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Creativity in science and the 'anthropological turn' in virtue theory

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Abstract

I argue that philosophical studies of the virtues of creativity should attend to the ways that our conceptions of human creativity may be grounded in conceptions of human nature or the nature of reality. I consider and reject claims in this direction made by David Bohm and Paul Feyerabend. The more compelling candidate is the account of science, creativity, and human nature developed by the early Marx. Its guiding claim is that the forms of creativity enabled by the sciences are ultimately valuable insofar as they advance our emancipation from a state of existential alienation. I end by encouraging future investigations of such vertical explanations of the significance of certain virtues in the context of scientific enquiry.

Keywords Bohm · Creativity · Feyerabend · Marx · Science · Virtue

1 Introduction

An attractive development in contemporary philosophy of science is an increased interest in the significance to scientific enquiry of various *virtues* – excellent character traits, attitudes, sensibilities, and ways of thinking. Popular candidates include curiosity, open-mindedness, and the procedural epistemic virtues, like diligence and conscientiousness (Paternotte and Ivanova 2017). Contemporary virtue theorists offer two main accounts of what justifies the normative classification of epistemic character traits as virtues, sometimes with reference o scientific examples (Baehr 2011; Battaly 2016; Zagzebski 1996). Some argue for consequentialist accounts: the virtues tend systematically to bring about good effects or ends. Others define virtues in terms of good

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motivations, values, or desires. What counts as the relevant sorts of good effects and motives is, naturally, shaped by the particularities of our practices and projects.

In the case of creativity, there are many accounts of its goodness. Some focus on its effects, such as Paisley Livingstone's explication of creativity as 'originality in the devising of an effective means to some end' (Livingstone 2018: 108). Some urge much more expansive accounts of the nature and value of creativity, often by emphasising the importance of certain 'inner' features of the agent. Matthew Kieran argues that creativity involves 'presuppositions of mastery, control, and sensitivity to reasons in guiding how agents bring about what they aim to do' (Kieran 2014: 128). To a degree, these different accounts reflect different models of the nature of virtue, alongside the sheer range of ways of forms taken by our creative dispositions and behaviours (Paul and Kaufman 2014).

Whichever account one endorses, there are good reasons to accept that creativity is among the virtues. It might be the case that there's no single virtue, 'creativity', but rather a broader range of subtle distinctive types of creative attitudes, dispositions, sensibilities, and styles of thinking. Consider, for example, Mike Beaney's distinction between creativity as forming new concepts and a more radical form of creativity aimed at 'development of new conceptual frameworks' (Beaney 2018: 275). Consider, too, Maggie Boden's account of the creative mind as including, among other things, creation of new 'conceptual spaces' (Boden 2004: 86f). An interesting feature of some accounts of the value of our creative capacities is that they invoke deeper claims about human nature, even of the nature of reality. Consider the Romantic emphases on our capacities for artistic and existential creativity, or the muscular pragmatist celebrations of the 'almost divine creative functions' intrinsic to 'the being of man' (quoted in Craig 1996: 263). Several distinguished historians of philosophy have detailed the intellectual and cultural development of these deep conceptions of creativity, which often point to the early Renaissance as marking a shift towards a new valorisation of human creative capacities (Cooper 2002; Craig 1996).

I want to recommend that philosophical studies of the virtues of creativity should also attend to the ways that our conceptions of human creativity may be grounded in conceptions of human nature, even of the nature of reality. Across the Western tradition, one finds celebrations of creativity that play on specific conceptions of human beings and reality – of creativity as, inter alia, a means of of emulating divine power, enacting Baconian imperatives to transform nature, or as a manifestation of our 'will-to-power'. Several major contributes to virtue ethics include these studies of the grounding of conceptions of virtues in specific cultural and moral traditions that include anthropological and metaphysical conceptions, including landmark work by Philippa Foot and Alasdair MacIntyre (Foot 2001; MacIntyre 1984). Common to their projects is an attempt to locate the virtues within specific historical and social contexts, traditions, and metaphysical visions. The ambition of their contemporary admirers is to articulate 'an account of the virtues and their importance for human life [which] depends not just on biological considerations but also on the nature of one's whole cosmic outlook' (MacPherson 2020: 115).

