

## Ernest Nagel's Naturalism: A Microhistory of the American Reception of Logical Empiricism

Christopher Pincock – 6751 words – October 14, 2015

Ernest Nagel, then, is a remarkably wide-ranging analytical philosopher, who has combined logical power and scientific learning in his admirable effort to formulate principles that should guide rational inquiry and rational living.

– Morgenbesser, Suppes, and White (1969), v.

I.

Ernest Nagel (1901-1985) stands out as one of the earliest and most successful American advocates of a broadly logical empiricist philosophy of science. His magnum opus *The Structure of Science: Problems in the Logic of Scientific Explanation* (1961) offers what turned out to be a compelling model of analytic philosophy of science. This work embodies one set of ideals for the analytic philosopher: modest, engaged with the details of science, and displaying technical mastery of logic and mathematics. It is thus fruitful to consider how and why Nagel adopted this approach to the philosophy of science. An examination of Nagel's case has no immediate implications for the broader question of how analytic philosophy fashioned its self-image in the 1950s and 1960s, for it turns out that Nagel's situation was far from typical of American philosophers in this period. At the same time, Nagel's proposed "contextualistic naturalism" (Nagel 1956, xviii, Nagel 1954, 54) can inform such a broader history of analytic philosophy.<sup>1</sup> For it appears that prior support for naturalism in some form helped logical empiricist commitments to

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<sup>1</sup> Nagel's position was also called "critical naturalism" (Morgenbesser, Suppes & White 1969, v).

find a foothold in the United States. Debates about naturalism permeate American philosophy throughout the critical formative period of analytic philosophy (Eldridge 2004, Jewett 2011). If we can see how naturalistic commitments served to shape the self-image of analytic philosophers, then we will have a better understanding of what this movement in philosophy might amount to.

In this essay I argue that Nagel's adoption of logical empiricist commitments was motivated by a problem at the heart of his naturalism. This is the problem of the metaphysical basis of logic. Nagel eventually argued that only a view of logic that freed itself from metaphysical commitments was consistent with a thoroughgoing naturalism. By these means he tried to offer a compelling philosophical position that would undergird his more piecemeal investigations into science. This form of naturalism aimed to sustain a vision of the philosophy of science that assigned a legitimate place to both the natural and the social sciences as well as ethical and political values.<sup>2</sup>

## II.

Nagel was born in Bohemia, then in Austria-Hungary, in 1901, but his family emigrated to the United States in 1911.<sup>3</sup> His philosophical outlook was shaped early on through his studies at the City College of New York with Morris R. Cohen (1880-1947). Nagel graduated from City College in 1923 and began an extended graduate study at Columbia, which culminated in a Ph.D. dissertation "On the logic of

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<sup>2</sup> See Richardson 2008 for a helpful overview of these developments. I take my discussion of Nagel to complement the reconstruction found in Reisch 2005.

<sup>3</sup> These biographical details are mostly drawn from Juffras 2003.

measurement” (Nagel 1930).<sup>4</sup> In his dissertation Nagel thanks John Dewey (1859-1952) for “a basis for whatever philosophy I can call my own” (Nagel 1930, iii).<sup>5</sup> As we will see, Nagel’s work often tries to negotiate the conflicts between Cohen and Dewey.<sup>6</sup> Nagel secured employment as an instructor at Columbia in 1930. He stayed there for the rest of his career, except for a few brief interludes.<sup>7</sup> Nagel’s trip to Europe in 1934-35 (as a Guggenheim fellow) is especially important for our discussion as it was during this time that he met the most prominent logical empiricists. His extended report, “Impressions and Appraisals of Analytic Philosophy in Europe”, published in two parts in the *Journal of Philosophy* in 1936, represents one of the earliest attempts to characterize analytic philosophy as a movement (Nagel 1956, 191-246).

Nagel agreed with both Cohen and Dewey that logic was properly conceived as the broad study of the appropriate tools for rational inquiry, including the discussion of scientific methods for evaluating evidence. As Nagel put it in the 1934 textbook *An Introduction to Logic and Scientific Method*, co-authored with Cohen, “Logic may be said to be concerned with the question of the adequacy or probative value of different kinds of evidence” (Cohen & Nagel 1934, 5).<sup>8</sup> Formal logic and the study of deductive proof are important parts of logic, but they by no means should

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<sup>4</sup> Nagel’s Ph.D. was awarded in 1931, but a number of privately printed copies of his dissertation were produced in 1930.

