

RUSSELL AND THE NEWMAN PROBLEM REVISITED

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ABSTRACT. In his 1927 *Analysis of Matter* and elsewhere, Bertrand Russell argued that we can successfully infer the structure of the external world from the structure of our explanatory schemes. While nothing guarantees that the intrinsic qualities of experiences are shared by their objects, he held that the relations tying together those relations perform mirror relations that actually obtain (these being expressible in the formal idiom of the *Principia Mathematica*). This claim was subsequently criticized by the mathematician Max Newman as true but trivial, insofar as from a closed body of observations (or “Ramsey sentence”) one can always generate other equally-satisfactory networks of relations, provided they respect the original set’s cardinality. Since any model thus generated will be empirically adequate, “[t]he defence is therefore driven back from the fairly safe *fictitious-real* classification to the much less tenable ‘trivial’ and ‘important’” (Newman 1928). Given the definitional rigour afforded by the initial appeal to isomorphism (via one-to-one correspondences in extension), the received assessment, shared by Russell himself, is that retreating to a pragmatic adjudication would betoken a fatal blow. However, I suggest that reliance on “importance” can be avoided if we incorporate an impersonal criterion of *diachronic precedence*. When collecting observations, an ordinality emerges alongside the cardinality which gives that underived structure an irrevocable epistemological privilege. Hence, I argue that, all other things being equal, any construct parasitic on an antecedent theory ought to be regarded as inferior and/or dispensable, since it was generated by an algorithm lacking the world-involving pedigree of its host structure.

Keywords: structural realism, Bertrand Russell, science, history, discovery, observation

I want to examine an important exchange Bertrand Russell was involved in during the formative years of the analytic tradition, and make those debates alive by venturing novel philosophical arguments of my own. In order to tackle this twofold agenda, I want to begin with a story which nicely captures the core intuitions behind Russell’s early analysis of objectivity.

Karl Popper once recounted the tale, likely fictitious, of a “man who dedicated his life to natural science, wrote down everything he could observe,

and bequeathed his priceless collection of observations to the Royal Society to be used as inductive evidence” (2002, p. 61). One imagines boxes of hand-written notes, scribbled on dishevelled pieces of paper, being hauled in the library on barrows. The moral to be drawn from this fable, Popper rightly held, is that a collection of observations lacking any organizing principle is epistemically inert. In his picturesque words, this “should show us that though beetles may profitably be collected, observations may not” (ibid.). In Popper’s hands, of course, this lesson was supposed to tell against inductive accounts of knowledge. While I do not want to join him in denouncing what I take to be a perfectly innocuous (and indeed vital) inference, I think the general criticism conveyed by his absurd story is well-taken, insofar as the theoretical structure we erect on a given set of observations is at least as important as those elements themselves.

The basic picture which emerges from these plausible assumptions, then, is that of discrete experiences which, when arranged in accordance with some theoretical scheme, collectively paint a worldly scene that can be assessed for its truth or falsity. The sum of one’s first-person observations—or better still, the sum of several persons’ observations—therefore has the power to yield an objective representation of how things are (if and when these observational reports are properly combined). Using the familiar Aristotelian distinction, we might say that in order to know the world, we need observation as the “matter” and structure as the “form,” lest we fall prey to the familiar Kantian reprobation about empirical blindness and conceptual emptiness.

It is with this framework in mind that Bertrand Russell articulated his early account of objectivity. Russell would take a dim view of the heap of disconnected observations bequeathed in the story just told. In fact, according to Russell, structuring observations is not only a necessary addition; rather, he went further and held that “[t]he only legitimate attitude about the physical world seems to be one of complete agnosticism as regards all but its mathematical properties” (1954, pp. 270–271). Going back to Popper’s fable, Russell would thus maintain that the account tying together the various observational episodes recorded on the pieces of paper are what we should actually be interested in, since it is their arrangement—and not the atomic constituents themselves—that ultimately reveals how the mind-independent world is.

Working from a self-imposed embargo on pragmatic considerations that would eventually be lifted (by Quine and others) in the 1950s, the early Russell tried to support this claim of correspondence on purely *a priori* grounds. Defending what we would today taxonomize as a “structural realist” view of knowledge, Russell held that the various relations which enter into theories can be shown from the armchair to enjoy an isomorphic bond to

the world. What I want to do now is briefly reconstruct his argument, look at the crucial flaw that ultimately brought it down, and then propose a remediation which I think redirects many of the initial insights on a more plausible path.

