Quinton's neglected argument for scientific realism*

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In his influential 1962 article on the ontological status of theoretical entities, Grover Maxwell put forward an argument for scientific realism which became known as "the argument from the continuum". Maxwell's direct target was the "observational-theoretical dichotomy", an essential distinction for the logico-positivistic case against scientific realism. But as van Fraassen was to remark later, this distinction involves a category mistake: "*[t]erms or concepts* are theoretical [...]; *entities* are observable or unobservable" (1980, p. 14; my italics). What really matters for the realism/anti-realism debate is the latter distinction. Fortunately, Maxwell's argument can be construed as bearing on the possibility of drawing the observable/unobservable distinction. Here is the original argument:

> The point I am making is that there is, in principle, a continuous series beginning with looking through a vacuum and containing these as members: looking through a window-pane, looking through glasses, looking through binoculars, looking through a low-power microscope, looking through a high-power microscope, etc., in the order given. The important consequence is that, so far, we are left without criteria which would enable us to draw a non-arbitrary line between "observation" and "theory". Certainly, we will often find it convenient to draw such a to-some-extent-arbitrary line; but its position will vary widely from context to context.

Thus, the essence of the argument is that, given the existence of such a continuous series of detection devices, any attempt to isolate a domain of observable things and events will be vitiated by the vagueness, arbitrariness, contextual dependence and anthropocentric character of the distinction.

The argument from the continuum had a considerable impact on the anti-realist positions typically held at the time, and contributed to the rising tide of scientific realism in the following two decades. It is perhaps no coincidence that

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when Bas van Fraassen resolutely set out to swim against that tide, he begun by attacking Maxwell's argument (van Fraassen 1980, sect. 2.2). Van Fraassen tried to deflect the thrust of the argument by casting anti-scientific realism in exclusively epistemological moulds. Thus, he could afford to agree with Maxwell that the observable/unobservable distinction cuts no "ontological ice" (Maxwell 1962, p. 8). But he maintained that the distinction that can be drawn is, notwithstanding the mentioned characteristics, perfectly suitable for his "constructive empiricist" anti-realist position. According to van Fraassen, something is observable just if there are circumstances in which it could be observed by an *ordinary human being* with unaided senses. Now the real issue of scientific realism is, he claims, what epistemic attitude (belief in truth, belief in empirical adequacy) *ordinary human beings* should take toward scientific theories. And to "*this* question what is observable to *us* seems eminently relevant" (p. 18; my italics).

What makes room for this successful manoeuvre is the fact that the argument from the continuum is a *negative* argument, i.e., it aims to show that certain anti-realist positions are untenable.[1] By proposing a form of anti-realism differing substantially from those at which the argument aimed, van Fraassen could accept its premises, and even its immediate conclusion (that the observable/unobservable distinction is vague, anthropocentric, etc), without *ipso facto* surrendering to scientific realism. (Actually, much of the appeal of constructive empiricism stems exactly from the fact that it is a relatively weak brand of anti-realism.) This circumstance underlines the importance of Quinton's argument, since, as we shall see, it is a *positive* argument for scientific realism, i.e., it offers direct, independent support for this epistemological position.

In *The Nature of Things* (1973) Quinton offers an insightful, far-reaching analysis of several central metaphysical and epistemological notions and theses. It doesn't belong to the scope of the present article to inquiry into Quinton's original and, in many cases, intriguing positions. Its purpose is to isolate, and comment briefly, an interesting argument he offers for scientific realism.[2] In the chapter entitled "Theory", a section devoted to observability directly addresses the issue of the epistemic reliability of instruments that allegedly enhance visual perception. After noting that many things are said to be unobservable in the weak, practical sense that they require special attention to be perceived, Quinton adds:

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[1] For the distinction between negative and positive arguments for realism, see Putnam (1975), p. 72.

[2] Given Quinton's views about material objects in general (see Quinton 1973, part I, and, for a more concise statement, Quinton 1964), the version of scientific realism he has in mind is very restricted, but this point need not concern us here.

