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Source: *The Review of Metaphysics*, Vol. 57, No. 4 (Jun., 2004), pp. 741-753
Published by: Philosophy Education Society Inc.
Stable URL: http://www.jstor.org/stable/20130385

TRUTH VS. NECESSARY TRUTH IN ARISTOTLE'S SCIENCES

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AT *POSTERIOR ANALYTICS (APO)* 1.1.71B15 AND FOLLOWING, Aristotle identifies six characteristics of the first principles from which demonstrative science (*apodeiktikê epistêmê*) proceeds. These are traditionally grouped into two sets of three: group A: (1) (true) *ex alêthôn*, (2) (primary) *prôtôn*, (3) (immediate) *amêsôn*; group B: (4) (better known than) *gnôrimôterôn*, (5) (prior to) *proterôn*, and (6) (causes of) *aitiôn*.[1] The characteristic, which I believe has been underrated and somewhat misinterpreted by scholars and commentators from Philoponus to the present day, is the characteristic of truth (*alethê*). In this paper I propose to present a textually based interpretation of truth that shows the following: (1) that truth is necessarily linked to being (*to on*). (2) The example given of nonbeing (*to mê on*), the commensurability of the diagonal with the sides of a square, suggests more than simple truth is required for first principles and premises of demonstrative science; and that Aristotle later in the *APo* changes this characteristic to necessary truth (*ex anankês alêthês*), for he recognizes that truth alone is an insufficient basis for scientific demonstration. (3) The referents of necessary truth are eternal being, and the

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[1] *Aristotle's Prior and Posterior Analytics*, a revised text with introduction and commentary by W. D. Ross (Oxford: Clarendon Press, 1949), 50–67. I follow Ross's grouping and translation of the six characteristics. On the six characteristics see also Thomas Aquinas, *Commentary on the Posterior Analytics of Aristotle*, trans. F. R. Larcher (Albany: Magi Books, 1970), 13–19. *Aristotle's Posterior Analytics*, trans. Jonathan Barnes, 2d ed. (Oxford: Clarendon Press, 1994), 96–101. John Philoponus, *In Aristotelis Analytica Posteriora Commentaria*, ed. Maximillan Wallies (Berlin: George Reimer, 1909), 23–7. Richard McKirahan, *Principles and Proofs* (Princeton: Princeton University Press, 1992), 26–35. Terrence H. Irwin, *Aristotle's First Principles* (Oxford: Clarendon Press, 1988), 51–70. Patrick Byrne, *Analysis and Science in Aristotle* (Albany: State University of New York Press, 1997), 92–102. Michael Ferejohn, *The Origins of Aristotelian Science* (New Haven: Yale University Press, 1991), 16–33.

The Review of Metaphysics 57 (June 2004): 741–753.

need for eternal being demands (4) that universals exist extramentally for Aristotle. (5) Finally, one of the important ways that universal genera and species exist for Aristotle are as real, causal principles.

At *APo* 1.1.71b25–6, Aristotle explains that the principles "must be true (*alêthê men oun dei einai*), because it is not possible to know non-being (*hoti ouk esti to mê on epistasthai*); for example, that the diagonal is commensurable [with the side of a square]."[2]

I

While Aristotle seems to be making a rather straightforward claim, that is, that true scientific premises must refer to real being, commentators differ on the meaning and importance of Aristotle's text. For example, Ferejohn claims the following, "To begin with, truth, the first condition listed at 71b6, is no more than an *unanalyzable* consequence of Aristotle's very minimal requirement that a demonstration must constitute a proof (or sound argument) for its conclusion."[3] It is not clear why Ferejohn fails to mention the example of the commensurable diagonal Aristotle presents in his text, nor is it entirely clear why Ferejohn believes truth is an "unanalyzable" condition. I assume that when Ferejohn speaks of a sound argument, he means its form must be valid and its premises true. I believe Ferejohn has grossly underestimated the importance of truth.

Philoponus presents perhaps the most straightforward account of why Aristotle would claim that the premises of scientific demonstrations must be true. As Philoponus explains, while it is possible to get a true conclusion from false premises, a genuine demonstrative syllogism must have true premises. For example, one could argue that "a man is a stone, a stone is a living animal, therefore, a man is an animal."[4] Although he does not say this explicitly, what Philoponus

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[2] Throughout this paper the Oxford Classical Texts are used as the source of Aristotle's *Posterior Analytics* (*APo*), *Metaphysics* (*Meta*), *Nicomachean Ethics* (*EN*), *De Anima* (*DA*), and *Categories* (*Cat*); the exception is *Generation of Animals* (*Gen An*), which is taken from the Loeb Classical Library Edition. All translations, except of the six characteristics, are my own.