Russell's argument began with a fairly uncontroversial premise which, following Stathis Psillos (2009, p. 126), we can call the "Helmholtz-Weyl" principle. It states that "we are justified, when different perceptions offer themselves to us, to infer that the underlying real conditions are different" (quoted by Weyl 1963, p. 26). This principle grafts itself nicely onto well-known Russellian tenets. Russell (1998, p. 59) thought that observational episodes conveyed by nondescript demonstratives like "This is white" supply us with "knowledge by acquaintance." Although we can wave our index fingers around and attempt to ostensibly convey what is happening when we enjoy such first-person episodes, these empirical points of contact, Russell held, are by their nature private and ineffable. This, of course, does not make for promising bedrock if what one is after is objective third-person knowledge. Not to worry, one does not have to wait long to depart from this baseline atomicity, since "[t]he next simplest [facts] would be those in which you have a relation between two facts, such as: 'This is to the left of that'" (ibid.). The moment we bring two or more *relata* into relation, we leave the domain of intrinsic qualities and effectively enter that of intelligibility (and, by extension, science). This is where the aforementioned move from different perceptions to different causes does its work. On this view, a three-part sequence like lemon/apple/lemon will bear the same relational configuration as a three-part sequence avocado/banana/avocado—even if one person tastes avocado flavours where another tastes lemon. Hence, so long as variations in experience attest to variations in whatever is impinging on the sense organs, the "Helmholtz-Weyl" principle licenses the inference of a common mind-independent *structure*.

So impressed was Russell with this that he maintained that any version of idealism, if consistently pursued, would have to acknowledge that scientific theories have the same form as their worldly domain (the one-to-one isomorphism entailing that worldly structures have true theories as their converse domain). "Two relations P , Q are said to be 'similar' if there is a one-to-one relation between the terms of their fields, which is such that, whenever two terms have the relation P , their correlates have the relation Q , and vice versa" (Russell 1954, p. 249). In the previous example, avocado-tastes mapped onto lemon-tastes, and apple-tastes onto banana-tastes. Likewise, "[a] book spelt phonetically is similar to the sounds produced when it is read aloud" (ibid.), since the structure binding the printed characters can be monotonically correlated with the structure binding the spoken sounds (ibid., p. 400). Russell's claim was that good empirical accounts and the

world are isomorphic in just this way. Hence, for a period at least, he took structure to be the one exception escaping his usual policy of philosophic agnosticism. Venturing beyond the veil of appearances, he declared that “[i]f the phenomenal world has three dimensions, so must the world behind phenomena; if the phenomenal world is Euclidean, so must the other be; and so on. In short, every proposition having a communicable significance must be true of both worlds or of neither [...]” (Russell 1950, p. 61).

To be sure, Russell made a partial concession to the sceptic, insofar as the contents that hang together in a given structure remain subject to the possibility of a radical disconnectedness—both from the world and from one observer to another. This concession was nevertheless assumed to be benign, since qualitative relata fall outside the ambit of testability and intersubjective verification such that “the only difference must lie in just that essence of individuality which always eludes words and baffles description, but which, for that very reason, is irrelevant to science” (Russell 1950, p. 61; for a kindred view, see Carnap 2003, pp. 28–30). It is important to underscore that Russell is here shaving off qualia because they are non-structural and *not* because they allow for commutative differences that make no difference. The analytical motive for the dismissal is relevant, because at no point did Russell contemplate using a more blunt pragmatic razor to cut himself loose from the formal problems in which he was later entangled.

Looking back, Russell’s belief that discarding qualitative features is an unproblematic move can seem hopelessly naive. As anyone familiar with contemporary debates about consciousness well knows, qualia would come back to haunt analytic philosophy with a vengeance (see Livingston 2004). As things stand, Russell did not have to wait for the emergence of “zombies” to have his views challenged. Rather, trenchant criticisms came from a purely logical front as Russell’s project of deducing realism by appealing to structural relations was effectively terminated in the late 1920s by the Cambridge mathematician Maxwell H. A. Newman (in what turned out to be Newman’s sole philosophical paper).