<sup>5</sup> It does not appear that Dewey was Nagel’s official supervisor as Dewey became emeritus professor in 1930. Woodbridge is also thanked by Nagel in his introduction.

<sup>6</sup> See, for example, Costello 1932, 470 and Suppes 1994, 259.

<sup>7</sup> In 1959-60 Nagel was a fellow at the Center for Advanced Studies in the Behavioral Sciences, where much of the final drafting of *Structure* was completed.

<sup>8</sup> Compare Nagel 1956, ix, 52. Hollinger notes that the 1934 textbook was “predominantly Nagel’s work” (Hollinger 1975, 158, 162, fn. 14).

exhaust the attention of the logician. An urgent question for this approach to logic is to determine how it is that logical statements (like the law of excluded middle) or principles of inference (like modus ponens) constrain our evaluation of evidence. Until the mid-1930s Nagel was content with the account of logic that he sketched in his book with Cohen. A succinct statement of this view is that logic is tied to the modal character of things: “the norm or correctness of logic is based on the possibilities in the nature of things which are the objects of our discourse” (Cohen & Nagel 1934, 17). The things in question are not merely the actual things found through empirical investigation, but also non-actual things. A claim like “metals conduct electricity” is not just about actually existing metals, but also pertains to metals that could exist. More generally, “whatever actually exists is only one of an indefinite number of possibilities. The actual is a flying moment passing from the future which is not yet to the past which no longer is” (Cohen & Nagel 1934, 21). This suggests some kind of realism about the non-actual, be it merely possible metals or metals beyond the present.

Nagel’s early approach to the nature of logic raises a number of questions for a naturalist. Nagel’s naturalism was announced in his dissertation, and remained a constant element of his approach to logic and the philosophy of science. In its initial form it embraced three commitments:

their common conviction [1] that reflective inquiry may discover the order of the birth and decay of things; [2] that thought and ideal forms have physical efficacy only in virtue of the operations of matter of which they are expressions; and [3] that the ideals of life must be based upon the

satisfactions achievable in a material world (Nagel 1930, ii, numbering added).

On the metaphysical side, Nagel proposed that the findings of science indicated that the natural world, made up of ordinary things like chairs and people, is all that exists. He also aimed to place scientific methods of testing and validation at the heart of any account of genuine knowledge. It is hard to see how this sort of naturalism can make sense of logic as the study of the natures of actual and merely possible things. The implicit modal realism of the 1934 position seems to flatly contradict metaphysical naturalism. Also, our knowledge of the truths of logic does not appear to be the sort of thing that scientific methods could validate. Indeed, as Nagel sometimes argued at this time, scientific methods take logic for granted, and so they would have trouble legitimating our knowledge of logic.

Cohen appears not to have been troubled by the tensions between naturalism and his conception of logic as he happily embraced a non-naturalist metaphysics and epistemology. His 1930 “Faith of a Logician” offers a frank defense of “logical realism” (Cohen 1949, 9). Cohen rejected a Millian empiricism about logic as “Experience alone cannot prove the absolute impossibility of things that have not as yet occurred” (Cohen 1949, 9). Here Cohen cites the irrationality of the square root of 2 and pi. More generally, “since all proof rests on assumption, it is vain for philosophy to pretend to prove all its material assumptions” (Cohen 1949, 10). This dependence not only undermines Mill’s empiricism, but also rationalism and Kantian idealism, for according to Cohen these philosophies try to justify all substantial claims without recognizing their necessary presuppositions. Cohen

endorsed what he called “the principle of polarity” that says there is a “necessary opposition in all determinate effects” (Cohen 1949, 12). For logic this meant that even though logic reflects the “formal relations” of all things, there is a material element that eludes logical determination: “The world may be said to contain an irrational element in the sense that all form is the form of something which cannot be reduced to form alone” (Cohen 1949, 11).