[3] Ferejohn, *Origins*, 21 (my emphasis).

[4] Philoponus, *Commentaria*, 24. I am using my translation of the text of Philoponus.

implies in his example is that a living stone, or a man who is a stone, does not exist and so the premises refer to nonbeing and are false. As Aquinas succinctly summarizes, for Aristotle, "what is not true does not exist, for to be and to be true are convertible. Therefore, anything scientifically known must be true. Consequently, the conclusion of a demonstration which does beget scientific knowing must be true, and a fortiori its premises [must be true]."[5] In the same vein, Byrne notes that "truth, for Aristotle, is correspondence with what is. . . . [T]he full meanings of syllogistic arguments intend the being of what they state. The whole necessity of the connection between premises and conclusions depends on this. . . . One cannot have scientific knowledge that *a fact cannot be otherwise* if there is no such fact."[6]

II

This last line of Byrne's interpretation implies a problem or limitation of true premises as the bases for necessary conclusions. According to Aristotle's *APo*, we have knowledge (*epistasthai*) of something when we know that it cannot be otherwise [than it is] (*mê endechesthai tout' allôs echein*).[7] And that which cannot be otherwise is that which is necessary.[8] However, Aristotle points out, "it is possible for some beings to be true and to be capable of being otherwise" (*esti de tina alêthê men kai onta, endechomena de kai allôs echein*).[9] For example, as Philoponus explains, "walking is to move by one's legs; Socrates is walking, therefore, Socrates is moving by his legs."[10] While it may be true at one time or another that Socrates is walking and this entails moving his legs, Socrates is not necessarily a thing walking or always a thing walking. Socrates is not essentially a thing walking. In other words, a necessary conclusion, which is the proper object of knowledge, must come from necessary premises.

The need for necessary premises leads us to the apparent need for eternal and necessary subjects of demonstration and back to

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[5] Aquinas, *Commentary*, 17.
[6] Byrne, *Analysis*, 93 (my emphasis).
[7] *APo* 1.2.71b9–12.
[8] *APo* 1.33.88b31–2.
[9] *APo* 1.33.88b32–3.
[10] Philoponus, *Commentaria*, 84.

Aristotle's example of nonbeing at 71b26: the commensurability of a diagonal with the sides of a square, which commentators like Philoponus take to be an example of the *false* not the *necessarily false*.[11] This example, I believe, seems to indicate that Aristotle had more in mind than mere truth and changeable beings when he points out initially that demonstrative premises must be true. At *Metaphysics* 5.12.1019b21 and following, Aristotle clearly explains that to say the diagonal is commensurable (*summetron*) with the side "is not only false but necessarily false" (*ou monon pseudos alla kai ex anankês pseudos*). The opposite, then, that the diagonal is incommensurable, is not only true but necessarily true (*ex anankês alêthês*; . . . *to enantion ou monon alêthês alla kai* anankê *asummetron einai*). A diagonal commensurable with the sides of a square is an impossible being; it cannot possibly exist. On the other hand, that the diagonal is incommensurable is a necessary being and the referent for a necessary truth. What Aristotle's position seems clearly to lead to, though he himself never explicitly articulates it, is the following definition of necessary truth: to say of what cannot possibly not be what it is, that it is, is necessarily true.

What Aristotle himself clearly does say is that, "while it is possible to reason syllogistically from true premises and not demonstrate something; it is not possible to do anything except demonstrate something [if one reasons] from necessary premises" (*ex alethôn men gar kai mê apodeiknunta syllogisasthai, ex anankaiôn d'ouk estin all' ê apodeiknunta*).[12] Aristotle goes on to explain that necessary premises depend on discovering necessary truths about a subject (*genos*). At 74b22 and following he explains that the first principles and first premises[13] of demonstrative science are not merely acceptable, reputable opinions (*endoxa*), which are true (*alêthês*). Rather, a genuine demonstrative principle and premise is what is first (*to prôton*) with respect to a genus of being (*tou genous* [*tou ontos*]). Such appropriate, first truths about an explanatory genus are necessary

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[11] Compare Philoponus, *Commentaria*, 26–7. Philoponus comments that "to say that the diagonal of a square is commensurable with the side is false (*pseudos*)"; and that "to claim to know non-being (*to mê on*) is not [scientific] knowledge."