Nancy Snow sees studies of this sort as part of what she calls an 'anthropological turn' in virtue theory. Central to that turn is a commitment to forsake purely abstract analyses of virtues in favour of ones sensitive to the ways in which the forms and significance of virtues are 'shaped by cultural contexts and the forces of daily living' (Snow 2019: 189, 193). Naturally, such calls should be welcomed by philosophers of

science sensitive to practices and contexts of enquiry. Encouragingly, anthropological studies of creativity in science are also available.

The best example, to my knowledge, is Mike Martin's *Creativity: Ethics and Excellence in Science*. It urges a sort of 'realism' about creativity in science, defined in terms, first, of an 'accurate view of human nature' and, second, due appreciation of 'the role of the intellectual virtues in science [that avoid] implausible idealisations about the purity of motives and commitments' (Martin 2007: 28). Curiosity and a love of knowledge are inevitably mixed up with personal ambition, egotism, personal rivalries, and much else in both everyday life and the sciences. Such dappled conceptions of the messy realities of the characters and behaviour of scientists are captured nicely in the title of Steven Shapin's book, *Never Pure*, which rejects the 'hagiographical' historiographical style of 'praising famous scientists and displaying their unique intellectual powers and moral virtues' (Shapin 2010: 117).

I want to distinguish two ways of performing an 'anthropological turn' in the study of the virtues. Call them *horizontal* and *vertical* explanations. Although they are not mutually exclusive, most work focuses on the horizontal style to the neglect of the vertical. Snow urges and Martin offers *horizontal explanations*: they seek to explain the forms and significance of creativity relative to the structures and practices of the sciences – incentive structures, professional ethical codes, and so on (see Martin 2007: chs. 6–9). By contrast, *vertical explanations* explain the forms and significance of creativity in terms of something more fundamental – a 'worldview' or conception of human nature. When explaining *why* certain kinds of creativity are admirable, one refers 'downwards' to underlying anthropological and metaphysical conceptions. Put another way, horizontal explanations situate the explanandum in structures and practices, while vertical structures ground them in a worldview.[1] Late medieval Christian praise of creativity as a means for human beings to cultivate likeness to God, the creator *par excellence*, are of this sort, as are later visions of creativity as the paradigmatic manifestation of the 'self-assertive' conception of humanity made salient by Renaissance humanism (see Cooper 2002: chs. 2–5).

Most contemporary work on the virtue of creativity focuses on the horizontal style of explanation. Granted, much work exists to be done in that direction, not least due to the huge variety of forms taken by our aesthetic, practical, ethical, and epistemic activity. A few studies do contemplate the grounding of conceptions of creativity in deeper metaphysical or religious visions (eg Talliaferro and Varie 2018). Within virtue epistemology, Bob Roberts and Jay Wood float the possibility that at least some epistemic virtues 'presuppose' or are 'indexed' to some 'particular understanding of human nature and the nature of the universe' (Roberts and Wood 2007: 23, 82, 189). Some accounts of epistemic humility, for instance, depend on quite substantive presuppositions about our epistemic situation relative to the wider order of things – a claim borne out by historical studies of that virtue (see Cooper 2002; Pardue 2013). Changing conceptions of virtues, like creativity and humility, often track deeper changes in background anthropological conceptions and metaphysical visions. It is these sorts of deeper changes that necessitate the employment of vertical explanations.

I offer a vertical explanation of the significance of the virtues of creativity to scientific enquiry which takes its cue from two figures who make expansive claims

[1] I thank Adrian Currie for this helpful way of putting the point.

about the relations of science, creativity, and human life – David Bohm and Paul Feyerabend. Within their works, one finds various intriguing claims about the deep existential significance of creativity and an expansive vision of how a truly creative science can transform human life for the better. What they lack is the accompanying anthropological conception of human beings. Fortunately, this is furnished by an earlier figure who inspired them both – Karl Marx. His writings of the 1840s present a powerful account of creativity, human nature, and science. The deep claim is that proper appreciation of the sciences must involve grasping that their deepest significance lies in their being unique vehicles for cultivation and satisfaction of the creative capacities intrinsic to human flourishing. Ultimately, the forms of creativity enabled by the sciences advance our emancipation from a discomfiting state of existential alienation (of a sort explained in sections 3 and 4).