> An issue of principle arises only with the objects apparently revealed to our perception when our senses are assisted by various sorts of instrument. The detailed structure of a snow crystal that we see under a magnifying glass is something we should ordinarily regard as having been observed. Is this a legitimate step? What counts in its favour is the fact that *all the features of things that are observable without this modest kind of instrumental assistance are still observed with it*, along with some other features as well. But once we admit that a thing can be literally observed with a magnifying glass there seems no point at which we can reasonably say that we are observing, not the thing itself, but its effects as we move along the series of ever more refined and sophisticated observational aids: from magnifying glasses to microscopes and from ordinary microscopes to electron microscopes with vast powers of magnification. The argument from continuity applies even to the latter. The properties and constituents of the specimen that are visible without assistance are all seen through the electron microscope at the lower levels of magnification, although greatly enlarged. *As the magnification increases some of the detail that was observed at the preceding stage is still there to be seen* (pp. 301-2; italics added).

As we see, the argument explores the same kind of ordered series of magnifying devices appearing in the argument from the continuum. Also, Quinton points to the existence of a "continuity" along the series. We submit that this similarity between the arguments has misled readers of Quinton's book to take the above argument as being just another restatement of the argument from the continuum.[3] Apparently, no explicit note was taken of the argument in the literature. To the best of our knowledge, the only other complete statement of (effectively) the same argument appeared much later, in Seager (1995), pp. 467-468. No reference to Quinton's original version is made, however. Furthermore, the argument is there mistaken for Maxwell's argument (p. 468), and when possible objections to the argument are considered, van Fraassen's reply to Hacking's "argument of the grid" is discussed instead. [4]

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[3] For an example of such a restatement, see Smart (1968), pp. 152-3.

[4] Despite these inaccuracies, Seager's analysis of the argument is, under other aspects, very perceptive. After drawing attention to a pair of real micrographs of the sternal gland of an ant, found in Hölldobler and Wilson (1990, p. 231), which nicely illustrates the controlled continuity argument, he remarks, for instance: "Personally, I find it almost impossible to resist the conviction that the [unobservable pheromone] receptacles are there, more or less as imaged [...]. I feel that it would be something of a preposterous coincidence that any imaging system would produce such pictures, given the hind end of an ant as 'input', while at the same time no such structure exists in the ant" (p. 467). (The reference to Hölldobler and Wilson's book is missing in Seager's article; it is supplied in the reference list, below.)

It is also remarkable that Quinton himself failed to underscore the important differences between his argument and the argument from the continuum. But in point of fact although the basic ingredients of the familiar argument are clearly present in the situation envisaged by Quinton, its conclusion – namely, that the distinction observable/unobservable is arbitrary, etc. – is not drawn, at least not explicitly. More crucially, Quinton's argument evokes an important consideration, which is entirely missing in the familiar argument from the continuum. As the underlined sentences indicate, Quinton realized that with a suitable choice of instruments and specimens it is possible to *control* each step in the series, as to the reliability of the putative magnifying instrument. This control results from the *overlapping* of the visual patterns occurring in any pair of successive instruments: what is seen with (or, more neutrally, *in*) instrument *n*, in its upper levels of magnification, is also seen, *in an exactly resembling pattern*, with instrument *n+1*, in its lower levels of magnification. In the following page Quinton himself refers to a "*confirming* continuity", in the situation studied. The new argument could, accordingly, be called the "*controlled* continuity argument".

As an argument for scientific realism, Quinton's argument involves two presuppositions. First, there is commitment to realism about observable, ordinary objects. As Quinton remarks, the series begins with observation with unaided senses, and this observation should be interpreted realistically. But this premise poses no special difficulty, for nowadays the typical contenders on the issue of scientific realism are all realists about ordinary objects. The other substantial epistemological assumption made in the argument is that if an instrument is able to faithfully reproduce a certain structure, it will also be trustful with respect to certain other structures seen *in the same visual field*, but which did not appear in the preceding instrument. This assumption looks extremely plausible. Only by an unbelievable coincidence such phenomena would occur in the absence of a correct causal relation with an independently existing entity.