[12] *APo* 1.6.74b16 and following.

[13] Compare *APo* 1.2.72a6 and following.

truths; but not every truth is appropriate to a genus (*kai talêthes ou pan oikeion*).

III

One might be tempted to object at this point that Aristotle's position in *Metaphysics* 5.12 is not to be found in the *APo*. Aristotle's account of the difference between opinion (*doxa*) and knowledge (*epistêmê*) at *APo* 1.33 and of the possibility of having opinion and knowledge of the same object (though not at the same time), in which he uses the example of the commensurability of the diagonal with the sides of a square, makes it clear that Aristotle has the notion of necessary truth and necessary being and impossible truth and impossible being in mind in the *APo*.

However, two more serious objections need to be answered if my interpretation is to prove to be correct. One, the definition of necessary truth, which I propose to be Aristotle's own implicit definition, entails that the objects of necessary truth be eternal. That is to say, that which cannot possibly not be what it is, not only must actually exist but must exist in an eternal and changeless way. Not only must the diagonal of a square always be incommensurable with the sides, or not only must a man always exist as an animal, but diagonals, squares, men and animals must always exist; that is, they must be eternal. According to Aristotle, this means that first premises of demonstrative syllogisms must be universal (*katholou*) in a special sense: they must express *kata pantos* and *kath' hauto* relations. At *APo* 75b21–6, Aristotle himself explains that it is clear that since premises from which demonstrative syllogisms are formed are universal (*katholou*), it is necessary that the conclusion drawn from them be eternal (*aidion*) and imperishable. For a demonstration about perishable things will not be scientific in the strict sense (*haplôs*) but will only be a demonstration accidentally (*kata sumbebêkos*)—that is, that a conclusion is true of a certain subject not universally but at a certain time and in a certain way.

Aristotle presents a rather succinct summary of the proper qualities of appropriate and genuine scientific subjects at *Nicomachean Ethics* 6.3.1139b19–24. There he states: "for we accept [or agree] that that which we know (*ho epistametha*) cannot be otherwise (*mêd' en-*

dechesthai allôs echein). And with respect to those things which can be otherwise, when they are outside of our perception, we cannot be sure if they exist or not (*lanthanei ei estin* ê *mê* [*estin*])." The last sentence makes it clear that Aristotle requires eternal objects as the objects of scientific knowledge (*epistêmê*); for we must be sure that what we are scientifically demonstrating about what actually exists and exists in a certain way (for example, man is a kind of animal), and has not perished or radically changed. Only in this way can we be sure that we are demonstrating the truth about something—in the Aristotelian sense of truth.

McKirahan rejects the apparent need for the subjects of necessary truth to exist necessarily. He notes, first of all, that "being necessary is not one of the requirements of principles listed in 1.2."[14] I have already answered McKirahan's objection by showing that Aristotle's example in 1.2, and his subsequent modifications of the characteristic of truth at 1.6.74b15 and following, show that Aristotle does have necessary truth in mind, which would refer to eternal and necessary being, when he speaks of scientific demonstration in the strict sense. McKirahan claims further, however, that, "If the objects of science exist of necessity, then precious few disciplines can qualify as sciences."[15] He claims that only astronomy and theology will be secure sciences since the stars and god exist eternally and of necessity.[16] He then rightly points out that in a sense species of animals exist eternally and of necessity, though not the individual members of a species as individuals.

I would contend strongly that Aristotle believes species (and genera) are eternal, for at *Generation of Animals* 731b18–732a2 Aristotle explains that being is better (*beltion*) than nonbeing and eternal being is better than the being of things that can either be or not be. However, those beings subject to generation and perishing are eternal (*aidios*) in the manner open to them. Because of this, according to Aristotle, there will always be a class of men, of animals and of plants (*dio genos aei anthrôpôn kai zôôn esti kai phutôn*).