Newman (1928, p. 139) agreed with Russell that, for the purposes of serious explanation, the intrinsic character of observational relata can be dispensed with. However, the problem highlighted by Newman essentially draws out a consequence that does not bode well for the attempt to get some realist mileage out of the notion of structure. Expanding on the generic Aristotelian distinction introduced earlier, a good way to preview Newman’s grievance would be to say that while Russell grasped the variability of matter with respect to form, he overlooked the variability of form with respect to matter.

On Russell’s account, the qualitative contents of observational experiences can change while the structure organizing them stays the same. However,

to the extent that this distinction holds, one must likewise make allowances for the possibility that, with the same set of simple qualitative contents, the complex network of relations organizing them can be varied. Indeed, Newman showed that, as a matter of second-order logic and set theory, if we gather all observations into a sum (which we would today call a “Ramsey sentence”), any structure that satisfies a one-to-one correspondence with this class *cannot fail but* adequately square with experience. Using the mathematical terminology favoured by Newman, we can say that so long as one respects a set’s cardinal number, one can impose on that set a variety of ordinal structures. And since discrete observations are the guarantors of an empirical contact with the world, all structures that include them will *by definition* be materially adequate.

When structuring a set, informational entropy is increased, since one can no longer enumerate the members any which way. Russell and his contemporaries, however, took it for granted that anything which is extensionally equivalent is equivalent *tout court*. This assumption—which effectively reprises Georg Cantor’s conception of class-similarity—is not a happy one for contingent inquiries like natural science, since it renders the deductive inference from structure to objectivity basically vacuous. In other words, fashion a clay sculpture as you will, so long as the clay weighs the same when placed on a scale as it did initially, the shape imposed will pass muster. “In a sense, the Newman problem is the inverse of multiple realizability. Whereas in the latter case we have multiple instantiations (collections of entities) that fit the structural description, Newman’s problem amounts to saying that a given collection of entities can be endowed with any arbitrary structure, as long as the collection has the right cardinality” (Lyre 2010, p. 389).

Obviously, not all candidate structures ought to be taken as real. Yet, as plain as this may seem, a choice in this regard cannot be underwritten by purely formal considerations. As Newman put it: “The defence is therefore driven back from the fairly safe *fictitious-real* classification to the much less tenable ‘trivial’ and ‘important’” (1928, p. 146).

On the assumption (shared by all the original parties to this debate) that the world simply cannot house normative features like importance, this forced retreat to pragmatic considerations was taken to betoken a fatal blow. Russell’s initial hope was to anchor realism to the definitional rigour afforded by the notion of isomorphism, which he (mistakenly) thought showed that successful scientific theories model the structure of the world. However, such a claim to correspondence, Newman argued, is essentially tautological. Accordingly, it is hard to see how it can do any serious lifting in debates about the real nature of the world.

Most contemporary commentators (e.g., Demopoulos and Friedman 1985; Psillos 2009) take Newman to have articulated a knock-down criticism.

Interestingly, Russell seems to have shared that very assessment. In a letter dating from 1928, which is the same year Newman published his criticism in *Mind*, Russell wrote to Newman that he was “somewhat ashamed at not having noticed the point for myself” (1968, p. 176). Yet, there is reason to think that Russell *had* noticed the point. Indeed, in his 1919 *Introduction to Mathematical Philosophy*—which pre-dated Newman’s article by close to a decade—Russell demonstrated in explicit detail how one-to-one relations can survive endless variations, provided the outcome saves the cardinality at hand. He insisted, for example, that if we take the first ten integers, we can correlate these individual numbers with their respective doubles. The resultant set of even numbers will bear the same (bijective) relation to the initial set of integers, since one can just as easily travel in the other direction by dividing the numbers in half. Moreover, the cardinality is preserved: from ten items we go to ten items. Obviously, there is nothing unique about the operations of doubling and dividing. In fact, Russell rightly stressed that “[s]uch processes of correlation may be varied endlessly” (1950, p. 49). Russell’s faulty recollection (or false humility) notwithstanding, there is thus textual evidence that he did know of the structural underdetermination afforded by one-to-one relations. Russell may have been a bit over-dramatic in his apologetic response to Newman (or again, perhaps the fact that he knew beforehand is more precisely the source of shame). In any event, the lesson to be learned from Russell’s failure to deductively ground objectivity is that “[a] satisfactory account of [theoretical knowledge and reference] must do justice to such ‘obvious facts’ as that the world’s structure is discovered rather than stipulated” (Demopoulos and Friedman 1985, p. 635).

