

# Kant's Architectonic & the Possibility of a Proper Science of Nature

Colin McLear

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## 1 Proper Science [*haplos epistēmē*; *scientia propter quid*; *eigentliche Wissenschaft*]

- Often translated as ‘knowledge’ but not obviously ‘knowledge’ in contemporary English sense
  - Occasionally *epistēmē* is translated as ‘understanding’
  - Translate as ‘proper science’ so as to distinguish it from contemporary empirical science
  - May best be understood as epistemic *ideal*<sup>1</sup>
- Indicates sustained and systematic inquiry into some subject matter
- What kinds of individuals constitute the subject matter of a proper science?
  - Individuals with essences that explain the unity of their manifest features—viz. substances

<sup>1</sup> 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 (2013), 994-5)

## 2 Scholastic Aristotelian Science

- Proper science is:<sup>2</sup>
  - Demonstrative<sup>3</sup>
    - \* articulable in syllogistic form
    - \* conclusion follows from premises necessarily
  - Apodictically certain<sup>4</sup>
    - \* premises of syllogism are themselves certain
    - \* a conclusion C follows from some premises A and B, if and only if it is impossible for C to be false while A and B are both true and known to be such
  - Explanatory
    - \* conclusion of demonstration provides knowledge why, not merely knowledge that
    - \* there is an asymmetric dependence relation between premises and conclusion, such that the order of the premises displays their priority with respect to the conclusion
    - \* the fact indicated in conclusion is *caused* by facts indicated in the premises

<sup>2</sup> 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)

<sup>3</sup> the currency of science is demonstration (*apodeixis*), where a demonstration is a deduction with premises revealing the causal structures of the world, set forth so as to capture what is necessary and to reveal what is better known and more intelligible by nature (Shields (2013); cf. APo 71b33–72a5, Phys. 184a16–23, EN 1095b2–4).

<sup>4</sup> We contend that not all knowledge is demonstrative: knowledge of the immediate premises is indemonstrable. Indeed, the necessity here is apparent; for if it is necessary to know the prior things, that is, those things from which the demonstration is derived, and if eventually the regress comes to a standstill, it is necessary that these immediate premises be indemonstrable. (APo. 72b21–23)

## 2.1 Definition & Essence in Scholastic Explanation

- Scientific knowledge consists in saying why things are the way that there are for the members of the given domain
- Knowledge depends on articulation of real definitions of the subject matter of the science, which articulate the essences, or fundamental explanatory features, of the relevant individuals studied
  - *Essences*: individuate kinds, and explain why members of the kind have the features that they do
    - \* *propria*: necessary but not explanatorily fundamental features of a thing—*propria* may be *inferred* from the essence (risibility in humans)
    - \* *accidents*: non-necessary and non-explanatory features of a thing—accidents are *not* inferable from the essence (e.g. the blackness of crows)
  - Scientific knowledge depends on articulation of the essences of the relevant members in order to provide simple real definitions
- Scientific definition proceeds by specifying:
  - the kind to which its members belong (*genus*),
  - the name of the thing (*species*) defined by its principle feature (*difference*)
  - the characteristics (*properties*) which ‘flow from’ that principle feature
  - the remaining characteristics which are typical of the thing though not inferable from its principle feature
- A fully articulated proper science would be one which provides a set of real definitions of its members from which all the properties have been inferred or derived
  - Euclidean geometry is often taken as an exemplar<sup>5</sup>
    - \* Definition of a circle gives us the essence of the circle from which its other properties may be derived/deduced

<sup>5</sup> 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)

<sup>6</sup> I realized that it was necessary, once in the course of my life, to demolish everything completely and start again right from the foundations if I wanted to establish anything at all in the sciences that was stable and likely to last (Descartes, *Med 1*; AT 7:17)

## 3 Descartes on a Science of Nature

- For Descartes, proper science is not merely an epistemic ideal, but an *achievable* (for us) ideal
- Descartes’ foundationalist project in the *Meditations* aims at establishing a proper science of nature<sup>6</sup>
- Conceives of the natural world as essentially *mechanistic* and of the features of a body as being all derivable from the concept <extension>

*Pure Mechanism*: the laws of physics are deducible from the features possessed necessarily by all bodies qua *matter*—viz. extension and its modes of shape, size, motion, and number

