thus "architectonic is the doctrine of that which is scientific in our cognition in general" (A832/B860).

Given Kant's conception of a proper science, we can see why he would thus demand systematicity in the structure of our cognition if it is to be "scientific". Kant explains his position further by relating the conception of science as systematic to that of having an "idea" of the unity of a plurality (or "manifold") of cognitions.

> I understand by a system, however, the unity of the manifold cognitions under one idea. This is the rational concept of the form of a whole, insofar as through this the domain of the manifold as well as the position of the parts with respect to each other is determined a priori. The scientific rational concept thus contains the end and the form of the whole that is congruent with it. (A832/B860)

So all science is based on an "idea"—i.e. a concept of reason—that organizes all of elements of the science as subject. He says, "Nobody attempts to establish a science without grounding it on an idea" (A834/B862). The idea thus *delimits* or *demarcates* the science from other sciences (as well as any mere aggregate of cognition). It also, in so delimiting the science, is the basis through which each cognition is connected (in ground-consequent relations). Thus all of the parts of the science are comprehended through its idea.

Moreover, Kant characterizes this in terms of meeting the ends or needs of reason. He says,

> Under the government of reason our cognitions cannot at all constitute a rhapsody but must constitute a system, in which alone they can support and advance its essential ends. (A832/B860)

So part of the systematicity of science is that it serves the "essential ends" of reason. What are the ends of reason as Kant sees them? Kant says that reason has as its necessary end the sytematic unity of cognition.

> For the law of reason to seek unity is necessary, since without it we would have no reason and without that, no coherent use of the understanding, and, lacking that, no sufficient mark of empirical truth (A651/B679)

More generally, we can say that reason seeks the comprehension of all cognitions under apodictic principles. Part of the functional differentiation of the mind's various capacities requires specifying particular ends determined by the fundamental aims of those capacities in their speculative and practical use—viz. achieving cognition, and ultimately what Kant calls "comprehension" (*Begreifen*), via a priori principles (JL 9:64-5; see also *Dohna-Wundlacken*

Logik 24:730-1 (c. 1792); *Wiener Logik* 24:846 (1780); *Blomberg Logik* 24:132-3, 134-5, 136 (c. 1771)).

So science requires systematicity in part because of the nature of reason itself (viz. its end of comprehending), on which the drive to systematicity and the generation of organizing ideas depends.

A further implication of construing the cognitions of a proper science as comprehended through their idea, is that the subject matter of the science must exhibit a hierarchical explanatory structure, in the sense that there is a fundamental set of characteristics that our knowledge aims at – the "essence" or "nature" of a thing. These characteristics determine what other properties are possible for the thing. So if we know a thing's essence, we can know its other properties from their grounds (i.e. from the essence as the (partly) sufficient causal basis). Hence, on Kant's view we have scientific knowledge when we know something's real essence and understand the connections between the essence and other properties of a thing, as in (e.g.) geometric deduction – where we might know the properties of a circle from the circle's definition as a line whose every point is equidistant from an arbitrary "center" point.

Kant contends that pre-critical metaphysics cannot provide a merely empirical explanation of how we could have knowledge of this hierarchy of properties. On such views, there is no explanation of how we could know substance as substrate—i.e. as that being whose essence determines its various experiencable properties. Certainly, Newton and Locke were in agreement with Kant on this:

> we certainly do not know what is the substance of any thing. We see only the shapes and colors of bodies, we hear only their sounds, we touch only their external surfaces, we smell only their odors, and we taste their flavors. But there is no direct sense and there are no indirect reflected actions by which we know innermost substances (Newton (2004), 91; cf. Locke, E IV.iii.14, 546)

Since Kant *does* contend that we can know the essence of things, as least *insofar as they could be objects of experience*, a science of such things will take the form of elucidating these essences. But Kant also thinks that we can only know the essences of objects of experience because we (i.e. our minds) are the basis or condition of such knowledge. Hence, a characterization of the structure and systematicity of science is simply a reflection of the structure and system inherent in the finite discursive mind. Let's look at this in a bit more detail.