Despite Cohen’s interest in logic, mathematics and science, one can sympathize with Nagel’s search for an alternative grounding of this modal approach to logic. In his early publications Nagel maintained that logic did presuppose some metaphysical claims, but remained open to various ways of carrying out this grounding. One forum that led Nagel to present his views is a remarkably sharp exchange with Dewey in 1929. Nagel’s “Intuition, Consistency, and the Excluded Middle” begins as a review of Becker’s *Mathematical Existence* and the third edition of Fraenkel’s set theory textbook (Nagel 1929a). Nagel assails phenomenological approaches for failing to address the basic issue: “A philosophy which sanctions the a priori in its usual forms leaves the connection between material and formal logic unexplained, and too often makes a confusing puzzle of the applicability and application of logic to existence” (Nagel 1929a, 482).<sup>9</sup> Nagel also criticizes a regress argument that is reminiscent of Cohen’s discussion of logic. Drawing on Peirce, Nagel contends that this argument involves a “confusion of logical priority and temporal antecedence” (Nagel 1929a, 482). We may conceive of the initial

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<sup>9</sup> Even at this early stage of his career, Nagel did not shy away from harsh criticism of his opponents, going as far as to complain of “all the Nelsons who ... reveal themselves as pathetic dictators to the tides of scientific progress” (Nagel 1929a, 482). Nelson had tried to defend the Euclidean character of perceptual space.

application of logical principles as “habits of thought” that are without legitimacy (Nagel 1929a, 483). Over time, we can abstract out workable general principles that seem to serve well in the reliable production of knowledge. Nagel thus embraced a kind of fallibilism about logic that he took to be the required cost of making sense of the application of logic to concrete or “material” reality: “the most rigorous proof yet devised may turn out to be leaky” (Nagel 1929a, 483). He was happy to extend this approach to contentious claims like the law of excluded middle. It is a genuine claim about reality that could turn out to be false. Part of Nagel’s qualified defense of the law of excluded middle is to emphasize the role of the context in making its application definite. Although “every case of disjunction is conditional upon the context” (Nagel 1929a, 487), whenever a determinate context is given, and where it makes sense to apply the predicate, the predicate either does or does not apply to the subject.

Dewey objected forcefully to Nagel’s application of the law of excluded middle to claims about the future. Nagel (writing in 1929) said that it is true that Hoover either will or will not be President in 1930, once one applies the appropriate qualifications. One such qualification is that Hoover is still alive in 1930. Nagel concluded

It is possible, therefore, to enumerate exhaustive (though very general) properties about the future, if that future is not altogether independent of the character of the present, or of any particular time – a condition which indeed is the condition for intelligible discourse about it (Nagel 1929a, 488).

Dewey responded that Nagel was confused about the formal character of logic: “If – as I believe – the principles, since they are purely formal, are applicable only to formal or non-existential subject-matter, confusion is bound to result when they are directly applied as criteria or rules in a philosophy of physical or existential affairs” (Dewey 1929, 701). There is a clear contrast between “conditions of existence” and “conditions of effective inquiry about existence” (Dewey 1929, 705). Logic, as formal, relates only to the latter, and the results of applying logical and mathematical reasoning cannot be taken to hold of material existent things without further investigation. As an example of this Dewey notes the irrationality of pi: “the conclusion has no existential applicability until we are shown, by empirical evidence, that there are existences” of that exact sort (Dewey 1929, 704). Analogously, we cannot apply the law of excluded middle until we have assured ourselves that this formal principle applies to that domain of existence. In sum, we cannot assume “that logical and formal principles have a direct material and ontological application” (Dewey 1929, 703).

Nagel responded to Dewey in a short note “Can Logic Be Divorced From Ontology?” (Nagel 1929b). Nagel’s answer is a clear “no”. The key argument that Nagel offers for this conclusion assumes naturalism: “For one who is committed to a whole-hearted naturalism, the continuity between logic and metaphysics can not be broken” (Nagel 1929b, 708). Nagel takes Dewey to be such a naturalist, and this commits Dewey to the claim that we can know some “generic traits of existence” as well as “irreducible traits in every subject-matter of scientific inquiry” (Nagel 1929b, 706). This means that we must be able to draw conclusions about the world



itself based on our investigations into the world. Nagel complains that Dewey's separation of logic and ontology would preclude this extrapolation:

if logical traits are cut off from ontological traits, so that the former have no prototype in the latter, Professor Dewey's belief that the precarious and stable are exhibited, not only in the human foreground, but as outstanding features of nature throughout, is untenable (Nagel 1929b, 707).

