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Title

How pluralistic is pluralism really? A case study of Sandra Mitchell's Integrative Pluralism

Abstract

Epistemic pluralists often argue that different epistemic perspectives in science are equally warranted given different contexts. Sandra Mitchell—with her Integrative Pluralism (IP) —has notably advocated for this kind of *epistemic* pluralism. A problem arises for Mitchell because she also wants to be an *epistemological* pluralist. She claims that, not only are different epistemic perspectives in science equally warranted, but different *understandings* of these epistemic perspectives in science are also equally warranted. The problem is that Mitchell presents her understanding of epistemic perspectives in science (IP) as if it is *the* correct understanding. It is, then, contradictory to claim that there is more than one such understanding. As a solution, I suggest we follow Feyerabend in being *opportunistic* pluralists. We can adopt pluralism as a short-term strategy in the pursuit of long-term *unitary* goals. One such goal is what philosophers of understanding call *objectual understanding*, which appears to be the kind of understanding that pluralistic views like IP tacitly aspire to anyway.

Keywords

Scientific pluralism; scientific perspectivism; scientific understanding; objectual understanding; unity of science

Introduction

One of the key questions in the philosophy of science relates to whether we should be monists or pluralists about the various 'ologies' (methodologies, ontologies, epistemologies) associated with scientific inquiry. Do we aim at and hold out for the unification of science (*a la* Ladyman and Ross, 2007) or do we accept and try to work with the disunity of science (*a la* Cartwright, 1999)?[1] My focus here will be on epistemology, specifically on *understanding*. Is there some unitary understanding in and of science or only a variety of different, yet equally warranted, ways of understanding?

Sandra Mitchell's (2003, 2009) Integrative Pluralism (IP) is exemplary of pluralistic epistemologies in the philosophy of science. IP maintains that there is a diversity of contextually situated, yet equally utilisable and therefore correct, models operant in scientific practice. Models can be *integrated* (merged or consolidated for explanatory and/or pragmatic purposes). But, such integration will itself be contextually situated and therefore *diverse* in nature. The same goes for the epistemic practices in science associated with such models. Following Ronald Giere (2006), Mitchell claims that there is a diversity of equally warranted *epistemic perspectives* in science rather than any unifying epistemic meta-perspective.

Mitchell (2020a) has recently extended IP to apply to the philosophy of science itself. As with epistemic perspectives *in* science, there is a diversity of different, yet equally warranted, *epistemological perspectives about* science. And, the different understandings of science associated with these different epistemological perspectives are likewise equally warranted. It is a case of diversity all the way down.

I will call IP in science IP_{SCI} and IP in the philosophy of science IP_{PHIL}. We can think of IP_{SCI} as a thesis about epistemic perspectives and we can think of IP_{PHIL} as a thesis about epistemological perspectives. An epistemic perspective is what is commonly called a "way of knowing", approximately what philosophers of science might call a research program (Lakatos, 1970) or a stance (van Fraassen, 2002). By the same token, an epistemological perspective is a way of knowing about ways of knowing. Epistemological perspectives are (mostly) employed by philosophers of science rather than by scientists. Philosophers of science adopt some epistemological perspective when they develop and defend some thesis about epistemic perspectives.

[1] See Cat (2022) for an overview of the current debate.

On IP_{SCI}, more than one legitimate—i.e. warranted or justified—epistemic perspective (related to some model) can obtain in science. IP_{SCI} is, then, an epistemological perspective. It is a (pluralist) thesis about epistemic perspectives. IP_{PHIL} is also an epistemological perspective, but it is a (pluralist) thesis about epistemological perspectives rather than about epistemic perspectives. We can think of IP_{SCI} as a first-order epistemological perspective (about epistemic perspectives) and IP_{PHIL} as a second-order epistemological perspective (about epistemological perspectives). As we will see, Mitchell presents IP_{SCI} as the best way to understand science and IP_{PHIL} as the best way to understand understandings of science.

Mitchell is particularly concerned with the normative consequences that follow from adopting pluralistic versus unitary approaches (whether epistemic or epistemological). She wants to advise on whether scientists and philosophers of science *should* pursue pluralistic or unitary approaches. If unitary approaches fail—as Mitchell believes—then we should naturally not pursue them. We should instead pursue pluralistic approaches. I will, at times, follow Mitchell in focussing on this normative aspect of the debate. As such, my negative argument sometimes amounts to the charge that IP faces a dilemma when it advises against pursuing unitary approaches while itself being a unitary approach.

Note that my argument does not beg the question against IP. I will not assume the unitary approach that IP denies. Instead, I aim to show that IP is implicitly committed to the kind of unitary approach it explicitly rejects. This is because Mitchell often centres IP around the notion of *understanding*. And, the kind of understanding IP pursues and claims to grant is indubitably unitary in nature, or so I will argue. Mitchell is, however, unclear on what exactly she takes understanding in the relevant context to be. An examination of IP will suggest that the view tacitly aspires to what epistemologists call *objectual understanding*, and objectual understanding is a unitary kind of understanding. I will also suggest that philosophical inquiry broadly construed often pursues this kind of unitary understanding, the kind that Mitchell denies.

Mitchell's extension of IP from science into the philosophy of science has not yet been thoroughly critiqued, and my argument is therefore novel in relation to both the epistemology of science and the broader unity/plurality debate in the philosophy of science. Although my target is IP, my argument may carry implications for other epistemological pluralists working in the philosophy of science. Naturally, a pluralistic thesis should be logically and axiologically consistent with the principles of pluralism (see van der Merwe, 2021). Philosophers disagree

about many things, including foundational suppositions. Yet, if there is one thing we can agree on, it is surely that logical and axiological self-consistency is mandatory.