- Descartes does *not* endorse pure mechanism, as he takes the laws of physics to depend not only on the essence of matter, but also God's activity<sup>7</sup>
  - Mechanical laws, including conservation of force, depend on nature of matter and God's immutability
- The status of Cartesian physics as a proper science thus depends on Descartes' proof of God's existence and non-deceitful nature
  - M 2 proof of the certainty of our own existence and our knowledge of the nature/essence of material body (wax argument)
  - M 3 proof of God's existence and concurrence in preserving our own finite existence
  - M 5 proof of God's existence<sup>8</sup>

#### 4 *Locke on a Science of Nature*

- Agrees with Scholastic and Cartesian philosophy that proper scientific knowledge is demonstrative, certain, and explanatory
- Proper science is achievable in mathematics and morals<sup>9</sup>
- Proper science is not achievable for natural philosophy<sup>10</sup>
  - We cannot derive the features of material bodies a priori from our concepts of them<sup>11</sup>
    - \* *Obscurity*: we cannot be certain of the determinate primary qualities of the corpuscles constituting observable material bodies
    - \* *Inscrutability*: we cannot discover the necessary connections that hold between the determinate primary qualities of material bodies and their manifest secondary qualities
- An empirical science of nature (natural philosophy) is not proper science; it cannot provide necessary and universal knowledge with certainty, nor can it provide a priori explanatory derivations of the features of any existing natural body
  - There may be some very general exceptions to the limitations of our knowledge<sup>12</sup>
- Natural science proceeds by the arbitrary/conventional definition of kinds and the refinement of these definitions according to experience

<sup>7</sup> God's perfection involves not only his being immutable in himself, but also his operating in a manner that is always utterly constant and immutable....God imparted various motions to the parts of matter when he first created them, and he now preserves all this matter in the same way, and by the same process by which he originally created it; and it follows from what we have said that this fact alone makes it most reasonable to think that God likewise always preserves the same quantity of motion in matter. (*Principles* II.36; AT 8A:61-2)

<sup>8</sup> I see plainly that the certainty and truth of all knowledge depends uniquely on my awareness of the true God, to such an extent that I was incapable of perfect knowledge about anything else until I became aware of him. (Med 5; AT 7:71)

<sup>9</sup> Where there is no Property, there is no Injustice, is a Proposition as certain as any Demonstration in *Euclid*: For the *Idea* of Property, being a right to any thing; and the *Idea* to which the Name *Injustice* is given, being the Invasion or Violation of that right; it is evident, that...I can as certainly know this Proposition to be true, as that a Triangle has three Angles equal to two right ones. (E IV.iii.18, pp. 549–50).

<sup>10</sup> The complex *Ideas* we have of Substances, are, as it has been shewn, certain Collections of simple *Ideas*, that have been observed or supposed constantly to exist together. But such a complex *Idea* cannot be the real Essence of any Substance; for then the Properties we discover in that Body would depend on that complex *Idea*, and be deducible from it, and their necessary connexion with it be known; as all Properties of a Triangle depend on, and as far as they are discoverable, are deducible from the complex *Idea* of three Lines, including a Space. (Locke, E II.xxi.6; cf. III.xi.22)

<sup>11</sup> In vain, therefore, shall we endeavour to discover by our *Ideas* (the only true way of certain and universal knowledge) what other *Ideas* are to be found constantly joined with that of our complex *Idea* of any Substance: since we [1] neither know the real Constitution of the minute Parts on which their Qualities do depend; nor, did we know them, could we [2] discover any necessary connexion between them and any of the *secondary Qualities*: which is necessary to be done before we can certainly know their necessary co-existence. (IV.iii.14)

<sup>12</sup> Some few of the primary Qualities have a necessary dependence, and visible connexion one with another, as Figure necessarily presupposes Extension, receiving or communicating Motion by impulse, supposes Solidity. (IV.iii.14)

## 5 *Kant on Proper Science*

*Science*: A systematically organized body of cognitions<sup>13</sup>

*Proper science* [eigentliche Wissenschaft]: 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<sup>14</sup>