2 Bohm and Feyerabend

An earlier generation of philosophers of science emphasised the various ways creativity was integral to fruitful scientific enquiry. Imre Lakatos was critical of models of science which he saw as inhibiting the 'creative shifts' vital to ensuring the 'generativity' of what he famously called 'scientific research programs' (Lakatos 1980: 51, 99). Karl Popper emphasised the value of 'free, bold, and creative interpretations', albeit 'controlled by severe criticisms and severe tests' (Popper 2002: 261). Mary B. Hesse criticised philosophies of science that impugned the value of 'introspection, insight, and creativity', capacities whose affirmation should be part of 'the task of a logic of science' (Hesse 1974: 1).

Such testimonies to the roles of creativity in science involve horizontal explanations, focused onto the practices, structures, and everyday activities of the sciences, like generating theories and interpreting evidence. Much contemporary work on creativity in science has this sort of focus, consistent with the turn to practices. But creativity can matter to science in other ways beyond its roles in science's epistemic practices. We can also ask further questions about the centrality of creativity to conceptions of human flourishing and the ennobling effects of a collective human enterprise – the sciences – characterised by profound exercises of creativity. Matthew Kieran, for one, construes creativity in these terms as 'an achievement of character that is in and of itself praiseworthy and admirable', therefore a component of a good and flourishing life (Kieran 2014: 140). Curiosity has a similar exalted status in relation to science, of course, although creativity has its champions, too—those who argue that the deeper or fuller significance of science is only revealed through *vertical explanations.* Such champions need not deny the roles of creativity to scientific practice, but they do want to insist on telling the vertical story, too. Two examples of such champions are Paul Feyerabend and David Bohm.

I start with the self-styled 'epistemological anarchist', in whose sparky writings there are many discussions of creativity, usually in three contexts. The first are criticisms of various 'myths' or 'fairytales', as Feyerabend calls them, about the nature of science, which occlude the vital roles of creativity in science (Feyerabend 1987a, 1987b:159, Feyerabend 1993: 117). A main criticism of methodological monism is that it disguises the creativity inherent to scientific practice – at the workbench, in the field – by

presenting it as mere mechanical performance according to standardised rules. Second, the technicoloured epistemic pluralism overdramatically labelled 'epistemological anarchism' requires practically and epistemically creative scientists (Feyerabend 1993: 18). 'Anything goes!' was of course the polemical expression of a far subtler set of positions on the history and practice of science, although one of the points Feyerabend was making was that scientific practice requires the presence of creative scientists, able to create new ways of going about enquiry.[2] In these two contexts, what one finds are distinctively horizontal explanations of creativity in relation to the structures of science.

The third context in which Feyerabend discusses – indeed, praises – creativity is more expansive in a way consistent with vertical explanation of its significance and is mainly found in scattered remarks ranging from the late 1960s to the last writings of the early '90s. *Against Method* warns that 'the idea of a fixed method … rests on too naïve a view of man', one oblivious to the potent capacities for creative imagination of human beings (Feyerabend 1993: 18). What methodological monism gets wrong, one might say, is not only the realities of scientific practice, but also, more deeply, the fundamental character of human beings as creative, inquiring creatures. Feyerabend's urge to philosophers of science to attend more carefully to the arts, recently explored by Ambrosio (2021), is of a piece with that conviction (Feyerabend 1967). Into the late writings, similar remarks emphasise the epistemic and cultural importance of our creative capacities, albeit on condition that they are informed by respect for the concrete traditions and contexts of human life (Feyerabend 1987a, 1987b: 141ff). Indeed, these 'big-picture' remarks start to refer to 'the view of human beings' underlying these expansive claims about the ways creativity features in human life and the implications of all this for 'politics, education, science, and personal relations' (Feyerabend 1987a, 1987b: 138). By the time of *Conquest of Abundance*, creativity has come to be situated within reflections on the relationship of human beings to the wider order of our "abundant' reality' (Feyerabend 1999: 226ff). Here, the significance of creativity has gone deep, well beyond its scientific practices.