At the same time, Nagel admits that he does not know how "to exhibit that connection [between logic and ontology] in detail" (Nagel 1929b, 709).<sup>10</sup>

We see, then, that the puzzle of how to reconcile a robust account of the nature of logic and its link to ontology, consistent with some form of naturalism, was prominent in Nagel's thinking in 1929. As late as 1935, we still see Nagel struggling with the options for dealing with this set of commitments. In "Notes Towards a Naturalistic Conception of Logic" (Nagel 1956, 39-54), Nagel announces the strategy that would eventually allow him to remove the dependence of logic on metaphysics. The main innovation is to deepen the contextual or operational approach hinted at in the 1929 discussion:

A clear recognition that all analysis and all judgments of importance are contextual, that distinctions and traits are distinctions and traits within denotatively fixed subject matter, that the extrapolation of one analysis to

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<sup>10</sup> Most of 1929a and 1929b appear as chapter V of Nagel's dissertation (Nagel 1930). In new material added at pages 87-89 Nagel repeats his basic worry: "But does it follow that because a universal does not exist *by itself*, it does not exist *at all*, apart from the abstractive process?" (Nagel 1930, 89). Nagel did clarify the point about the law of excluded middle and the future by changing "exhaustive (though very general) properties" (Nagel 1929a, 488) to "exhaustive formal properties" (Nagel 1930, 90).

other situations must be attended by caution if dislocations of meaning are not to result, are important services which a thoroughgoing naturalism can render (Nagel 1956, 41).

Nagel had deployed this approach to measurement to conclude that talk of length or temperature independently of the operations of measurement is illegitimate. Now he suggests the same approach is needed for logic. What is needed is “a systematic procedural analysis of both logic and mathematics” that is currently “but a hope” (Nagel 1956, 50).

III.

Nagel announced his mature position in the philosophy of logic in the 1944 paper “Logic Without Ontology” (Nagel 1956, 55-92).<sup>11</sup> The contrast with the 1929 debate with Dewey is stark. For, as the title of the article suggests, Nagel has now decided that a naturalist must divorce logic from any ontological presuppositions. The argument for this conclusion depends on an honest “operational analysis of formal concepts” (Nagel 1956, 73). This reveals that the function of logical and mathematical symbols is not to reflect matters of fact, but to impose a kind of order on our scientific thinking:

Various norms or ideals – such as the desire for a certain degree of precision, for intellectual economy and notational convenience, or for a certain type of comprehensiveness – also control the direction of inquiry and the articulation of theories. Many symbolic constructions and operations are therefore indices of the standards regulating the course of systematic

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<sup>11</sup> See also Nagel 1938a and 1938b.

investigations, and are not merely indications of the expected conclusions of experiment or of the intrinsic relations between phases of subject matter (Nagel 1956, 72).

Neither a simplistic empiricism nor a metaphysical grounding of logic is appropriate as both obscure this organizational function of logical norms.

When it comes to logical principles, Nagel thinks he has found what their function is in our investigations. A “principle of noncontradiction” is adopted to prescribe a reform of the actual use of language in order to make it more precise (Nagel 1956, 74). This “regulative function” does not reflect any underlying character of things in the world. It is instead justified by the aim of “effective communication” (Nagel 1956, 74) in scientific contexts. Similar points apply to logical rules of inference such as modus ponens: “The explicit formulation of canons of inference ... help to fix usages where they have previously been unsettled: they serve as *proposals* for modifying old usages and instituting new ones” (Nagel 1956, 76). Nagel takes the justification of these proposals to be exclusively a matter of helping scientists to achieve their desired ends. This means that the question of which logic is to be adopted is not solved by arbitrary means, but by considering “the adequacy of the proposed changes as means or instruments for attaining the envisaged ends” (Nagel 1956, 77).