For Aristotle, universal genera and species would be certain kinds of eternally recurring combinations of matter and form ex-

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[14] McKirahan, *Principles*, 125.
[15] Ibid., 126.
[16] Ibid.

pressed in individual substances. Since this is true, geometry and arithmetic are not as problematic as McKirahan claims for there will always be shapes and units that can be separated off eternally recurring kinds of sensible substances by human minds.[17]

IV

McKirahan argues specifically against *APo* 1.8.75b21 and following claiming that eternal and imperishable are "meant to hold for conclusions of proofs, not subjects. Similarly, even though much of I 31 applies to universal terms as well as propositions, the examples show again that the universals intended are propositions that can be conclusions of proofs (87b35–36, b39–88a2, 88a14–16)."[18] He concludes by claiming, "the statements that scientific facts are always and eternal do *not* entail that science requires eternally existing *particulars*. Since necessary and eternal scientific facts can apply to non-eternal particulars, there is no need to suppose scientific existence claims to be necessary, and so we may hold that when Aristotle claims that premises and conclusions of demonstration express necessary truths, he intends them to apply only to per se predications, not to existence claims."[19] However, if universal and necessary truths did not refer to real existents, then they would not be true in the Aristotelian sense of truth. Therefore, I believe McKirahan's account is incorrect. In one sense, however, I do agree with McKirahan: science does not require eternally existing particulars as the eternal referents for necessary scientific truths.[20]

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[17] Compare *DA* 3.7.431b12–19; and *Meta* 13.3.1078a23–6 on mathematical and geometrical being. Since man can exist eternally as an eternally recurring combination of matter and form, mathematicals and geometricals can exist eternally as dimensions of sensible substances that are "separated off" substances by human minds.

[18] McKirahan, *Principles*, 127.

[19] Ibid., 131–2 (emphasis added). If eternal and necessary truths apply only to per se predications and not to existence claims, then I do not see how these truths qualify as scientific truths in the Aristotelian sense of referring to real being (*to on*). Moreover, I do not believe McKirahan has existence claims correct for Aristotle for he does not take seriously the possibility that for something to exist for Aristotle, it must exist as something.

[20] Compare *APo* 1.24.85b18 and following.

Barnes gives an interpretation similar to McKirahan's. Barnes explains that Aristotle's claim that we can have knowledge of the real (even though everything real is particular and the objects of knowledge are universal) makes sense only in the following way: "knowledge is of universal *propositions*; only particular *objects* are real: universal propositions do not require universal objects as their subject matter."[21] I believe Barnes's account is also wrong.

Both McKirahan and Barnes adopt an apparently nominalist position: universals exist only in names or concepts. However, Aristotle's characteristic of the truth of first principles and premises (which, I contend, he later specifies as necessary truth), clearly suggests that the premises refer to actually existing beings.[22] On the account given by Barnes and McKirahan, the truth of universal propositions used as demonstrative premises must refer either to what the medievals called "beings of the mind" (*entia mentis*), or to perishable particulars, or to both. We have seen, however, at *APo* 1.8.75b21 and following, that demonstrations about particulars as such are only demonstrations in an accidental (*kata sumbebêkos*) sense, that they apply only at a certain time and in a certain way. This clearly implies that when, for example, a particular man dies, the per se claim that all men are animals is not true of the deceased individual for he is now nonbeing.[23] If only "scientific facts" expressed in propositions are eternal in some sense, then what happens to the real referents of Aristotle's characteristic of truth?

The answers to the question just raised, to the problem of the necessary truth of scientific principles and premises (which is a genuine problem—*pace* Barnes), and the need for eternal and necessary subjects are to be found, I believe, in determining the ontological status of universals for Aristotle. It seems to me that universals can be real for Aristotle in a number of ways and are not just beings of the mind. As Irwin points out, "Scientific propositions must be true, and known to be true; they therefore correspond to some objective reality. . . . Since a science purports to state truths about universals, not

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[21] *Aristotle's Posterior Analytics*, 139–40 (emphasis added).

[22] Compare *Meta* 4.7.1011b26 and following: "*to de* [*legein*] *to on einai kai to mê on mê einai, alêthês*."

[23] Compare *DA* 2.4.415b13: "*to de zên tois zôsi to einai estin*." Since "to exist" for animals (including man) is "to live," then when a man or other animal dies, it can be said to no longer exist.

about particulars, *universals* are the primary subjects of which a science predicates properties (*APo*. 77a5–9, 83a30–5, 85b15–18, *Meta*. 1003a14–15, 1059b24–7)."[24] If truths about universals correspond to some objective reality, universals must exist in some objective way. Aristotle's universals are not Platonic Forms existing independently of particulars;[25] but statements about Aristotelian universals are not just about the particulars that manifest them. According to Irwin, "A science is intended to describe a natural, objective kind, not to distinguish kinds whose existence depends on being spoken of or thought."[26]

Evidence that scientific universals are real is provided, according to Irwin, by the fact that, "In claiming that a science offers *explanations*, Aristotle *assumes* the reality of universals. Since scientific statements explain, they must be about universals, [that is] Aristotle claims that universals are better known by nature than particulars are, and he is justified in so far as propositions referring to universals explain facts about particulars; but he would be completely unjustified if he took a nominalist view of universals or scientific laws."[27] If universals only exist in names or concepts, they could not truly explain why certain properties must exist in all particulars of a certain kind of being. There would be no real connection between purportedly explanatory, universal propositions and particular existents. In general, I agree with Irwin's account of the reality of universals for Aristotle.