The crucial feature of these reflections is Feyerabend's evident conviction that we can only fully appreciate the nature of creativity with recourse to an appropriate conception of human nature. (Interestingly, the opening chapters of *Conquest of Abundance* are devoted to a shift of anthropological conceptions that allegedly occurred during the Homeric period – see Feyerabend 1999: chs. 1 and 2)). True to form, Feyerabend uses a via *negativa*, criticising two conceptions of creativity he regards as problematic. First, overly individualist conceptions of creativity which construe it in terms of 'individual creative acts', the achievement of genius figures acting in isolation from any wider communities or contexts (Feyerabend 1987a, 1987b: 136). A creative scientist or artist, of course, always operates alongside others and, moreover, draws on an inherited tradition of practice and understanding. Second, conceptions of creativity as a mysterious capacity, some 'divine gift', that is ultimately inexplicable and therefore resistant to training or collective facilitation (Feyerabend 1987a, 1987b: 142). Although this may suit the egos of some creative agents, it effaces the integral role of structures, communities, and traditions in facilitating putatively 'divine' acts of creative genius.

[2] On 'anything goes' and Feyerabend's actual epistemological position, see (Chang 2021), Kusch (2021), Shaw (2017) I discuss Feyerabend's complaints about philosophical models of science that occlude the creativity of scientists in Kidd (2021: 177–178).

Moreover, it feeds an invidious historiographical style focused onto superhuman scientific geniuses, that is nowadays untenable, given new studies of the collective and social dimensions of creativity (Currie 2019a; Paul and Stokes 2018). Once we fill in the relevant contexts of enquiry, there is nothing necessarily puzzling about acts of scientific creativity: we can be 'surprised and delighted by the creativity and ingenuity with which historical scientists uncover the past' without thinking that is 'any great mystery concerning their success' (Currie 2019b: 18).

I grant Feyerabend's criticisms, even if, true to form, his expression of them was often intemperate—as when he derides, without examples, 'vague and soggy talk about "scientific creativity"' (Feyerabend 1996: 26). At this point, he is appealing to a set of convictions about the human good, developed across a set of papers back to the late 1960s. Some of the general features are celebrations of creativity, independence, and freedom and loathing of myopia, dogmatism, and conformity (see, eg, Feyerabend 1968 and Feyerabend 1970: §4). Usually, he appealed to such values to challenge what he regarded as invidious claims, rather than sitting down to articulate a stable conception. The 1987 paper, 'Creativity—A Dangerous Myth', has a provocative opening claim: 'the view that culture needs individual creativity is not only absurd but also dangerous' (Feyerabend 1987b: 701). After rehearsing criticisms of individualism and mysterianism, he attacks the 'conceited view that some human beings, having a divine gift of creativity, can rebuild creation to fit their fantasies', an attitude of hubris with baleful social, ecological, and existential consequences (Feyerabend 1987b: 711).

What is needed, argues Feyerabend, is criticism of 'the view of human beings that underlies the idea of individual creativity' (Feyerabend 1987b: §3). Alas, that is insufficient by itself. The real solution would be a superior conception of creativity, which avoided forms of distorting individualism and stultifying mysterianism, while offering still offering a substantive anthropological conception. Unfortunately, Feyerabend neither offers his own conception of creativity nor says enough about the offending 'views of human beings'. At its broadest, his point is that creativity should be construed as a collectively scaffolded set of epistemic and practical capacities, not the inexplicable gift of rare geniuses, blessed by the gods. Moreover, there are grim warnings that misconceiving human creativity will – somehow – diminish the vital energies of the sciences. Even worse, it risks distorting the patterns of 'complex interaction' with other persons and reality that cultivates a sense of our being intimately 'at home in the world', rather than 'detached aliens' (see Feyerabend 1987b: 707 and Feyerabend 1999: 128, 246, 204).

Such heady claims about science, creativity, and the existential predicament of human beings may be interesting and are consistent with a wider tradition in German philosophy of science that includes Edmund Husserl's *Crisis of the European Sciences* – a book Feyerabend had studied. Without a suitably complex account of human nature, though, they can only be so compelling. What is needed is an explanation of *why* the stultification of human creative capacities should induce a sense of existential alienation, rather than just frustration at scientific work done badly. Put another way, Feyerabend needs to provide a 'view of human beings' – an anthropological conception – capable of giving grounds for a vertical explanation of the deep significance of creativity and its intimate relation to scientific enquiry. His critique of some notions of creativity in science is compelling, but what he lacks a positive view to replace them.