2.C Kant's Science of Nature – General vs. Special Metaphysics

It is part of the contention of the Critical philosophy that a science is only possible in so far as it is based on the conditions of synthetic a priori cognition. Kant argues that the structure of the finite discursive mind sets those conditions. Thus the only proper science is that of the objects of experience—or often simply "nature", whose synthetic a priori conditions may be cognized and ultimately known.

Here's how Kant puts things in the Architectonic of the first *Critique*:

> Metaphysics in the narrower sense consists of *transcendental philosophy* and the *physiology* of pure reason. The former considers only the *understanding* and reason itself in a system of concepts and principles that relate to objects in general, without assuming objects that may be *given* (Ontologia). The latter considers *nature* – i.e., the totality of *given* objects . . . and is therefore *physiology* (although only rationalis)" (A845/B873).

Kant then explains that the latter doctrine (rational physiology) consists in turn of a "metaphysics of corporeal nature" or "rational physics," and a "metaphysics of thinking nature" or "rational psychology" (A846/B874). Kant's explanation of why things are split up this way immediately adverts to his conception of the possibility of metaphysics as grounded in the structure of finite discursive cognition. He says,

> how can I expect an a priori cognition, and thus a metaphysics, of objects insofar as they are given to our senses, and therefore given a posteriori? . . . The answer is: we take no more from experience than what is necessary to *give* us an object – of either outer or inner sense. The former takes place through the mere concept of matter (impenetrable, lifeless extension), the latter through the concept of a thinking being (in the empirical inner representation: I think)" (A847-8/B875-6)

Kant is also clear about this in his later (1785) work *Metaphysical Foundations of Natural Science*. In this work, we again see Kant as distinguishing between transcendental philosophy (i.e. "critique", or the doctrine through which the possibility of metaphysics is articulated), and a metaphysics of nature, which "considers everything so far as it is, on the basis of a priori concepts" (A845/B873). This latter has two parts:

> [A metaphysics of nature] must always contain solely principles that are not empirical (for precisely this reason it bears the name of a metaphysics),

> but it can still either: first, treat the laws that make possible the concept of a nature in general…in which case it is the transcendental part of the metaphysics of nature; or second, concern itself with a particular nature of this or that kind of thing, for which an empirical concept is given, and here such a science must still always be called a metaphysics of nature, namely, of corporeal or of thinking nature. [In this second case] it is then not a general, but a special metaphysical natural science (physics or psychology), in which the above transcendental principles are applied to the two species of objects of our senses. (MFNS 4:469-70; cf. A845-9/B873-7)

So we have:

1. General metaphysics
    - conditions of an object in general
2. Special metaphysics
    - Corporeal nature (physics)
        - conditions of material objects
    - Thinking nature (psychology)
        - conditions of mental objects

General (or Transcendental) metaphysics concerns nature in its 'material' sense, as the sum total of all appearances which stand in lawful connection to one another, in virtue of the principles derived from the activity of the categories of understanding and the forms of sensibility in organizing experience.

> all appearances of nature, as far as their combination is concerned, stand under the categories, on which nature (considered merely as nature in general) depends, as the original ground of its necessary lawfulness (as *natura formaliter spectata*). (B165; cf. B159-60, B164-5, A127; Pr 4:297)

Special metaphysics is distinguished from General metaphysics in three ways:

1. not entirely 'pure' — it depends on empirical concepts (i.e. <matter>, <mind>)
2. extends only to objects of a particular form of intuition (e.g. space, time)
3. depends on the applicability of mathematics

The third condition is especially noteworthy, because it closely connects scientific status with mathematizability. WHy does Kant do this? Here is his argument:

> I assert, however, that in any special doctrine of nature there can be only as much *proper* science as there is *mathematics* therein. For, according to the preceding, proper science, and above all proper natural science, requires a pure part lying at the basis of the empirical part, and resting on a priori cognition of natural things. Now to cognize something a priori means to cognize it from its mere possibility. But the possibility of determinate natural things cannot be cognized from their mere concepts; for from these the possibility of the thought (that it does not contradict itself) can certainly be cognized, but not the possibility of the object, as a natural thing that can be given outside the thought (as existing). Hence, in order to cognize the possibility of determinate natural things, and thus to cognize them a priori, it is still required that the *intuition* corresponding to the concept be given a priori, that is, that the concept be constructed. Now rational cognition through construction of concepts is mathematical. Hence, although a pure philosophy of nature in general, that is, that which investigates only what constitutes the concept of a nature in general, may indeed be possible even without mathematics, a pure doctrine of nature concerning *determinate* natural things (doctrine of body or doctrine of soul) is only possible by means of mathematics. And, since in any doctrine of nature there is only as much proper science as there is a priori knowledge therein, a doctrine of nature will contain only as much proper science as there is mathematics capable of application there. (MFNS 4:470)

Cognizing a thing from its possiblity is cognizing it from its essence,[4] which Kant identifies with the ground of the possibility of a thing.

> Essence is the first inner principle of all that belongs to the possibility of a thing. Therefore, one can attribute only an essence to geometrical fig-

[4] Note that Kant often distinguishes between an essence, so understood, and a *nature*, where the latter is the ground of the *existence* (and not merely possibility) of a thing as determined by universal laws. A Kant puts it:

> If the word nature is taken simply in its *formal* meaning, where it means the first inner principle of all that belongs to the existence of a thing then there can be as many different natural sciences as there are specifically different things, each of which must contain its own peculiar inner principle of the determinations belonging to its existence. (MFNS 4:467; cf. Pr 4:294, 318)

> ures, but not a nature (since in their concept nothing is thought that would express an existence). (MFNS 4:467, note)

Kant then contends that to cognize an essence (or ground of possibility) we must advert to intuition, since the real or metaphysical possibility of a thing cannot be determined solely from concepts. Conceptual representation is necessary but not sufficient for cognition of essence. Kant then argues that cognition of a thing from its ground of possibility (or essence) a priori is tantamount to (or perhaps even identical with) a *mathematical construction* of that thing, since the thing is conceived in terms of features of pure intuition, plus a concept, as, e.g., the cognition of the essence of a circle is acheived in its construction in pure intuition as the "drawing" of a pure line whose every point is equidistant from an arbitrary "center" point.

The importance of mathematical construction for science has a significant consequence. Since Kant construes special metaphysics as being thoroughly mathematically describable, he concludes that the object of inner sense (i.e. the empirical mind or soul) is not going to provide the basis for a proper science, because that object does not admit of mathematical construction.[5] Hence, there is no special metaphysics of mental objects—i.e. psychology is not a proper science.

3 Hegel on the Systematicity of Science

Like Kant, Hegel considers systematicity an essential aspect of science. Indeed, as he puts it, "The true shape in which truth exists can only be the scientific system of that truth" (PS 2:11, §5). This is a stronger claim than that seemingly made by Kant, who argues only that for cognition to achieve the status of a kind of scientific *knowing* it must be part of a system and not merely an aggregate of other cognitions (like a list of names in a phone book). Further on in the preface Hegel clarifies, to some extent, why he holds this stronger position:

> The true is the whole. However, the whole is only the essence completing itself through its own development. This much must be said of the absolute: It is essentially a *result*, and only at the *end* is it what it is in truth. Its nature consists just in this: to be actual, to be subject, or, to be the becoming-of-itself. (PS 2:19, §20)

[5] Why doesn't it? That is a subject of some controversy, but at least one reason seems to be that time has only one dimension, and so lacks sufficient mathematical structure for construction to be possible.

So truth is possible only in the system because truth *is* (in some sense) the system. There is, of course, the question of what this can mean. There are two things that Hegel says that help us here. First, he says,

> In my view, which must be justified by the exposition of the system itself, everything hangs on grasping and expressing the true not just as *substance* but just as much as *subject*. (PS 2:18, §17)

The "true" is both substance and subject. Which is to say that the "true" is *both* the being that is known (substance) and the knower (subject). Hegel also characterizes this as "substance giving itself its self-consciousness, or, its coming-to-be and its reflective turn into itself" (PS 2:25, §28).