## 6 *Kant’s Architectonic*

- Proper science thus demands that the objects constituting its subject matter exhibit a hierarchical explanatory structure
  - 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
- Pre-critical metaphysics cannot provide an explanation of how we could have knowledge of this hierarchy<sup>15</sup>
- We can see that this is Kant’s aim by examining his remarks about objects in the context of his discussion of the structure of science

### 6.1 *Kant’s Science of Nature – General vs. Special Metaphysics*

- A metaphysics of nature, which “considers everything so far as it is, on the basis of a priori concepts” (A845/B873), has two parts:<sup>16</sup>
  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

<sup>13</sup> 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)

<sup>14</sup> 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)

<sup>15</sup> 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)

<sup>16</sup> [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)

- 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<sup>17</sup>
- 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 objects of inner sense cannot be mathematized, so there is no special metaphysics of mental objects—i.e. psychology is not a proper science

<sup>17</sup> 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)

## 6.2 *Essence vs. Nature*

*Essence*: the ground of the possibility of a thing<sup>18</sup>

*Nature*: the ground of the existence of a thing as determined by universal laws<sup>19</sup>

The goal of a special metaphysics is to articulate what belongs to the essence of its object (either matter or mind) by appeal to what belongs to the essence of an object in general (i.e. the categories) plus mathematical principles<sup>20</sup>

- If we are to explain the possibility of a special metaphysics of corporeal nature (i.e. physics) we need an account of how we know the essence of its subject matter—viz. *matter*<sup>21</sup>

<sup>18</sup> 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 figures, but not a nature (since in their concept nothing is thought that would express an existence). (MFNS 4:467, note)

<sup>19</sup> 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)

<sup>20</sup> a special metaphysics...must explain the possibility of applying mathematics to the specific empirical concepts involved in a proper natural science restricted to this domain [i.e. of objects in nature]. It must explain how these particular concepts acquire their precise mathematical structure and, in this sense, how their mathematical construction is possible. (Friedman (2013), 567)

<sup>21</sup> A property on which the inner possibility of a thing rests, as a condition, is an essential element thereof. Hence repulsive force belongs to the essence of matter just as much as attractive force, and neither can be separated from the other in the concept of matter. (MFNS 4: 511)

<sup>22</sup> Through experience I observe much, which belongs to the being of a thing; e.g. extension in space, resistance against other bodies, etc. Now, the inner ground of all this is the nature of the thing. We can only infer the inner principle of the thing from those characteristics that are known to us; therefore the real essence of the thing is inscrutable to us, though we cognize many essential parts thereof. We are acquainted with the powers of things in the course of experience. (Pölitiz Metaphysics (~1790-I), 28:553)

## 6.3 *Objects of a Proper Science*

1. In experience we only have *inferential* access to the essences of things<sup>22</sup>
2. Inferential access based on features of things revealed a posteriori cannot be a basis for explaining their unity
3. ∴ We cannot explain the unity of the qualities revealed in the course of experience
4. We have proper scientific knowledge
5. ∴ We must have recourse to a priori knowledge of the explanatory unity of the features revealed to us in experience

## References

Ayers, Michael. 1981a. “Mechanism, Superaddition, and the Proof of God’s Existence in Locke’s Essay.” *The Philosophical Review* 90 (2) (April): 210–251. doi:10.2307/2184440. <http://www.jstor.org/stable/2184440>.