A second example of a philosopher who urges expansive conceptions of creativity and science is David Bohm, a heterodox quantum physicist, whose later work focused

on a radical vision of science, creativity, and the nature of reality. Feyerabend, unsurprisingly, admired his work for its boldness, originality, and ambition, and published a very positive review of Bohm's book *Causality and Chance in Modern Physics* (Bohm 1957; Feyerabend 1960). Indeed, Feyerabend continued to refer to Bohm's work right up to the end of his life, if only in brief passing remarks.[3] Our best sources for Bohm's views on creativity and science are the transparently titled book, *Science, Order, and Creativity*, and a collection of papers, *On Creativity* (Bohm 2004, 2014). I will also draw upon interesting remarks scattered throughout his correspondence with the American abstract artist, Charles Biederman (Bohm and Biederman 1999).

The scope and depth of Bohm's thinking about creativity is obvious from these books. *Science, Order, and Creativity* aimed to provoke a 'surge of creativity' in the modern world by developing a 'a new notion of science … suitable for our present time' (Bohm 2014: 14). This would be achieved by dismantling the 'tacit [social] infrastructures' that 'impede creativity', while also identifying ways to transform 'the current activities of science' to better 'foster a more creative approach' (Bohm 2014: 51, 25). Some examples include fostering collaboration between artists and scientists, dialogues between physics and Indian philosophical traditions, and altering the institutional constraints of 'Big Science'. *On Creativity* explores the further thesis that 'manifestations of creativity in humankind', across the arts and sciences, share 'the same intrinsic nature as the creative forces in the universe at large' (Bohm 2004: xv).

Science could play at least two roles in facilitating the 'surge of creativity' envisioned by Bohm. First, the sciences ought to be arranged as culturally prestigious exemplars of potent creativity on a large scale. The scientific enterprise ought to be structured to bring forth novel conceptual possibilities and forms of practice, reminiscent of Feyerabend's famous pluralistic image of science as an ever-growing 'ocean of alternatives' (Feyerabend 1993: 21). Alas, that creative pluralism was thwarted, argued Bohm, because modern science is corrupted by 'tacit and unconscious ideas' that legitimate entrenched institutional features, like specialisation, which tend to inhibit creative exploration and cross-pollination (Bohm 2014: 12—an interesting recent example of this worry is Stanford 2019).

Second, science and scientists should interact more extensively with other human imaginative and intellectual endeavours. In a 1962 letter to Biederman, Bohm made clear his holistic vision of complexly harmonising human creative projects:

> 'Our true mode of life would be to live creatively in all of our relationships from moment to moment, and not just in certain moments in art, music, mathematics, science, etc.' (Bohm and Biederman 1999: 216)

Such talk of our 'true mode of life' echoed, decades later, in a chapter of *Science, Order, and Creativity* titled 'Creativity in the Whole of Life'. What is really needed for human flourishing, maintained Bohm, was using the paradigmatic creativity of the sciences to 'transform the whole of life' (Bohm 2014: 240). Ultimately, nothing less will do to satisfy what is really most fundamental in us—our 'deep desire for wholeness

[3] Feyerabend briefly refers warmly to Bohm's later book *Wholeness and the Implicate Order* (Feyerabend 1999: 204). On Feyerabend's relationship to Bohm, see van Strien (2020).

and human connectedness' (Bohm 2014: 298). Again, the creative dimensions of science resonate with deeper issues, that go way beyond the epistemic practices of science.

I think Bohm's account shares the same virtues and faults as the similar claims made by Feyerabend. The exciting expansive conception of science, creativity, and human life falls short because the underlying conception of human beings isn't spelled out in the necessary detail. Why, for instance, would cultivating our creative capacities help us overcome a painful sense of existential estrangement – our feeling like 'distant aliens', as Feyerabend says – and what anthropological conception is at work in those remarks about our constitutive desires for 'wholeness'? No definite answers are forthcoming from Feyerabend, at least, though we can identify clear influences on his own philosophical anthropology. Maybe the most obvious is Karl Popper. 'Science', like the arts, is 'an adventure of the human spirit', if still suffused with 'failings and shortcomings', but distinctive, too, insofar as it is 'the most admirable union of creative imagination and rational critical thought' (Popper 2013a: 259). In humanist spirit, Popper declared that his 'religion' was 'the doctrine of the splendours of the world; of the freedom and creativity of wonderful human beings' (Popper 2013b: 42). Underlying such remarks is a conception of human beings that goes back to the Renaissance: of human beings as epistemically frail but possessed of creative, rational, and imaginative capacities that, if used and cultivated properly, allow us to overcome our current limits and improve our worldly condition and achieve deeper truths about our wider reality.