Note also that I will not engage with the lively debate around the relationship between understanding, explanation, knowledge, and truth in epistemology and the philosophy of science (see however the collection in Grimm et al, 2017).[2] My concern is specifically with the kind of understanding IP_{SCI} is ostensibly (if tacitly) concerned with (i.e. objectual understanding). I will not discuss *alethic* unification (e.g. Niiniluoto 2018), *explanatory* unification (e.g. Kitcher, 1989), or the unity of scientific *knowledge* (e.g. Bird, 2007). Although truth, explanation, and knowledge are, I take it, associated with understanding, I will not go into how such associations may obtain.

The outline of my paper is as follows.

In Section 1, I explicate IP, firstly outlining IP_{SCI} and then its recent extension IP_{PHIL}.

In Section 2, I draw on recent work by philosophers of understanding to argue that IP tacitly endorses a unitary understanding of science despite outwardly rejecting unitary understandings of science. As currently formulated, IP is inconsistent. IP_{SCI} and IP_{PHIL} are in tension with each other.

In Section 3, I engage with a possible response to my argument. Some may object that a pluralistic thesis cannot be unitary; this is the whole point of pluralism. My counter-response is that, if this is the case, then IP cannot grant the kind of understanding (*viz*. objectual understanding) that it seems to aspire to. Objectual understanding is, at heart, unificatory.

In Section 4, I suggest a solution to IP's dilemma. We can draw from the best of both unitary and pluralistic approaches by following Feyerabend in thinking of pluralism as an *opportunistic* means to a unitary end. We will have to abandon IP_{PHIL}, but we can modify IP_{SCI} by adopting diversity as a short-term strategy in the pursuit of a long-term unitary goal. This unitary goal is objectual understanding, the kind of understanding that IP seems concerned with anyway.

1. Mitchell's IP: Pluralism in science and philosophy of science

[2] Angela Potochnik (2017, ch. 4) makes a detailed and persuasive argument that the "ultimate epistemic aim of science" is *understanding* (see also Kitcher, 1989). According to Darrell Rowbottom, science progresses "by increasing its power to predict, and ability to furnish us with an *understanding* of, how the phenomena behave and interrelate" (2019, p. 23 emphasis added).

In this section, I outline IP_{SCI} and IP_{PHIL}. As mentioned, we can think of IP_{SCI} as aspiring to grant understanding of epistemic practices in science, and we can think of IP_{PHIL} as aspiring to grant understand of understandings of epistemic practices in science (that is, to understanding understandings like IP_{SCI}).

1.1. IP_{SCI}: Pluralism *in* science

Mitchell positions IP_{SCI} against views that aspire to epistemic unification. This is, in part, because she considers unification to entail reductionism. Reductionists, she says,

> hold a set of beliefs and methodologies aiming to reduce the diversity of explanations [in science] to a small number of theories or laws at a privileged level of discourse, thereby globally unifying science (Mitchell, 2003, p. 1).

According to the reductionist, the discovery of such theories or laws would allow for infallible explanation, prediction, and manipulation of the world. The reductionist holds out for some theory-of-everything that can unify the diversity of extant models, theories, and explanations we find being effectively utilised across the sciences (Mitchell, 2020b). For Mitchell, such aspirations to epistemic unification are "hubris"; the "idealized and partial character of our representations suggest that there will never be a single account that can do all the work of describing and explaining" scientific phenomena (2003, p. xiii).

IP_{SCI} is Mitchell's alternative to reductionism's unificatory ambitions. Following Giere's (2006) Scientific Perspectivism, Mitchell states that scientific models are always incomplete, imprecise, partial, and context relative. They are always indexed to some contingent *perspective*. Different scientific perspectives, she says,

> are characterized by different assumptions, methods, instruments of observation, experimental arrangements, concepts, categories, and representations, all of which are associated with specific pragmatic concerns and explanatory or predictive projects (Mitchell, 2020b, p. 181; see also de Regt, 2017 and Massimi, 2022).

As the name Integrative Pluralism suggests, there are, though, certain commonalities—overlapping and epistemically salient features—that are shared and therefore integrable between successful scientific models.

> Since a single model cannot deliver all the causally relevant aspects of a given phenomenon with complete precision, using multiple models may be required to be adequate to the explanatory or predictive goal… [I]ntegrating multiple, compatible

> models can increase scientific knowledge of nature. While the enduring plurality of models cannot be reduced or unified to produce a single model, they can be interactively integrated, yielding increased accuracy while retaining perspectival pluralism (Mitchell, 2020b, p. 180).

Mitchell uses the example of different perspectives employed in modelling protein structure. Three different perspectives are employed in physics, chemistry, and biology (among others). Each perspective captures incomplete, imprecise, and partial—yet overlapping—accounts of the phenomenon. In physics,

> the basic atomic components of proteins and forces acting on them, will inform, but not determine, what is detected from an investigation of the protein's chemical structure. Knowing the chemical details, in turn, informs, but does not completely specify, biogenesis, interaction, and the biological functions of the macromolecule (Mitchell, 2020b, p. 185).

Mitchell concludes that the relationship between these three perspectives is one of integration rather than reduction. Each perspective, with its associated model, provides "a partial grasp of the phenomenon, and each requires input and ongoing engagement with the other perspectives…" (Mitchell, 2020b, p. 188). "Multiple models from different perspectives can be used together, in non-unifying and non-reductive ways, to explain or predict the same phenomenon" (Mitchell, 2020b, p. 182; see also Pickering, 1995).

Mitchell also distinguishes between "competitive" and "compatible" kinds of epistemic pluralism. IP_{SCI} is the compatible kind. Competitive pluralism is exemplified by Popper's falsificationist model of science where only fit hypotheses or theories survive in ongoing competition with rival hypotheses or theories. The end goal of this evolutionary process is an ideal of theoretical unity. Falsificationism only embraces pluralism on the way to purported unity; "pluralism is temporary and strategic but ultimately eliminable" (Mitchell, 2002, p. 56). In contrast, IP_{SCI} does not outwardly offer a unitary resolution of this sort; "even when the questions that scientists pose are disambiguated, there remains a variety of compatible answers" (Mitchell, 2003, p. 210; see also 2009, ch. 6). Further, "a search for the one, singular, absolute truth must be replaced by humble respect for the plurality of truths that partially and pragmatically represent the world" (Mitchell, 2009, p. 118).