Moreover, I believe Irwin's account depends on what he calls Aristotle's metaphysical realism (as opposed to the apparently nominalist position of Barnes and McKirahan). As Irwin explains, "In so far as Aristotle claims that objective first principles must be known by nature, he commits himself to a metaphysical realist conception of knowledge and reality. . . . What is 'known by nature' is not something that happens to be adapted to our cognitive capacities, or to play a special role in our theories or beliefs. It is known by nature because it is a primary feature of the world, and it is known to us only if we are in the right cognitive condition to discover what is really there."[28] I will not attempt to defend Irwin's account of Aristotle's realism, but in

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[24] Irwin, *First Principles*, 118.
[25] Compare *APo* 1.10.77a5–9, 1.22.83a22–5
[26] Irwin, *First Principles*, 119.
[27] Ibid. (emphasis added).
[28] Ibid., 5.

general I do agree with it and I believe it hinges on taking the characteristic of *truth* of first principles seriously. However, I do not believe Irwin's account goes far enough in the direction of the need for causal explanation and necessary truth in Aristotelian demonstration.

V

According to Aristotle's *Categories*, substance in the strictest sense is primary substance, examples of which are this particular man and this particular horse (*hoion ho tis hippos*).[29] Without the existence of primary substance, Aristotle explains further, nothing else would exist (*mê ousôn oun tôn prôtôn ousiôn adunaton tôn allôn ti einai*).[30] In addition to primary substance there are two secondary substances: species, an example of which is man, and genus, an example of which is animal. Species is said to be more truly substance than genus.[31] Since primary substance is that upon which all other being depends, and is thus the primary reference point of all being for Aristotle (in the *Categories*), we would expect that true knowledge (*epistêmê alêthê*) (which must refer to real being), should refer to primary substance.

Primary substances, for example, particular men or horses, however, are not the only existents for Aristotle. It would seem that the *Categories*' notion of primary substance is not necessarily what Aristotle regards as primary substance in the *Metaphysics*.[32] Of particular importance to my claim is that Aristotle clearly states that secondary substances, that is, species and genus, really exist and exist in one sense dependent on primary substance for they are predicated of primary substance. In order of natural priority, species is better called substance than genus according to Aristotle.[33]

In another sense, however, genus is said to be prior to species. At *Categories* 15a5 and following, Aristotle explains that "genera (*ta genê*) are always (*aei*) prior to (*protera*) species. For the order of being cannot be reversed (*ou gar antistrephei kata tên tou einai*

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[29] *Cat* 5.2a13.
[30] *Cat* 5.2b5 and following.
[31] Compare *Cat* 5.2b7–22.
[32] Compare, for example, *Meta* 7.17.1041b7–9.
[33] *Cat* 5.2b7–11.

akolouthêsin). For example, if [the species] aquatic (*enhydrou*) exists, then animal [necessarily] exits, but if animal (genus) exists (*ontos*), aquatic (the species) does not necessarily exist." Since species is composed metaphysically of genus and specific difference, it makes sense that animals can be said in a sense to exist first and then become differentiated into aquatic, terrestrial, and so forth. This does not necessarily mean that genera can exist independently of species and particular members of a genus. Genera and species may exist in a sense in dependence on particular substances, but nonetheless they truly exist and exist in an eternal way.

However, does the apparent temporal, causal priority of genus over species extend to a particular fish, horse, or man? That is, does a particular horse or man first become an animal, then a man, and then Coriscus; so that the genus animal and the species man are stages in the development of, and part of the nature of, a particular man like Coriscus? I believe an examination of Aristotle's texts reveals a "yes" answer to these questions.

At *Generation of Animals* 736a35–736b5, Aristotle explains that, while all living things, including all animals, have nutritive soul (*threpikê psychê*), animals come to acquire, in the course of their development, sentient soul (*aisthetikê psychê*), and then man in particular comes to acquire rational soul (*noetikê psychê*). Aristotle explains further, animals come to acquire sentient soul because "an offspring does not become animal and man or animal and horse at the same time (*ou gar hama ginetai zôon kai anthrôpos oude zôon kai hippos*); for the end (*to telos*) of the process of generation is formed last of all. And that which is peculiar to an individual offspring is the end of the process of generation."