This analysis suggests that the controlled continuity argument is a kind of *abductive* argument. The best (only?) explanation for the phenomena of partly overlapping, confirming visual patterns in the series of instruments seems to be the existence of an object capable of causally interacting with the instruments in the way scientists (and scientific realists) ordinarily assume they do. [5]

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[5] In a previous work (Quinton 1964), Quinton had come close to state the controlled continuity argument (p. 345). But its key ingredient was expressed rather imperfectly. As a result, Quinton mistook this forerunner as being "an essentially analogical argument" – seeing something directly and through a microscope seem to be analogous "kinds of observational access". We hope to have made clear that the complete, final version of the argument has much more to recommend it than this naive-looking analogy.

Notice also that Quinton's argument for scientific realism is quite straightforward, in the sense that it does not involve commitment to the truth of any particular scientific theory. In other words, the conclusion that we have good grounds to believe in the existence of certain "unobservable" entities does not come *via* support to the truth of scientific theories postulating such entities. The argument is, thus, germane to the defence of a mild form of scientific realism championed by Nancy Cartwright (1983) and Ian Hacking (1981, 1983, 1984), namely *realism about entities* (as opposed to realism about theories).

It should be remarked, in this connection, that one of Hacking's main arguments for this kind of scientific realism, "the argument from coincidence", bears a close resemblance to the controlled continuity argument. Considering the case of two (or, typically, more) structurally similar micrographs obtained with microscopes of entirely different functioning, Hacking remarks that it "would be a preposterous coincidence if, time and again, two completely different physical processes produced identical visual configurations which were, however, artifacts of the physical processes rather than real structures in the cell" (1983, p. 201). What is missing here, relatively to Quinton's argument, is just reference to the possibility of building a controlling series of visual patterns, *beginning with unaided observation*. This point is important, because it shows that the typical contemporary anti-realist can be led step by step to deeper levels of "unobservable" reality, starting from a realm in which, by his own admission, anti-realism is unattractive.

The similarity between Hacking's argument from coincidence and the controlled continuity argument, coupled with an analysis of the former made by Reiner and Pierson (1995), lends further support to our interpretation of the latter as a kind of abductive argument. These authors convincingly show that, *pace* Hacking, the argument from coincidence "invokes explanatoriness as a mark of truth – [which] is just the feature of IBE [inference to the best explanation] that has been so criticized" (p. 64). On the basis of this analysis Reiner and Pierson launch a dilemma against Hacking: "If IBE fails as a defence of realism, then Hacking's argument likewise fails; otherwise his argument is largely unnecessary, since the other arguments for scientific realism suffice" (p. 68). But we believe the second horn of the dilemma is untenable. In contrast to logical arguments, abductive arguments are not waterproof; they are plausibility arguments only. The more abductive arguments you have for a given claim the better. And the appeal of Hacking's and Quinton's arguments derives largely just from the straightforward character of the explanatory problem-situation they explore (as compared e.g. with Putnam's "miracle" argument).

These realist arguments appear thus to have better prospects of warding off van Fraassen's well-known strategy of substituting an emasculated form of IBE for

the usual one, when the latter involves unobservable entities: the best explanation has, he holds, epistemic credentials only for empirical adequacy, not for truth *simpliciter*. Given the pervasive problem of the empirical underdetermination of theories, this point gives pause to many realists. But in the cases considered by Quinton and Hacking, we are not confronted with the issue of the empirical equivalence of high-level scientific theories, but with the *prima facie* more decidable choice between the common-sense, unsophisticated realist explanation that the series of visual patterns have a real cause in some unobservable item, and the outlandish idea that they are experimental artefacts.