As expressed in the following quotes, IP_{SCI} is centrally concerned with pursuing and granting *understanding*:

> [IP_{SCI}] promises to be better for understanding the diversity of scientific practices [than] traditional philosophical analyses and representations (Mitchell 2003, p. 128).
>
> [IP_{SCI}] is the first step toward a better understanding of science (Mitchell 2003, p. 192).
>
> Pragmatic and pluralistic approaches to a multiplicity of scientific methodologies provide better scaffolding for an integrated understanding… (Mitchell 2009, p. 65).
>
> [IP_{SCI}] is a step on the road to an expanded understanding of our complex world (Mitchell 2009, p. 119).
>
> [IP_{SCI} provides] a sophisticated, nuanced understanding of science (Mitchell 2020a, p. 773).
>
> [IP_{SCI} is] a pluralistic, pragmatic, and dynamic understanding… that highlights and explicates the epistemic value of diversity (Mitchell 2020a, p. 791).

Note that Mitchell is not specifically concerned with the technical epistemological debate around the nature of scientific understanding.[3] She does, however, frequently frame her view in terms of understanding. The above quotes suggest that she considers one of IP_{SCI}'s central contributions to be its ability to grant understanding of its subject matter. If not, then it is mysterious why she would repeatedly talk of IP_{SCI} in terms of understanding.

A further motivation for IP_{SCI} appears to be, not only that it grants understanding, but that it grants a better understanding than rival epistemologies. Mitchell presents IP_{SCI} as the correct way to understand scientific representation and its associated epistemic practices. To my knowledge, Mitchell does not expressly state that IP_{SCI} is *the* correct understanding rather than merely *a* correct understanding. She does, nonetheless, position IP_{SCI} against what she calls a "simple reductive understanding" (Mitchell, 2009, p. 65). She states: "I believe we can provide a better, more accurate understanding of science to the public, to prevent the rejection of science driven by oversimplified accounts" (Mitchell, 2020a, p. 790).

An anonymous reviewer queried whether Mitchell believes IP_{SCI} to be the correct view about science. She might simply argue for IP_{SCI} because she thinks it is the best available option, because it is important to counter dominant views, or simply to contribute to a debate. This seems to me like a very strange thing to do. Maybe some scholars do this, but it would be

[3] See the collections in Grimm et al (2017) and Grimm (2018) for the status of the current debate.

decidedly odd to devote one's career to developing and defending a general philosophical view (like IP) without attaching any doxastic commitments to it.

In any event, to avoid a speculative discussion about Mitchell's psychology, I am not contending that she *thinks* of her view as the correct one. Rather, I am contending that her view is *presented* as if it is the correct one (which it clearly is). I think that it is true of any recognised scholar that they will present their view as the correct one in their writings. I do not see how things could be any other way. Even epistemic or epistemological nihilists or full-blown relativists argue for their views in such a way that it is presented as the correct one. IP_{SCI} might maintain that a single (reductive or unificatory) understanding can apply in some practical context. But, IP_{SCI}—*qua* philosophical thesis—is presented as the correct understanding—a pluralistic understanding—that applies across contexts.

1.2. IP_{PHIL}: Pluralism *about* science

Mitchell introduces IP_{PHIL} in her (2020a) paper 'Through the Fractured Looking Glass'. There, she states that the complexity of subject matters in science partly motivates IP_{SCI}. IP_{PHIL} likewise

> embraces the complexity of the nature of science and the diversity of ways in which philosophers investigate, represent, and use the knowledge of science gained by their investigations… (Mitchell, 2020a, p. 788).

As with epistemic perspectives *in* science, there are, then, different, yet equally legitimate, epistemological perspectives *about* science. Philosophers of science, says Mitchell, "have a responsibility to promote a more accurate account of science" (2020a, p. 790), and such an account is exemplified in IP_{PHIL}'s pluralistic approach. Mitchell does not mention unitary philosophies of science in the relevant paper. We can, though, presume that—as with epistemic perspectives in science—unitary philosophies of science attempt to reduce the diversity of epistemological perspectives defended across the philosophy of science to some monistic or unitary conception.

As mentioned in the introduction, IP_{PHIL} advocates for pluralism about ways of understanding science. There are multiple equally legitimate understandings each associated with different equally legitimate epistemological perspectives (as opposed to epistemic perspectives). IP_{PHIL} is IP_{SCI}-style pluralism applied to the higher order of abstraction at which philosophy operates compared to science. IP_{SCI} advances pluralism about epistemic perspectives in science, while

IP_{HIL} advances pluralism about epistemological perspectives about science.[4] Let us take the modelling of protein structure example again. As Mitchell points out, there are (at least) three different epistemic perspectives scientists may adopt here: a physical, a chemical, and a biological perspective. That is, there are (at least) three different ways to model and know about protein structure. Note that Mitchell's claim that these different epistemic perspectives are equally warranted—that they should be understood in terms of IP_{SCI}—is epistemological (rather than epistemic). Thus,

> IP_{SCI} is an epistemological perspective incorporating an epistemological claim—a pluralistic claim—about epistemic perspectives in science.
>
> IP_{PHIL} is also an epistemological perspective incorporating an epistemological claim—a pluralistic claim—but this time, it is a claim about epistemological perspectives on epistemic perspectives in science.

In other words,

> IP_{SCI} aspires to understand epistemic perspectives in science.
>
> IP_{PHIL} aspires to understand understandings of epistemic perspectives in science.

It is in this sense that IP_{HIL} operates at a higher order of abstraction than IP_{SCI}. IP_{SCI} is a first-order epistemological perspective on epistemic perspectives, and IP_{HIL} is a second-order epistemological perspective on first-order epistemological perspectives.

It should be apparent that IP_{SCI} is the kind of epistemological perspective that IP_{PHIL} is about. IP_{SCI} is an epistemological perspective that makes a pluralistic claim about epistemic perspectives in science, but IP_{PHIL} is an epistemological perspective that makes a pluralistic claim about epistemological perspectives that make pluralistic claims about epistemic perspectives in science.