A man comes into being in stages, as it were, because of the movements in the male sperm of the particular individual as father and as male, and of the universals (*tôn katholou*), that is, the movements that belong as a human being (thai is, species) and as an animal (that is, genus).[34] At 768a12–13, Aristotle states that the movements in the sperm of the father and the universals, that is, species and genus, are actual movements (*energeiai men hai tou gennôntos kai tôn katholou hoion anthrôpou kai zôou*); whereas, the movements of the mother and the grandparents are potential movements (*dunumei de*

[34] Compare *Gen An* 4.3.767b25–32.

kai tou thêleos kai tôn progonôn). Because the movements in the sperm of the universal genus and species are actual, not potential movements, the following temporal course of the development of a particular human being is suggested by Aristotle's account. In human embryological development, first generic animal characteristics appear, that is, those common to animals. Next, these generic characteristics are specified further by the movements in the sperm of the species, man, so that the individual manifests human specifications of the generic (animal) characteristics. Lastly, in the best case, at least, the movements in the sperm of the father's form specify the species characteristics even further so that, for example, Coriscus comes to resemble his father.

Scientific demonstration of human essential properties is based on the causal efficacy of the movements in the sperm of the universal genus and universal species. Thus, universal species and universal genera exist in part, at least, precisely as causal principles that produce effects, in a certain temporal sequence and in a certain order of ontological completion (of form informing matter) in the generation of particular individuals of these kinds. It is precisely when the natural process of generation breaks down and relapses to the already present actual movements in the sperm of species and genus that the reality of these universal causes becomes most apparent. That is, Aristotle maintains that there are two types of monsters (*terata*) which result from the failure of the natural process of generation to take place. One type of monster, who resembles none of his forebears, manifests only species characteristics common (*koinon*) to all humans.[35] A second type is an offspring who is "most general" (*malista katholou*) in form and manifests only the generic properties common to all animals (*zôon*).[36] It is important to note that the causal movements of the universal species and of the universal genus can have manifest effects in an individual substance. This clearly shows that such universal causes are real for Aristotle.[37] Because of the universal causes present in the genesis of every human being, it is necessarily true to say that man cannot possibly exist and not exist as an animal.[38] Because these universal causes will not cease to exist and

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[35] Compare *Gen An* 4.3.768b10 and following.
[36] Compare *Gen An* 4.3.769a11 and following.

be operative in the ongoing genesis of humans, it is true to say that man and animal are eternal.

In conclusion, Aristotle's characteristic of the truth of first principles, when we are dealing with the first truths of an explanatory *genos*, becomes the characteristic of necessary truth, which requires as its referent eternal and often universal being.[39] By recognizing the force of Aristotle's example of nonbeing, the commensurability of a diagonal with the side of a square, we come to expect and find in Aristotle's text the limitation of simple truth and the requirement of necessary truth for the premises of scientific demonstration in the strict sense. Necessary truth requires eternal being, like eternal species and genera, which exist as universal, explanatory kinds of being and as universal causes operative within the genesis of an individual substance. By recognizing the requirement of necessary truth for proper first principles of scientific demonstration, we can come to appreciate the need for really existent universals and eternal being in Aristotle's theory of the particular sciences and in so doing, more accurately appreciate the theory itself.

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[37] On the reality of the movements in the sperm of the universal species and universal genus, see John Cooper, "Metaphysics in Aristotle's Embryology," *Proceedings of the Cambridge Philological Society* 214 (1988): 20; and David Balme, "Aristotle's Biology Was Not Essentialist," in *Philosophical Issues in Aristotle's Biology*, ed. Allan Gotthelf and James Lennox (New York: Cambridge University Press, 1987), 312. For a more complete analysis of the generation of monsters, see my "Aristotle on Monsters and the Generation of Kinds," *American Catholic Philosophical Quarterly* 77 (2003): 21–36.

[38] For a brief but accurate discussion of "exist" as "exist as" in Aristotle, see David Charles, *Aristotle on Meaning and Essence* (Oxford: Oxford University Press, 2000), 73–5, esp. 73 n. 22.

[39] Of course, particular sciences are not always concerned with universals; theology—the study of the First Unmoved Mover—would not be concerned with universals in the *APo*'s sense of universals.