Nagel extends this approach to mathematics as well, at least in connection with the use of irrational numbers in measurement. He focuses on the claim that an object is the square root of 2 feet long (Nagel 1956, 87). As we have seen, both Cohen and Dewey use statements of this sort to bolster their views on the nature of

logic. Nagel claims that there is no simple relationship between the mathematical entity and the object that renders such statements true. Instead, there is an elaborate process of testing that would lead us to assert or reject such a claim: “the irrational numbers become excellent and practically indispensable means for indicating in a compact way the values obtained in an indefinite series of experimental determinations” (Nagel 1956, 91). A length claim of this sort is both an allusion to a series of past measurements, but also involves taking a position on what will be measured in the future. Allowing such measurements into our science, then, is a decision that is justified by the broader aims of our inquiry. It does not require any commitments about precise lengths in the world, but only the practical point that this policy will best serve the aims of science.

In divorcing logic from ontology, Nagel has moved much closer to Dewey’s 1929 position. Still, from Nagel’s perspective, his approach is superior to Dewey’s approach as Nagel now has a way of addressing the earlier objection to Dewey. Recall that Nagel had worried that Dewey was unable to use logic to find out truths about the real world, including the truths needed to sustain Dewey’s naturalism. Nagel’s focus on the aims of scientific inquiry allows him to bypass this problem. The justification of a logical principle turns on its ability to aid scientists in finding out truths about the actual world. So we may adjust our logical commitments with this concrete aim in mind. There is no distinction between the objects of inquiry and the objects in the world, and thus no gulf between what logic helps us to believe and what we should believe about the world. Nagel can allow that scientists do discover

particular facts and general patterns that obtain in the objective, mind-independent world.

It seems that Nagel hoped to bring Dewey around to his position. In 1944 Dewey, Hook and Nagel co-authored a spirited defense of naturalism, "Are Naturalists Materialists?" (Nagel 1956, 19-38). This shows that Nagel had no qualms about identifying his naturalism with Dewey's naturalism. In print, Nagel expressed hopes for Dewey's 1938 *Logic: The Theory of Inquiry*. His short notice from 1939 concludes that "Those who read it must acquire courage and inspiration to contribute their share toward completing the fundamental task which Professor Dewey has envisaged with such startling clarity and adequacy" (Nagel 1939, 581). But the task in question mainly involved clarifying several "obscure" (Nagel 1939, 580) aspects of Dewey's discussion, including the question of how different kinds of general claims function in scientific discourse. For his part, Dewey seemed unimpressed with Nagel's views. In a letter to Bentley from 1939, Dewey complained that Nagel "was brought up philosophically by Morris Cohen who gave an ontological, 'realistic' interpretation to all basic logical ideas and I think reaction from that has carried him further towards formalism than he will stand by in further development" (Hickman 2008, 1939.02.05 (08610)).<sup>12</sup>

Whatever their alliances, then, Nagel's contextualist naturalism involves a distinctive conception of logic that marks a break with Dewey's naturalism. Nagel's

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<sup>12</sup> See also Hickman 2008, 1939.03.05 (08613). See Nagel 1954, 101-149, Suppes 1969 and Nagel 1981 for some of Nagel's later discussions of Dewey's *Logic*. In 1981 Nagel returns to the original discovery problem from 1929a (xxii), while also complaining that Dewey never clarified the necessity that was said to unite the terms of a universal proposition. As a result, "the grounds for his criticism of those logicians whom he calls 'formalists' are not obviously relevant" (xviii).

attempt to divorce logic from ontology prompted a number of replies, including the extended 1949 *Philosophical Review* exchange with Everett J. Nelson and Everett Hall (Nagel 1956, 93-102).<sup>13</sup> Nelson offered a variant on the presupposition argument that we have seen in Cohen: to explain how logic is an effective instrument, one must see how it reflects the underlying “categories” of reality, and so our knowledge of these categories is presupposed in scientific inquiry. Hall launched a more general complaint that any account of the character of logic involved some metaphysical claims about reality. This meant that it was fruitless to try to completely separate logic from metaphysics. Nagel complained that Nelson’s attempt to offer a metaphysical explanation of logic’s success was poorly motivated. It was just not clear how a metaphysical foundation of logic could help to solve any of the open questions about logical principles. In his response to Hall Nagel pointed out that his target was “speculative ontology” (Nagel 1956, 101) and not the ordinary claims about humans about what facilitate their communication.<sup>14</sup>

IV.