Schematically, consider some subject matter S. There will be a variety of epistemic perspectives P_1, P_2, P_3, …, P_n on S (informed by pertinent modelling practices). The *epistemic* pluralist claims that the members of [P_1, P_2, P_3, …, P_n] can enjoy equal legitimacy. This is an epistemological claim, a claim that aspires to grant a particular understanding—a pluralistic understanding—U of [P_1, P_2, P_3, …, P_n]. IP_{SCI} expresses such a U. However, there are naturally

[4] IP_{PHIL} also presumably advocates for pluralism about philosophical accounts of scientific ontology and scientific methodology, for example. Our concern here is, though, with scientific epistemology.

a variety of understandings U_1, U_2, U_3, …, U_n of [P_1, P_2, P_3, …, P_n]. The *epistemological* pluralist claims that the members of [U_1, U_2, U_3, …, U_n] can enjoy equal legitimacy. This is a second-order epistemological claim, a claim that aspires to grant a particular understanding—once again, a pluralistic understanding—U* of [U_1, U_2, U_3, …, U_n]. IP_{PHIL} is such a U*.[5]

IP_{PHIL} thus advances pluralism about things like IP_{SCI}, and herein lies Mitchell's dilemma:

> IP_{SCI} purports to grant the correct understanding of some feature of science, but IP_{PHIL} claims that there is always more than one correct understanding of some feature of science.

As mentioned, IP_{SCI} is not presented as only one of several correct understandings. Instead, it is presented as the correct understanding compared to rival understandings (e.g. reductive or oversimplified understandings). IP_{SCI} and IP_{PHIL} are, therefore, in tension with each other. It is self-contradictory to concurrently argue that there is only one X but also many Xs (I flesh out this argument through the next two sections).

2. The unitary nature of IP_{SCI}-style understanding

In this section, I discuss several writers who have developed pertinent theories of understanding. The reason is to define 'objectual understanding' and demonstrate its unitary nature. I discuss Michael Friedman's unitary conception of understanding and then contemporary views in the philosophy of understanding that (explicitly or implicitly) endorse unificatory motifs. I also mention some examples of unificatory understanding relevant to science in practice. I conclude that IP_{SCI} is tacitly committed to a unificatory kind of understanding.

2.1. Friedman's understanding

Friedman (1974) is usually credited with first emphasising the key role of understanding in science. Science, he says,

> increases our understanding of the world by reducing the total number of independent phenomena that we have to accept as ultimate or given. A world with fewer independent

[5] Presumably, there are a variety of understandings of understandings of understandings of some subject matter U^*_1, U^*_2, U^*_3, …, U^*_n, and so on. Such a regress may be interesting to think about, but it need not directly concern us here.

> phenomena is, other things equal, more comprehensible than one with more (Friedman, 1974, p. 15; see also Kitcher, 1989).

An example is how we gain a unified understanding of entities like planets, falling bodies, and gasses when their behaviour is jointly derived from the laws of mechanics. Such an understanding can then be unified with understandings in neighbouring scientific domains and so on.[6] Scientific understanding is

> a global affair. We don't simply replace one phenomenon with another. We replace one phenomenon with a *more comprehensive* phenomenon, and thereby effect a reduction in the total number of accepted phenomena. We thus genuinely increase our understanding of the world (Friedman, 1974, p. 19 original emphasis).

It is clear here that Friedman is concerned with general understanding in science rather than with understanding some local phenomenon or the outcome of some specific experiment. And, that he thinks of understanding in unificatory, rather than pluralistic, terms.

2.2. Unificatory versus explanatory understanding

Different contemporary philosophers of understanding have outlined different taxonomies of understanding (see Hannon, 2021 for detail). John Bengson (2018), for example, notes that philosophers of understanding often distinguish between "theoretical understanding" and "practical understanding" (which is closely related to the standard distinction between knowing-what and knowing-how). According to Bengson, theoretical understanding offers insight into some subject matter (e.g. understanding what constitutes successful epistemic practices in science), while practical understanding is embodied in actions, specifically skilful activities (e.g. understanding how to conduct scientific experiments). Our concern (and Mitchell's concern) is thus with theoretical understanding.[7]

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[6] Such a cumulative and convergent epistemological process recalls William Whewell's famous notion of *consilience*. Whewell thinks of science as a "genealogical tree": there are various branches of science that are "uniting their ramifications so as to form larger branches, these again uniting in a single trunk" (1840, I, p. 241; Popper, 1972, pp. 262-263 expresses a similar metaphor; see also van der Merwe forthcoming-a).

[7] Bengson (2018), interestingly, goes on to argue that theoretical understanding and practical understanding "possess a common underlying nature"; they can be accommodated into a unified "comprehensive understanding".

Christopher Baumberger and colleagues (2017) distinguish between two types of (theoretical) understanding:

> Objectual understanding: Some subject understands some subject matter or domain of things.
>
> Explanatory understanding: Some subject understands why something is the case.

Objectual understanding does not involve understanding *why* (or *how*); it is not concerned with mechanisms or causes. Instead, objectual understanding involves understanding *what* something (or some collection of things) is. It involves understanding some subject matter *simpliciter*. This is what Duncan Pritchard (2010) calls "holistic" understanding. Various outwardly different things are recognised as manifestations or proper parts of one underlying or overarching thing. Objectual understanding quantifies over a range of outwardly diverse phenomena of interest to merge those phenomena into a single comprehensible epistemological thesis (see Kvagnig, 2009; Baumberger et al, 2017; Khalifa, 2017, ch. 4 for detail). On this classification, IP_{SCI} aspires to objectual understanding rather than explanatory understanding. IP_{SCI} does not attempt to explain why (or how) scientists employ the epistemic practices they do nor why (or how) scientific representations represent. Rather, IP_{SCI} aspires to grant a general overarching understanding of some subject matter or domain of things (*viz.* successful epistemic practices in science).