- . 1981b. “Locke Versus Aristotle on Natural Kinds.” *The Journal of Philosophy* 78 (5) (May): 247–272. doi:10.2307/2025955. <http://www.jstor.org/stable/2025955>.
- . 1991. *Locke: Epistemology & Ontology*. Vol. 1 & 2. London: Routledge.
- . 1996. “Natures and Laws from Descartes to Hume.” In *The Philosophical Canon in the Seventeenth and Eighteenth Centuries: Essays in Honour of John W. Yolton*, edited by G. A. J. Rogers, Sylvana Tomaselli, and John W. Yolton, 83–101. Rochester, N.Y.: University of Rochester Press Rochester NY.
- Barnes, Jonathan. 1975. “Introduction to Aristotle’s *Posterior Analytics*.” In *Posterior Analytics*, edited by Jonathan Barnes, Second edition, xi–xxv. Oxford: Clarendon Press.
- Beck, Lewis White. 1956. “Kant’s Theory of Definition.” *The Philosophical Review* 65 (2) (April): 179–191. doi:10.2307/2182830. <http://www.jstor.org/stable/2182830>.
- Berg, Hein Van Den. 2014. *Kant on Proper Science: Biology in the Critical Philosophy and the Opus Postumum*. Dordrecht: Springer.
- Charles, David. 2010. “Definition and Explanation in the Posterior Analytics and Metaphysics.” In *Definition in Greek Philosophy*, edited by David Charles, 286–328. Oxford: Oxford University Press.
- De Jong, Willem R., and Arianna Betti. 2010. “The Classical Model of Science: A Millennia-Old Model of Scientific Rationality.” *Synthese* 174 (2): 185–203. doi:10.1007/s11229-008-9417-4. <http://link.springer.com/article/10.1007/s11229-008-9417-4>.
- Descartes, Rene. 1984. *The Philosophical Writings of Descartes*. Edited by John Cottingham, Robert Stoothoff, and Dugald Murdoch. Vol. 2. Cambridge: Cambridge University Press.
- . 1985. *The Philosophical Writings of Descartes*. Edited by John Cottingham, Robert Stoothoff, and Dugald Murdoch. Vol. 1. Cambridge: Cambridge University Press.
- Downing, Lisa. 1998. “The Status of Mechanism in Locke’s Essay.” *The Philosophical Review* 107 (3) (July): 381–414. doi:10.2307/2998443. <http://www.jstor.org/stable/2998443>.
- Friedman, Michael. 2006. “Philosophy of Natural Science.” In *The Cambridge Companion to Kant and Modern Philosophy*, edited by Paul Guyer, 303–341. Cambridge: Cambridge University Press.
- . 2013. *Kant’s Construction of Nature: A Reading of the Metaphysical*

- Foundations of Natural Science*. Cambridge: Cambridge University Press.
- Kochiras, Hylarie. 2013. "Locke's Philosophy of Science." In *The Stanford Encyclopedia of Philosophy*, edited by Edward N. Zalta, Fall 2013. <http://plato.stanford.edu/archives/fall2013/entries/locke-philosophy-science/>.
- Locke, John. 1970. *An Essay Concerning Human Understanding*. Edited by Peter H. Nidditch. Oxford University Press.
- Nadler, Steven. 1998. "Doctrines of Explanation in Late Scholasticism and in the Mechanical Philosophy." In *The Cambridge History of Seventeenth-Century Philosophy*, edited by Daniel Garber and Michael Ayers, 1:513–532. Cambridge: Cambridge University Press.
- Osler, Margaret J. 1970. "John Locke and the Changing Ideal of Scientific Knowledge." *Journal of the History of Ideas* 31 (1) (January): 3–16. doi:10.2307/2708366. <http://www.jstor.org/stable/2708366>.
- Pasnau, Robert. 2013. "Epistemology Idealized." *Mind* 122 (488) (October): 987–1021. doi:10.1093/mind/fzt093.
- Politis, Vasilis. 2004. *Routledge Philosophy Guidebook to Aristotle and the Metaphysics*. London: Routledge.
- Shields, Christopher. 2007. *Aristotle*. London: Routledge.
- . 2013. "Aristotle." In *The Stanford Encyclopedia of Philosophy*, edited by Edward N. Zalta, Winter 2013. <http://plato.stanford.edu/archives/win2013/entries/aristotle/>.
- Sorell, Tom, Graham Alan John Rogers, and Jill Kraye, ed. 2009. *Scientia in Early Modern Philosophy: Seventeenth-Century Thinkers on Demonstrative Knowledge from First Principles*. Dordrecht: Springer.
- Spinoza, Benedictus de. 2002. *Complete Works*. Edited by Michael L. Morgan. Hackett Publishing.
- Watkins, Eric. 1998. "The Argumentative Structure of Kant's *Metaphysical Foundations of Natural Science*." *Journal of the History of Philosophy* 36 (4): 567–593. <http://muse.jhu.edu/journals/hph/summary/v036/36.4watkins.html>.
- . 2009. "Kant's Philosophy of Science." In *The Stanford Encyclopedia of Philosophy*, edited by Edward N. Zalta, Spring 2009. <http://plato.stanford.edu/archives/spr2009/entries/kant-science/>; Stanford University.