One way to rephrase that moral—the one I would now like to defend—is to say that structure without history is empty.

Newman showed how an open-ended array of structures can be imposed on a given body of discrete observations, and that the duplication of structures is free to employ any algorithm. This liberalism is nevertheless subject to one non-negotiable constraint: the ensuing duplicates cannot compromise the cardinality at hand. In other words, on the terms set by Russell and Newman, one will fatally corrupt the “matter” of a sculpture if, in the course of refashioning its “form,” one removes or adds some clay. Now, as Demopoulos and Friedman point out, “Newman’s problem arises *after* the domain has been fixed” (1985, pp. 628–629). This, to my mind, is a crucial feature, into which we can begin to wedge a solution. Indeed, one may justifiably ask: what determines this cardinality?

Clearly, no transformational rule contains that cardinality. Despite the open-ended character highlighted by Newman, it seems that the cardinality which constrains the spawning of structures must come from a specific source, namely, a founding string of observational episodes. Just as a hunk

of clay always has *some* shape, that cardinal class must obviously have *some* original structure. Hence, we may conclude that, since Newman's problem arises after the domain has been fixed, all subsequent mirror images must be parasitic on a master copy that is patently *not* the product of a model-theoretic duplication. To be sure, a master copy is still a copy, in the sense of "corresponding" to whatever in the world makes it true. That is not, however, to be glossed as a bad thing. If an artist paints a still life, the ensuing sign-vehicle is not a forgery; but if someone else paints that original painting, the new work *will* be a forgery. Newman duplicates enter at this second stage, and it is these which, I argue, ought not to enjoy the same epistemic standing as the original theoretical depiction of the world.

The following analogy might help to clarify my diagnosis. Imagine two athletes competing in Plato's mathematical heaven, playing shot-put. One is in top form, and puts the shot 25 meters, breaking the world record. Upon witnessing this splendid performance, the other summons all his energies and likewise puts up a distance of 25 meters. Which of the two set the world record? Given our lofty Platonic playing-field, it seems the answer must be: *neither*—or *both*. This is because the distances are exactly 25 meters each and, on a purely synchronic conception, that makes them equivalent. Whatever can be said of one can apparently be said of the other. It is clear, though, that only one of the two athletes set the record. It may seem paradoxical, but the two quantities are nevertheless different, even though they involve the same quantities. Concretely, the reason is that the relations at hand occurred *diachronically*, such that the first throw will forever have a predicate which the second cannot, namely "...is the record-setting performance." This privilege, anchored in a situated historical context, is irrevocable; and subsequently matching the distance to the last decimal cannot alter this, save in an artificial perspective that neglects the temporal priority of one of these quantities.

Before the Newman objection gets off the ground, there must be a body of observations at one's disposal, and that mass must from the start have some structure that bears witness to the way it was diachronically harvested. When collecting a body of observations, then, an "underived ordinality" emerges alongside the cardinality. All other things being equal, I submit that any model-theoretic duplicate lacking this world-involving pedigree ought to be regarded as inferior and/or dispensable. Paying attention to the historical record should thus allow one to deflect the trivial realization highlighted by Newman.

It is uncontentious that "among all those relations-in-extension which generate the same structure, only those which express *real relations* should be considered" (Psillos 2009, p. 163). That conviction is undoubtedly correct. But, faced with the proliferation of empirically-adequate structures, we nevertheless need a principled reason to justify our endorsement of some relations

over others. Interestingly, Carnap (2003, pp. 235–237) tried to achieve this result by making “foundedness” a primitive. However, it is difficult to see how such an intangible (and uncharacteristically un-analytical) notion differs from the existentialist *Dasein* (Friedman 2000). Temporal antecedence, by contrast, can be defined in a rigorous manner, if anything can. I therefore argue that diachronic priority can allow us to pick out the relevant structure amidst the flurry of artificial duplicates—without ascribing a normative property like “importance” to the world. In this sense, indexing structures to their situated context of discovery is a third option that was overlooked by Russell and Newman alike.