Similar to Baumberger et al, Victor Gijsbers (2013) distinguishes between "explanation-understanding" and "unification-understanding". Explanation-understanding approximates Baumberger et al's explanatory understanding, while unification-understanding approximates Baumberger et al's objectual understanding. Unification-understanding, says Gijsbers, "consists in knowledge of the relations of kinship between the phenomena" (2013, p. 521). It takes the "form of a classification of phenomena, of describing many phenomena in a single language, of assimilating them to each other—in other words, of unifying them" (Gijsbers, 2013, p. 519; see also 2014). Biological classification is an example of unification-understanding. Taxonomists classify living organisms into species, genus, family… up to life itself. Such a classification allows for successful predictions and grants understanding, but it does not provide explanation-understanding: it does not answer a "why?" question.

> Once we have such a classification we see how the animal species 'fit together'… Rather than having to cope with the seemingly chaotic natural world, we have found order in it, and we now understand it better (Gijsbers, 2013, p. 520).

If we follow Gijsbers, then IP_{SCI} aspires to a kind of unification-understanding because it aims to "form a classification" of various successful epistemic practices in science. It aims to account for these practices in a "single language" —a pluralistic language—centred around notions of integrability and diversity.

Note that my claim is not that Mitchell explicitly expresses concern with objectual understanding. My claim is rather that IP_{SCI}—because of the very kind of thesis that it is—aspires to objectual understanding when it purports to grant understanding of epistemic practices in science. Mitchell might rightly think that integration sometimes offers limited explanatory understanding in some contextual scenario, but this is not the purpose of IP_{SCI} *qua* general philosophical thesis about science (I press this point in Sections 2.5 and 3).

Note also that I do not necessarily intend to make a sharp distinction between objectual (or unificatory) understanding and explanatory understanding. Sometimes the distinction is more formal than real. Understanding climate change, for example, partly involves understanding *why* the average temperature on Earth is rising and *why* this cannot be solely due to non-human factors. Explanatory understanding can overlap with or contribute to objectual understanding (see Gijsbers, 2013; Baumberger et al, 2017). Thus, explanatory understanding can sometimes generate the kind of unification I have identified with objectual understanding.[8]

2.3. Case study: Unification in physics

The unitary nature of objectual understanding can be illustrated as follows. Let us say that some inquiring agent A is confronted with two mysterious and seemingly disjoint phenomena X and Y. A wants to understand *both* X and Y, but understanding is absent due to X and Y's disjointedness. Intuitively, when phenomena of interest are disjointed, we do not sense that understanding is present, not objectual understanding anyway. Now, suppose some second more enlightened agent A′ explains to A that X and Y are, in fact, not disjointed. Properly analysed, X and Y are two manifestations or kinds of the same general phenomenon Z. X and Y can be jointly incorporated into Z. Or, X and Y are proper parts of the whole that is Z. Either way, we sense that A has now gained in understanding; some understanding that was absent is now present. When an agent comprehends two previously disjoint phenomena in terms of one

[8] Thank you to an anonymous reviewer for pointing this out.

overarching phenomenon, understanding *prima facie* obtain. Or, there is, at least, a higher degree of understanding than before (see also Gijsbers, 2013).[9]

The unification of the so-called fundamental forces of nature in physics is a famous example of objectual understanding in practice. Before Maxwell's merger of the electric force (F_E) and the magnetic force (F_B) into the electromagnetic force (F_{EB}), each force was studied independently and understood differently. F_E granted understanding of static electricity and lightning for example. F_B granted understanding of the attraction and repulsion of iron objects. After Maxwell's merger, the understanding granted by F_E and F_B remained, but F_{EB} granted a new overarching understanding. F_{EB} grants understanding of, not only F_E and F_B, but also the behaviour of light and chemical processes. The understanding granted by F_{EB} is not merely the sum of the understandings granted by F_E and F_B. Through unification, a new and better (a higher degree of) understanding has emerged, an understanding not previously present. F_{EB} grants understanding of F_E, F_B, *and* F_{EB}. It, thereby, grants an overarching understanding of three kinds of phenomena instead of one or two.

Weinberg, Glashow, and Salam later unified F_{EB} with the weak nuclear force (F_{weak}) responsible for radioactive decay and neutrino interactions inside atoms. F_{EB} and F_{weak} are unified by the electroweak force ($F_{electroweak}$). $F_{electroweak}$ grants understanding of boson interactions, the nature of the Higgs field, and certain features of the Standard Model of particle physics not previously understood via F_{EB} and/or F_{weak} (see Hollik, 2006 for detail). As before, the understanding granted by $F_{electroweak}$ is better than the understanding granted by F_{EB}, F_{weak}, or F_{EB} plus F_{weak}. This is because $F_{electroweak}$ encompasses F_E, F_B, F_{EB}, F_{weak} *and* $F_{electroweak}$. $F_{electroweak}$ grants an overarching understanding of five kinds of phenomena instead of one, two, three, or four.

Gravity (g), responsible for the attractive force between all massive bodies, and the strong nuclear force (F_{strong}), responsible for bondings within atomic nuclei, remain outliers. As

[9] Christoph Kelp has the following to say about degrees of understanding:

> [M]aximal understanding of a phenomenon is maximally comprehensive and well-connected knowledge of it, degrees of understanding are a function of distances from maximal understanding, and understanding a phenomenon can be truly attributed when one surpasses a contextually determined threshold on degrees of understanding (2021, p. 8; see also Kelp, 2015; Khalifa, 2017 ch. 1. Van der Merwe forthcoming-b emphasises the general importance of the notion of degrees in the philosophy of science).

before, we (or, at least, most physicists seem to) sense that understanding of the fundamental forces of nature is incomplete while g and F_{strong} remain ununified with $F_{electroweak}$. Unificatory-minded physicists' goal is now to merge g, F_{strong}, and $F_{electroweak}$ into a so-called theory of everything (see Weinberg, 1992; Ladyman and Ross, 2007; Peebles, 2020).