One could at first think that this point can be extended, *mutatis mutandis*, to the other main argument offered by Hacking, the "argument from engineering", which is also intended by him to be a theory-free argument for entity realism. Several recent analyses of the argument indicate, however, that it is not, and cannot be as independent from high-level theories as Hacking claims.[6] In a sense, then, the argument from engineering appears to be more vulnerable to anti-realist criticism than the more direct argument from coincidence.[7] The almost exclusive attention given to the former in the literature is thus unjustified.

Van Fraassen himself has attempted to refute the argument from coincidence, by claiming that the similarities in the observed images result from a deliberate process of filtering away dissimilarities when the instruments were made: "Since I have carefully selected against nonpersistent similarities in what I allow to survive the visual output processing, it is not at all surprising that I have

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[6] Morrison (1990), Resnick (1994), Iranzo (2000). By examining an example taken from contemporary physics, Morrison argues, further, that the manipulability criterion – which lies at the basis of the argument – is not always sufficient to ground belief in the reality of putative scientific entities (pp. 11-13). She also claims that Hacking's argument from coincidence is not, and was not intended by Hacking as an argument for scientific realism (p. 5). Unfortunately, however, Morrison offers no evidence at all for these contentious claims. Finally, Resnick and Iranzo both persuasively argue that the argument from engineering is a kind of abductive argument, being thus, in this respect, on a par with the argument from continuity.

[7] We would not, however, go as far as Reiner and Pierson, who hold that "[n]othing in Hacking's argument [from engineering] can forestall van Fraassen's usual objection against realists, which would here consist in pointing out that the beliefs behind our experimental practices of relying on certain causal relations may be merely that these practices, or perhaps the phenomenological theories that describe the causal interactions in question, are empirically adequate, rather than true" (1995, p. 67; italics added). The authors do not show how this general objection bears on the specific case considered by Hacking in his argument from engineering. Also, van Fraassen's own reply to Hacking (1985, pp. 297-300) does not focus sharply enough on this argument. But discussion of this point lies beyond the scope of the present paper.

persistent similarities to display to you" (1985, p. 298). We do not know whether van Fraassen would suggest a similar reply to Quinton's argument. But in any case we find this kind of claim very hard to accept. First, as Hacking underlines, coincidences of the relevant kind can be observed to occur not with two, but with a dozen or more entirely different instruments. Secondly, even if we admit, for the sake of argument, that the conception and construction of all these instruments in different epochs and by independent makers followed an explicit plan to get coincident images, the trick could conceivably work, at best, with a single specimen, but never with the endless variety of specimens that have been examined since the first microscope was invented centuries ago.[8]

Notice, to finish up that, as anticipated above, the controlled continuity argument is a *positive* argument for scientific realism. It offers direct grounds for believing in "unobservable" entities, independently of any possible weakness of anti-realist doctrines (apart, of course, of their apparent incapacity of affording a minimally plausible explanation for the phenomena explored in the argument). Thus, Putnam seems to have gone a bit too far when he asserted, famously, that "*[t]he* positive argument for realism is that it is the only philosophy of science that doesn't make the success of science a miracle" (1975, p. 73; my italics). Putnam's "miracle" argument is the most influential and, arguably (given its wide scope), the strongest positive argument for scientific realism, but it doesn't seem to be the only one.[9]

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[8] While pointing out other weaknesses in van Fraassen's reply to Hacking, William Seager has, apparently, swallowed van Fraassen's story about contrived coincidences (Seager 1995, pp. 462, 464, and specially 467, n. 2; these passages appear, however, to contrast with Seager's remark quoted in footnote 4, above). For the sense of unreality conveyed by van Fraassen's philosophy of science in general, see e.g. Schlagel (1988).

[9] Smart's "cosmic coincidence" argument (1968, pp. 150-1) is another important positive, abductive argument for scientific realism. (And it should not be confused, as often happens, with Putnam's "miracle" argument, as it operates at a different explanatory level.) All of Hacking's "experimental" arguments for entity realism also clearly belong to this category; but they were published after Putnam wrote those words.

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