This is not to say that, for instance, the Ptolemaic account in astronomy should be preferred over the Keplerian one just because it came before. That is not what I am advocating. The complex structural relation expressed by Keplerian astronomy is not a Newman duplicate of Ptolemy’s, because the cardinality of observations over which it ranges is greater/different. As such, the relevant worry is not even applicable to this case. However, if one were to concoct a theory that explains the same celestial motions as Kepler’s laws only by “cryptographically” reshuffling that explanatory structure (with a “key” that could trace the one-to-one path back to the original laws), then the new account would deserve, in my view, to be shaved off. Of course, if that reshuffled structure somehow manages to capture one further fact, then things are no longer equal, and my proposed razor of priority no longer applies. Going back to the analogy with shot-put distances, the diachronic perspective I am urging has the virtue of making sensible the requirement that a candidate theoretical structure must explain a greater cardinal number of observations than its predecessor.

In a move that lends support to this view, Stathis Psillos (2009, p. 153) has recently suggested that a Ramsey sentence is best viewed as a “growing” existential statement. The idea of “growth” is a potent one, since it brings with it a diachronic dimension. Scientific explanation has marched on quite a bit. Now it may be that, having come this far, we get to look back at this enumerative totality and discern recurring motifs of varying salience. Moreover, it may be that the common threads we uncover are, in the main, structural in nature. Hence, “[h]aving specified these *natural* relations, one may abstract away their content and study their structure. But if one begins with the structure, then one is in no position to tell *which* of the relations one studies and *whether* or not they are natural” (Psillos 1999, p. 66). Inductive generalizations therefore do not license a departure from the mode of investigation which yielded the discovery, as if historical inquiry was a ladder out of Plato’s cave which one could discard upon reaching the immutable structural verities (e.g., Ladyman et al. 2007).

As can be seen, the exchange between Russell and Newman broached major philosophical themes. One could make the case that shared worries about the potential disconnectedness of structures from the world stem from what Donald Davidson (2001, pp. 183–198) later identified as the “third dogma” of empiricism, namely the dualism of scheme and content. In the same vein, I have argued that Newman’s problem is only a “problem” if empirical knowledge disowns its historical roots. Be that as it may, assumptions about the separability (and primacy?) of structure were at the core of early analytic philosophy, and it is hard to see how one can challenge those assumptions without also challenging the intellectual program they influenced. Hence, looking back at Russell’s failure to secure knowledge of the external world by means of truth-preserving argumentation, one is naturally tempted to look for resources that are non-monotonic. Pragmatic expediency is one straightforward way to sift through an artificial accumulation of isomorphic structures: you figure out which whole is convenient to adopt, and then commit yourself to it for as long as this proves useful (see Quine and Ullian 1978, pp. 64–82). Resorting to this strategy, though, means taking on the role of the proverbial bull in the China shop. Those misgivings notwithstanding, a more serious objection (which Rorty attracted like a lightning rod) would be that pragmatic considerations are too closely bound with subjective interests and pluralism to secure the twin desiderata of mind-independence and univocity that we naturally expect a tenable realist account to meet.

It may take fancier footwork, but I think a perspective can be developed that respects the embargo on informal appeals which characterized the early analytic program. With this in mind, my suggestion in this paper has been that reliance on features like “importance” can be avoided if we turn to the impersonal criterion of diachronic precedence. When collecting observations, an ordinality emerges alongside the cardinality which gives that structure an irrevocable epistemological privilege. I submit that, all other things being equal, any construct parasitic on an antecedent theory ought to be regarded as inferior and/or dispensable, since it was generated by an algorithm lacking the historical credentials of its host structure. Hence, if a “crucial experiment” is one capable of producing a single verdict sufficient to adjudicate between competing theories, then a good way to summarize my remarks would be to say that I have endeavoured to supply a “crucial *context*.”

As we pay increasing attention to the history of analytic philosophy, we gather that analytic philosophy has not paid much attention to history. Of course, early logical empiricists (like Reichenbach) thought it wise to divorce such a “context of discovery” from questions pertaining to “justification.” However, in a bid to dissolve the worries engendered by Newman, I have argued that, in the end, theories are justified *because* they are discovered.

That may seem like a truism, but it is an oddity of our philosophical craft that no one ever really stated things that way.

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