However, as Angela Potochnik (2017) points out, genuine understanding is not merely a "felt sense" of understanding. It involves an "epistemic accomplishment" of some sort and not merely a "subjective state". Genuine understanding, says Potochnik, "is produced when information about the world is of the right sort to induce in us a felt sense of understanding" (2017, p. 115). The question of what this "right sort" of information about the world may be falls outside the scope of this paper. We can, nonetheless, assume that the kind of rigorous empirical inquiry identifiable in institutionalised physics (*ceteris paribus*) produces information about the world that qualifies (if anything does) as the right sort (see van der Merwe forthcoming-b, §4). In any event, for our purposes, we can simply follow Potochnik in taking genuine understanding to involve "successful mastery, in some sense, of the target of understanding" (2017, p. 94). Such mastery typically results in what philosophers of understanding call *grasping*.

2.4.Grasping

According to Wayne Riggs, grasping some subject matter involves an "awareness of how its parts fit together, what role each one plays in the context of the whole, and of the role it plays in the larger scheme of things" (2003, p. 20; see also Gijsbers, 2013; Grimm, 2006, 2021). Allan Hazlett (2018) considers grasping to occur when we correctly represent the explanatory structure—the "jointy" structure—of the world. For Jonathan Kvagnig, understanding requires the grasping of "explanatory and other coherence-making relationships in a large and comprehensive body of information" (2003, p. 192). Understanding involves identifying the common structure between some variety of phenomena;

> when understanding comes to mind, the central elements in focus are ones concerned with structural relationships between various pieces of information grasped by the possessor of understanding (Kvagnig, 2009, p. 97; see also Elgin, 2004).

Baumberger et al likewise state that in

> the literature about understanding, it is commonplace that… understanding requires more than believing or accepting or even knowing isolated pieces of information.

> Additionally, it is claimed, the agent must 'grasp' or 'see' how they hang together (2017, p. 12).

If these writers are correct, then grasping involves a kind of epistemological unification in the mind. Grasping how structural relations or information systematically hangs together or "hooks up in the right way" (Kelp, 2021) suggests the unity that is central to objectual understanding.

Potochnik (2017, ch. 4) identifies two *sources* of understanding: patterns and causes. Our concern here is with the former; IP_{SCI} is not about what causes scientific phenomena. We can instead think of IP_{SCI} as being about identifying and incorporating patterns of epistemic activity in science into an overarching pluralistic schema. We are thus concerned with a synchronic rather than diachronic kind of understanding.[10] Synchronic understanding obtains via logical analysis or classificatory sorting of some or other occurrent phenomena into a coherent structure or whole, while diachronic understanding obtains when we find a suitable causal, teleological, or functional explanation of some or other occurrent phenomena.

2.5. IP's (tacit) commitment to objectual understanding

Given the above, we can say that IP_{SCI} aspires to objectual, synchronic understanding. IP_{SCI} sets out to analyse, sort, and then grant understanding of successful epistemic practices in science *simpliciter*. That is, IP_{SCI} proceeds synchronically by (1) examining scientists' various successful representational and epistemic practices and (2) identifying or "grasping" a common pattern. This common pattern is the *diversity* of those practices (I deal with the possible objection that diversity cannot be a unificatory notion in the next section).

Mitchell is not necessarily concerned with scientific understanding in the sense that the authors discussed in Sections 2.1 to 2.4 are. In the literature, scientific understanding is often cashed out in terms of understanding *in* science rather than understanding *of* science. Yet, either can be an objectual kind of understanding (as can understanding that has nothing to do with science). I am not claiming that Mitchell thinks of IP_{SCI} as a thesis about scientific understanding. My claim is rather that, in analysing and interpreting science, IP_{SCI} tacitly purports to grant objectual understanding of science (recall the quotes from section 1.1).[11] *Mutatis mutandis*, IP_{PHIL} aims to grant objectual understanding of understandings of science (understandings like IP_{SCI}). It seems that any thesis that is presented as an overarching

[10] See Baron and Norton (2021, pp. 188-190) for more on this distinction.

[11] Thank you to an anonymous reviewer for pressing me on the points discussed in this paragraph.

understanding of science (or of anything else for that matter) will (explicitly or implicitly) lay claim to an objectual kind of understanding.

In any event, there are, of course, cases where understanding does not aspire to unification (see de Regt 2017 chs. 3 and 4 for detail). This can occur when we aim to understand some local phenomenon for some pragmatic or explanatory purpose. An example involves what Peter Strawson calls the "dismantling model" of analysis. The dismantling model represents analysis "as a kind of dismantling of a complex structure into simpler elements, a process which terminates only when you reach pieces which cannot be further dismantled" (Strawson, 1992, p. 19). Here, we understand some single (albeit complex) phenomenon by breaking it up into a variety of simpler elements each understood independently (see also Kelp, 2021, pp. 42-45).

For our purposes, what matters is that non-unitary cases of understanding are contextual and pragmatic in a way that IP-style understanding is not. IP (IP_{SCI} or IP_{PHIL}) does not employ something like Strawson's dismantling model. Despite appearances, IP does not attempt to disassemble one thing into a variety of things. IP, in and of itself, is not directly concerned with answering contextual or pragmatic questions. Instead, it aims to answer the general question "What is the nature of successful epistemic practices in science?" (recall Section 2.2). Doing so ostensibly involves coming to understand a variety of epistemic perspectives in terms of one epistemological perspective. The various epistemic perspectives found across the sciences are categorised —i.e. unified—into a single understanding. This single understanding is the pluralistic understanding entailed in IP_{SCI}. The same applies *mutatis mutandis* to IP_{PHIL}. IP_{PHIL} aspires to grant understanding of understandings of epistemic perspectives in science. The variety of epistemological perspectives found across the philosophy of science are categorised—i.e. unified—into a single understanding (or meta-understanding). This single understanding is the pluralistic understanding entailed in IP_{PHIL}.