Second, Hegel characterizes "truth" as inherently dialectical insofar as it is understood independent of "absolute knowing". This means that what is "true" develops in the course of the development of the system—or what seems to be interchangble with this claim—the development of substance as subject. As Hegel eloquently, if obscurely, puts it, "truth is not a stamped coin issued directly from the mint and ready for one's pocket" (PS 2:30, §39).

If truth is a kind of adequacy, conformity, or equality between knower and known (or subject and substance), then there is the true only by virtue of an entire determinate whole (i.e. the system) rather than any part of it. It is only in the whole that the true as such can be comprehended. The parts of the system in isolation give only unstable "glimpses" of the truth.

So Hegel has one very straightforward explanation of why science must be systematic – it is only the system as such that gives us truth, because only the system as such is fully adequate to how things are.

3.A System and Purpose

Kant conceives of science in terms of the structure of the mind, and demands that science must be organized according to an *idea*. This is very clearly a position that Hegel incorporates into his own philosophy. He says, "Science may organize itself only through the proper life of the concept" (PS 2:38, §53). The concept sets an *end* towards which it (i.e. all reality) strives to develop. The concept organizes the system and expresses it. It is, as possibility or *potentia*, the beginning of the system, and as fully determinate or actual, the end of the system. It aims at an actualization of itself.

So Hegel takes from Kant the idea of science as systematic, and as connected to reason, and also of being expressed in an idea that sets and end that brings unity to the plurality of parts of the science.

Finally, "the concept" as Hegel understands it, exemplifies an important feature of what Kant characterizes as intellectual intuition in the third *Critique*. Kant characterizes *finite* intellectual activity as 'discursive' to denote the manner in which our discursive understanding acts—viz. moving to and fro, from part to part, in building a whole—rather than merely as a synonym for 'conceptual', 'linguistic', or 'rational'. It is this notion he means to indicate in his characterization of the discursive intellect's activity as that of "running through" and "gathering together" (A99) representations. A non-discursive intellect, in contrast, exhibits a whole-to-part grasp of its representations. This means that in an intellectual intuition the content of any representational component is determined by the content of the whole, which the intuitive intellect apprehends "all at once" (*Religion Pölitz* (1783/4), 28:1051) via grasp of what Kant sometimes calls a "synthetic universal" (CPJ 5:407; cf. RP 28:1267; *Metaphysik* L_1 28:328; R 4270, 17:489 (1769–76); R6174 18:478 (1780s)). So the intuitive intellect is non-discursive because it would not engage in the manner of part-to-whole unification characteristic of discursive activity, instead representing all things via its holistic comprehension of the synthetic universal.

> Our understanding, namely, has the property that in its cognition, e.g., of the cause of a product, it must go from the **analytical universal** (of concepts) to the particular (of the given empirical intuition), in which it determines nothing with regard to the manifoldness of the latter, but must expect this determination for the power of judgment from the subsumption of the empirical intuition (when the object is a product of nature) under the concept. Now, however, we can also conceive of an understanding which, since it is not discursive like ours but is intuitive, goes from the **synthetically universal** (of the intuition of a whole as such) to the particular, i.e., from the whole to the parts, in which, therefore, and in whose representation of the whole, there is no **contingency** in the combination of the parts, in order to make possible a determinate form of the whole, which is needed by our understanding, which must progress from the parts, as universally conceived grounds, to the different possible forms, as consequences, that can be subsumed under it. (CPJ 5:407)

So the concept (or idea) is, like intellectual intuition, the determination of the parts through the whole. Importantly, Kant equates this with *God's* intellectual intuition. Hegel also equates

the truth with God—"God and God alone is the truth" (EL §1). Since the concept, in its full determinacy, is the concept of the absolute and fully adequate to it, Hegel is in basic agreement with Kant about God's intellectual intuition. Except in Hegel's case reality (or "the actual") is God thinking *itself*.[6]

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[6] There is a non-accidental connection between Hegel's position here and Aristotle's position in *Metaphysics Lambda (XII)* concerning the characterization of the divine mind as thought (νοῦς) thinking itself. (Aristotle 2016, 206 (1072 b)).