By the 1950s Nagel had achieved a prominent status in American philosophy.<sup>15</sup> A significant sign of this prestige is his December 1954 presidential address to the Eastern Division Meeting of the American Philosophical Association. His title was “Naturalism Reconsidered” (Nagel 1956, 3-18). This address is

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<sup>13</sup> Alice Ambrose also participated in this symposium as a critic of Nelson, but Nagel makes no mention of her position in his response.

<sup>14</sup> See Nagel 1956, 100 for a clear statement that the point of Nagel’s position is to maintain “a consistent experimentalism concerning all existential matters.”

<sup>15</sup> Juffras 2003, 179 notes that Nagel was promoted to full professor in 1946 and included in the American Academy of Arts and Sciences in 1954. Nagel was also an editor of the *Journal of Philosophy* from 1939 to 1956.

arguably the first by a philosopher who conceived of himself as an analytic philosopher.<sup>16</sup> Nagel begins by apologizing for taking up such a well-worn topic as naturalism. He goes on to clarify that his naturalism is not a grand system or “basic ground plan of the cosmos” (Nagel 1956, 4). Instead, Nagel’s naturalism is the result of paying attention to the wide variety of things in the world that science has drawn attention to. He notes that this modest approach has led to some concerns:

Some of us, I know, are distressed by the widespread scepticism of traditional claims for a *philosophia perennis*, and have dismissed as utterly trivial most if not all the products of various current forms of analytical philosophy. I do not share this distress, nor do I think the dismissal is uniformly perspicuous and warranted. For in my judgment, the scepticism which many deplore is well founded. Even though a fair-sized portion of recent analytical literature seems inconsequential also to me, analytical philosophy in our own day is the continuation of a major philosophic tradition and can count substantial feats of clarification among its assets. Concentrating on limited and determinate problems has yielded valuable fruits, not least in the form of an increased and refreshing sensitivity to the demands of responsible discourse (Nagel 1956, 4-5).

This tradition is naturalism and the chief selling point of analytic philosophy as Nagel frames it is the possibility of an internally coherent naturalism. As one might now expect, a crucial element of Nagel’s naturalism is the separation of logic from metaphysics.

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<sup>16</sup> Quine’s 1957 address and Max Black’s 1958 address show the increasing pull of canonical analytic figures.

Nagel singles out two claims for his naturalism before he turns to a consideration of logic. First, Nagel accepts “the existential and causal primacy of organized matter in the executive order of nature” (Nagel 1956, 7). However, equally important for Nagel is the view that “the manifest plurality and variety of things, of their qualities and their functions, are an irreducible feature of the cosmos” (Nagel 1956, 7). They are irreducible because they cannot be explained away in any deeper, metaphysical way. Both claims are said to arise from a reflection on the way science works when it generates knowledge. Humans find a place in nature by being organized material beings. But Nagel’s pluralism allows him to recognize many features of human life, including human values, as irreducible objects of scientific investigation. For example, a “naturalistic moral theory” (Nagel 1956, 11) is possible that will be based on the capacities and aims of living humans, and that can be supported by scientific investigations of the usual sort. More generally, to decide which problems to resolve, one must first find out which evils are remediable (Nagel 1956, 17). Science is thus a central part of any quest for moral and political improvement.