Thus, not only are IP_{SCI} and IP_{PHIL} in tension with each other but there also appears to be a tacit unificatory motif operant in IP. Logically, one's own claims must be consistent with any norms one stipulates for all claims. This is a well-known problem for more than one philosophical account of science. The Logical Positivists' assertion that all meaningful claims must be verifiable by experience is not itself verifiable by experience. Another famous example is Popper's (1963) demarcation criterion, a criterion that relies on falsifiability yet is not itself falsifiable. My argument is that a similar problem befalls IP. Mitchell cannot present one understanding of science (IP_{SCI}) as correct, while also stipulating that more than one

understanding of science can be correct (IP_{PHIL}). More generally, one cannot advocate for a unitary epistemology while also being a pluralist about epistemologies.

3. Possible objection: Diversity is not a unificatory notion

Epistemic and epistemological pluralists may raise an objection at this point. They may object that IP_{SCI} is not identifying and unifying any patterns or the like between various successful epistemic practices in science; this is the whole point of pluralism. My claim that incorporating some variety of phenomena under the banner of 'diversity' equates to unification is a *non sequitur*. However, if this is the case, then IP_{SCI} does not grant the understanding that it purports to grant. Saying that we should *understand* the variety of epistemic practices in science in terms of diversity is a claim that purports to objectual understanding. And, as argued, objectual understanding involves unification. This is a problem for those who want to be both epistemic pluralists and epistemological pluralists. More generally, the problem seems to apply to anyone who wants to be both a first-order pluralist and a second-order pluralist in some domain of inquiry. The second-order claims about things at the first order will have a unificatory character (assuming that the second-order claims aspire to grant understanding about things at the first order). A pluralist about things at the first order cannot also be a pluralist about claims at the second order, on pain of dilemma.

IP_{SCI} is an attempt to understand disparate phenomena in terms of a single overarching pluralistic schema. This is a schema that identifies, at the very least, one unifying commonality between those phenomena: their diversity. Various members of some class [M_1, M_2, M_3, …, M_n] all share a common property: the property of being diverse from every other member in that class. Although pluralists do not usually think of their theses in this way, arguing for diversity obliquely implies an advocation of unity. Plausibly, this applies to developing and defending any philosophical 'ism' (even nihilism or relativism). Almost by definition, developing an 'ism' involves grouping some plurality into an overarching unitary schema in one way or another.

Similar to Mitchell, Sandra Harding (2015) advocates for scientific pluralism because she believes it promotes *cultural diversity* (see also Massimi, 2022, ch. 11). Even then, one is still appealing to a unitary goal—diversity—that is not *itself* conceived of in pluralistic terms. Those, like Harding, who argue for diversity in science generally have a very specific idea of what diversity entails. They do not outwardly think that 'diversity' is open to unbounded interpretation or contextualised redefinition. Instead, the meaning of 'diversity' is usually

defined and understood in rather precise (even strict) terms (as, for example, an ideal state where previously disadvantaged perspectives or cultures enjoy, at minimum, equal status to traditionally dominant perspectives or cultures).

Mitchell and Harding also put forward the normative stipulation that we *should* pursue pluralism. We are putatively obliged to pursue the common—i.e. unitary—goal of diversity (whether cultural, epistemic, or epistemological). Mitchell states, for example, that "[p]hilosophy of science should embrace not just social diversity for ethical and political reasons but philosophical diversity for epistemic reasons" (2020a, p. 788). Here, we can see that Mitchell, in fact, advocates for both social diversity and philosophical diversity *because* of some other reason: ethical and political reasons in the former case and epistemic reasons in the latter case. Diversity is, then, not an end itself. It is pursued in the name of some further 'higher' goal. Plausibly, IP_{SCI}'s epistemic diversity only matters if it services such a 'higher' goal, and this goal will have a unitary nature. It is not at all clear what purpose is served by encouraging scientists or philosophers of science to deliberately pull in different epistemic directions for no reason other than that it promotes diversity in and of itself (see also van der Merwe, 2022).

Moreover, there can, arguably, only be a diversity of approaches in the philosophy of science if those approaches are somehow directed towards the *same* thing. Otherwise, there can be no single thing called science. There would only be various unrelated activities with no conceptual or purposive commonality. This is not what pluralists seem to be aiming for, especially not those who argue for something like the integration that is central to IP. The same applies to cultural diversity. Advocates for cultural diversity do not leave the value of diversity open to a plurality of interpretations. In fact, it is arguably a logical feature of cultural diversity that it requires a kind of unity. Some community can only be diverse if it is, in fact, *one* community. Otherwise, there would just be a scattering of individuals existing next to each other. These individuals can only possess the property of being diverse if they are grouped together in some or other way.[12]

In any event, as noted in the previous section, not all cases of understanding are unificatory. We may, at times, wish to understand some single phenomenon in terms of its causal history or its dismantled elements. Nonetheless, the above arguments suggest that IP_{SCI} tacitly promotes unification in three ways: (1) by pursuing objectual understanding, (2) by grouping

[12] Thank you to an anonymous reviewer for suggesting the arguments made in this paragraph.

a variety of phenomena into a single schema, and (3) by intimating that pluralism should be pursued for unitary ends.

As mentioned in Section 1, it would be odd to defend some view if one did not believe it to be the correct one. In any case, regardless of Mitchell's beliefs, IP_{SCI} is not presented as merely a personal preference. It is not presented as merely one of many equally legitimate understandings within a diverse spectrum of possible understandings of epistemic practices in science. Instead, it is consistently presented as offering the correct understanding compared to rivals.[13]

4. The value of diversity and Feyerabend's opportunistic pluralism

To resolve the tension in IP, Mitchell (and anyone else who subscribes to views like IP) seemingly has two options moving forward:

1. Abandon IP_{PHIL} and accept that philosophical perspectives like IP_{SCI} that aspire to correctness in objectual understanding cannot share that correctness with rival perspectives.

2. Embrace the epistemological relativism that presumably follows if IP_{SCI} does *not* aspire to correctness in objectual understanding but is rather only one of many equally correct understandings.

I suspect that Mitchell will prefer option 1. She is outspoken against relativism. She argues at length that alternative understandings (e.g. oversimplified and reductionist understandings) are, not only misguided, but also undesirable due to their repudiation of epistemic diversity. However, if we proceed with option 1—if we care about objectual understanding—then we seem obliged to accommodate epistemological unity in some way.

Interestingly, Kuhn's (1962) outwardly non-convergent and revolutionary epistemology of science—often labelled a kind of relativism (e.g. Sankey, 2018) —was developed in pursuit of the best *understanding* of science. Even Feyerabend's (1975) infamous anarchistic view of science can be thought of in a similar way. It is often overlooked that Feyerabend considered

[13] Henk de Regt has developed a contextualist theory of scientific understanding notably similar to IP. Contextualism, says de Regt, "supplies a framework for unifying" extant theories of scientific understanding (2017, p. 260). Like Mitchell, de Regt rejects relativism and presents his contextualist view as granting the correct understanding compared to rival views. As with IP, de Regt's contextualism, then, ultimately services a unificatory motif.

epistemological anarchism to be a short-term strategy, a kind of "opportunism", as he called it. Feyerabendian anarchism is ultimately conducive to the pursuit of a unitary end: an ideal of democracy or freedom (see also Shaw, 2017). Such a Kuhnian or Feyerabendian view potentially draws from the best of both pluralistic and unitary strategies. Pluralists, like Mitchell, need not abandon their commitment to diversity. We should, however, reconceive and express our pluralism as a provisional strategy ultimately servicing some unitary goal (whether that goal is e.g. epistemic, epistemological, or cultural). We can be short-term pluralists and long-term 'unitarists' (in the sense outlined above). Such a pluralism is then an explicit, rather than implicit, kind of Feyerabendian opportunism. It is provisionally pursued in the name of convergence on unity.[14] Specifically, if we care about objectual understanding (as Mitchell seems to and as many surely do), then we should aim to merge short-term contextualities into long-term unifications, unifications that are not themselves contextually conceived.

My emphasis on unity and convergence need not invoke the competitive, as opposed to compatible, pluralism that Mitchell attributes to Popper (Section 1.1). 'Unity' and 'convergence' need not connote 'competitiveness' (nor 'reductionism' or 'lack of diversity' for that matter). The pursuit of and convergence on unity can instead encourage *prima facie* desirables like cooperation, collaboration, and communal cohesion. It is common wisdom that people perform well in some task when they are incentivised around a shared purpose (see Smit et al, 2014). The identification and pursuit of a common goal can focus and align our interests in a way that is partly compatible with IP. A cultural diversity of persons might, for example, be encouraged to explore a diversity of epistemic practices, but with the ultimate aim of collectively achieving objectual understanding. As mentioned, it appears to be counterproductive when pluralists actively encourage scientists and philosophers of science to pursue contrary epistemic and/or epistemological avenues in and of themselves.

Mitchell may respond that IP_{SCI} is not a unificatory account but rather an *integrated* account. In the same way that scientists integrate models, IP_{SCI} is the product of integrating epistemic practices or perspectives in science, and integration is not synonymous with unification. Perhaps so. But, given the above arguments, integration itself will invariably service some unitary goal. Integrations do not ultimately have a contextual outcome. Instead, they are undertaken to service unitary outcomes, unitary outcomes like objectual understanding.

[14] This convergent motif is reminiscent of Whewell's notion of consilience (recall footnote 5).

Consequently, IP need not stand in opposition to unification. Integration—whether of epistemic perspectives or epistemological perspectives—can form part of the convergent and unitary strategy I have outlined: Opportunistic Pluralism.

The difference between IP and Opportunistic Pluralism is that, in IP, the outcome of integration is pluralistically conceived. How integration occurs is indubitably a context-relative matter. Conversely, in Opportunistic Pluralism, context, integration, and diversity form part of a provisional short-term strategy employed in the pursuit of a long-term non-pluralistic goal. Resolute epistemic or epistemological pluralists who reject this unitary motif may—like Mitchell—be tacitly committed to one anyway. As argued, pluralism only seems to make sense if it is an opportunistic means to some unitary end.

Conclusion

Mitchell's IP takes two forms: IP_{SCI} and IP_{PHIL}. IP_{SCI} promotes pluralism about epistemic perspectives in science, while IP_{PHIL} promotes pluralism about epistemological perspectives about science. I have argued that IP_{SCI} and IP_{PHIL} are in tension with each other. The kind of understanding IP_{SCI} pursues and purports to grant is, *au fond*, the unificatory kind. However, IP_{PHIL} stipulates that there are no, and we should not pursue any, such unitary kinds of understanding. I suggested that proponents of IP do away with IP_{PHIL} and instead embrace the idea that epistemological accounts aspiring to grant objectual understanding (in the way that IP_{SCI} does) are inherently unificatory. Pursuing objectual understanding involves the sort of inquiry that identifies and merges commonalities between a diversity of phenomena so that we can *grasp* them in a systematic or holistic—i.e. unitary—manner.

Although I have focused on Mitchell's IP here, my ultimate aim is to make a point about pluralistic views more generally. One cannot be both an epistemic pluralist and an epistemological pluralist (or a first-order pluralist and second-order pluralist) on pain of dilemma. My negative discussion of IP serves as a case study for introducing my more important positive discussion about objectual understanding and Feyerabend's opportunistic pluralism. This relates specifically to the idea that pluralism only makes sense if it serves some unitary goal.

I suspect that, on reflection, Mitchell will not question the unificatory nature of the kind of understanding IP purports to grant. What she seems to have missed is the dilemma that results when IP_{PHIL} encourages pluralism about ways of understanding while IP_{SCI} presents one way—the purportedly correct way—of understanding. Opportunistic Pluralism offers a solution to

this dilemma. Opportunistic Pluralism seems to draw from the best of both unitary and pluralistic strategies. The two need not stand at odds with each other. Instead, we engage in pluralistic means while pursuing unitary ends.

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