After laying out this version of naturalism Nagel considers “two repeatedly voiced objections which, if valid, would in my opinion seriously jeopardize the integrity and adequacy of naturalism as a philosophy” (Nagel 1956, 13). The first objection concerns the “logico-empirical method of modern science” (Nagel 1956, 13). If this is the only method that the naturalist will deploy, it seems that he is assuming in advance that the world works in a certain way. The main naturalist commitments seem to follow automatically from a restriction to scientific methods



of belief formation. In his reply to this objection Nagel insists that scientific methods do not presuppose the truth or falsity of any substantial claims. Claims about the transempirical or the divine are legitimate as long as they make some contact with the material order. Reported experiences of divine illumination, for example, should be accepted as genuine experiences in line with the ordinary standards of psychological investigation. But Nagel insists that additional scientific scrutiny is needed to determine what these reports are reports of. All aspects of the world and our experience of it are legitimate objects of scientific investigation. In this way, Nagel hopes to leave open any potentially legitimate claim about how the world is.

The second objection focuses more directly on logic itself:

in committing itself to the logic of scientific proof, it [naturalism] is quite analogous to religious belief in resting on unsupported and indemonstrable faith. For that logic allegedly involves assumptions like the uniformity of nature or similar principles which transcend experience, cannot be justified empirically, and yet provide the premises that constitute the ultimate warrant for the conclusions of empirical inquiry (Nagel 1956, 15).

Here we see an elegant presentation of the central tension between a metaphysical view of logic and naturalism. Nagel admits that if there are any significant claims about the world bound up with the use of logic in science, then a system of scientific beliefs must rest on these presupposed claims. But if these claims are taken for granted, then naturalism itself is just as much a matter of faith as the religious and metaphysical systems that it opposes.

It is precisely here that Nagel's shift on the nature of logic proves critical. For he is now well-positioned to deny that any substantial claims about the world are assumed when one proposes a logical system to govern scientific reasoning. Nagel rejects any global attempt to link scientific methods to some assumption concerning the uniformity of nature. Instead, science is said to proceed in a piece-meal fashion, by gradually establishing limited results in special domains. The basis for any particular choice here is the track-record of those methods in similar investigations: one can appeal to "the contingent historical fact that the special ways employed in obtaining and appraising the evidence have been generally effective in yielding reliable knowledge" (Nagel 1956, 15). This fallibilism about logic and logic's lack of presuppositions allows Nagel to escape the charge of blind faith: "in adopting scientific method as the instrument for evaluating claims to knowledge, naturalists are not subscribing to an indemonstrable faith" (Nagel 1956, 16). Logic is an instrument that is chosen to clarify and improve our science, and this choice can be justified independently of any presupposed claims about the natural world.

Nagel's presidential address offers, then, a conception of analytic philosophy that has at its core a defensible naturalism. Naturalism's perceived vulnerability is its reliance on logic and scientific method. But in Nagel's hands, logic itself is justified by its track-record and promise of improving the scientific investigation of nature, broadly construed. Nagel's *Structure of Science* is the most sustained product of this approach to philosophy. There are few explicit discussions of logic in the book, and this may have obscured Nagel's intended vision for the philosophy of science. Nagel suggests that logical and mathematical claims are true in virtue of the

meanings of the words that express the claim (Nagel 1961, 16, 38). However, he is often at pains to emphasize the vagueness of ordinary language, including the meanings of logical terms and central terms like “explanation” and “laws”. Nagel’s consistently deployed method of argument is the functional approach that we have seen already. One starts by identifying the point of a given honorific like “explanation”, and only then fashions a precise account of what that term should apply to. For Nagel, the point of having scientific explanations is to organize and extend scientific knowledge, where that knowledge is focused on the prediction and control of observable phenomena: “the sciences seek to discover and formulate in general terms the conditions under which events of various sorts occur, the statements of such determining conditions being the explanations of the corresponding happenings” (Nagel 1961, 4). This leads Nagel to defend a covering law approach to explanation, where theoretical laws are used to explain empirical laws, and empirical laws in turn explain events via deductive and inductively strong arguments.

Both principles of Nagel’s naturalism play a central role in his discussion. First, Nagel continues to maintain that the matter studied in physics plays an essential role in the existence of things and their causal interactions. That is, for something to exist, it must be material, and only physical events cause other physical events. Second, Nagel’s pluralism persists about how the world of things, people, values and so on all fit together. When it comes to laws, in particular, there are many kinds of scientific laws, and so many kinds of corresponding explanations: “not all laws of nature are causal” (Nagel 1961, 75). So, Nagel’s naturalism does not

collapse into what is now known as reductive physicalism. He can allow the legitimate and informative scientific investigation of social phenomena and even domains such as ethical, political and aesthetic values.

Sarkar has recently provided a thorough critical review of Nagel's account of reduction (Sarkar 2015). He emphasizes the non-formal conditions that Nagel imposed on scientifically valuable reductions. One of these conditions is that the reduction should help to improve the theory being reduced. Sarkar concludes "There is thus no question of the reducing theory replacing or eliminating the reduced one – eliminativism is against both the spirit and the letter of Nagel's analysis" (Sarkar 2015, p. 52). As Nagel puts it, "the reduction of one science to a second ... does not wipe out or transform into something insubstantial or 'merely apparent' the distinctions and types of behavior which the secondary discipline recognizes" (Nagel 1961, 366). The mereological decomposition of all wholes into their physical parts does nothing to displace a theory of those wholes. This is partly because not all explanations are causal explanations. An additional point in favor of theories of wholes is that these theories may afford laws concerning systematic dependencies that are unavailable if one appeals only to their parts.<sup>17</sup>

Jaegwon Kim misses this aspect of Nagel in his discussion of naturalism in the retrospective essay "The American Origins of Naturalism" (Kim 2003). Kim aims to present naturalism as the central preoccupation of analytic philosophy: "naturalism as *the ruling ideology* of analytic philosophy has helped to shape its problems during

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<sup>17</sup> Sarkar notes that Hempel 1969 and Nagel 1970 provide useful discussions of Nagel's account of reduction.

the second half of the twentieth century” (Kim 2003, 96, emphasis added).<sup>18</sup> He puts primary emphasis on the “primacy of organized matter”. This leads Kim to interpret Nagel’s pluralism as merely the rejection of “speculative metaphysical systems (e.g., Hegel’s) that attempt to give a sweeping account of all phenomena” (Kim 2003, 90). Nagel would surely reject this sort of metaphysical approach if it tried to force all scientific explanations into one form. This rigid approach would undermine the point of the quest for scientific explanation. But when Kim concludes that “in the current context we can set aside worries of this kind” (Kim 2003, 90), he is illustrating the gap between analytic philosophy in 1961 and in 2003. For in 1961 it was clear that a reductive physicalism that posited causal explanations for every phenomenon of interest would also be viewed as a sweeping metaphysical system. Nagel’s naturalism does not countenance such a dogmatic assumption, and I take it Nagel would be puzzled by the thought that the first component of his naturalism undermined the second. Kim has of course offered many arguments to the effect that any non-reductive physicalism collapses, in spite of its intentions, into reductive physicalism. It would be a delicate matter to determine how Nagel could best respond to these arguments and whether or not this response is compelling.

V.

The distinctively logical empiricist commitment at the heart of Nagel’s philosophy of science is the claim that we should set up our logic and mathematics so that it provides the best sort of assistance to the primary scientific task of

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<sup>18</sup> In the abstract Kim adds more qualifications: “If contemporary analytic philosophy can be said to have a philosophical ideology, it undoubtedly is naturalism” (Kim 2003, 83).

predicting and controlling observable events. Nagel is thus highly influenced by Carnap's mature philosophy of logic, especially his principle of tolerance as first enunciated in 1934's *Logical Syntax of Language* and the account of linguistic frameworks in "Empiricism, Semantics and Ontology." But Nagel adopted these commitments in order to resolve an issue at the heart of his naturalism, and we have seen how this problem arose prior to Nagel's contacts with Carnap and the other logical empiricists.<sup>19</sup> Other American philosophers took other routes forward and either abandoned any pretense of naturalism or else fashioned a form of naturalism that was considerably less contextual and pluralistic than Nagel's. Quine's naturalism is the most prominent example of this, and the conflict between Carnap and Quine can now seem to exhaust the range of options available. Our discussion of Nagel's naturalism shows that there are other alternatives that remain relatively unexplored, and that the scope for what could count as analytic philosophy is considerably wider than is often realized.

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<sup>19</sup> See also Nagel 1956, 237-239 and Nagel 1963 for some critical remarks on Carnap's approach to deductive and inductive logic.

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