I want to push back further, though, to an even earlier influence on Feyerabend and Bohm's thinking about the deep relations between creativity, science, and human beings. To do so, I consider a figure who influenced Feyerabend, Bohm, and Popper, whether by way of embrace or resistance—Karl Marx. Arguably it's in his writings that one finds a philosophical anthropology that emphasises deep connections between creativity and human nature, the existential character of unconstrained creative agency, and the relation of all of that to the sciences. Most obviously, Bohm was a committed Marxist, until the 1956 invasion of Hungary, after which, living in exile in Brazil and then Britain, he made few references to it (Junior 2019: chs. 3–4, Kojevnikov 2002). Feyerabend studied Marx early in his career and discussed him with Lakatos and, in the intellectual autobiography at the end of *Against Method*, describes becoming acquainted with various Marxists during his time in Vienna (Feyerabend 1993: 257ff; Lakatos and Feyerabend 1999: 151–152).[4] To understand that influence, I turn now to Marx.

3 Prometheanism and philosophical anthropology

'At the centre of Marxism', remarked Raymond Williams, is 'an extraordinary emphasis on human creativity and self-creation' (Williams 1977: 206). As sensuous material beings, one of our essential characteristics is creative, productive activity, which should be recognised among the fundamental drivers of human activity. Our creative impulses should also be located within human beings, reflecting our needs and goals, rather than

[4] On Lakatos and Marxism, see Dusek (2015) and Musgrave and Pigden (2016).

those of God or narrowly defined natural imperative. Full realisation of our creatively oriented capacities on this picture is a precondition for a full appreciation of the harms of oppressive social institutions and stultifying religious and philosophical dogmas. Stifling our creative agency is not only frustrating but a means of eroding one of our most fundamental capacities. For this reason, explains G.A. Cohen, 'the creative side of human nature' emerges as central to a 'Marxist philosophical anthropology' (Cohen 2000: 379). Marx embeds this conception of human nature within an historical narrative, ultimately owing to Hegel, according to which our creative efforts begin 'under the imperative of survival', until, slowly, 'the latent powers of humanity are roused', at which point, 'the project of attaining a creative existence is founded' (Cohen 2000: 379).

The essentially creative character of human nature is articulated by Marx in terms of our *Gattungswesen*, our 'species-essence', a concept central to understanding alienation (EPM 78, 128). Systems of exploitative capitalism, by 'degrading spontaneous activity', lead to the multiple modes of alienation analysed by Marx—alienation from one's capacities for meaningful productive agency, for instance, and from the natural and social worlds that are experienced in terms of substantive obstacles to our agency (EPM 77ff).[5] Such systems of alienation manifest a failure to grasp that, as Cohen puts it, 'humanity is essentially creative', with a consequence that social and economic systems become oppressive when they thwart our creative needs. The deep motivation of the proletarian revolution, for instance, was a felt 'frustration of the human essence which only communism, the ultimate result of essence-frustrating activity, will relieve' (Cohen 2000: 359).

I want to explore the possibility that, with these remarks on our 'species-essence', Marx offers an anthropological conception that yields a specific account of the significance of the virtues of creative productivity. Although Marx maintained an interest in our individual and collective capacities for creativity, I focus on his earlier writings, especially the *Economic and Philosophic Manuscripts*, written during 1844. Partly this is to provide a workable focus, but, more substantively, because Feyerabend showed much less interest in Marx's later work and on the critique of political economy. I think there are at least two reasons. First, there is the intellectual opportunism characteristic of Feyerabend's work – the appropriation of a variety of materials that suited his current predilections and needs, without assiduous attention to their particular contexts.[6] Second, the Prometheanism of the early writings lacks any specific political implications, other than the imperative to cultivate our creativity and to remove any contingent barriers that stand in the way. Although that is clearly consistent with muscular reform of class structures, it does not necessarily *entail* it and one could imagine alternative responses.[7] This means a Promethean anthropology can be adopted without our incurring a further set of stipulative political commitments—something obviously attractive to Feyerabend, who was much less effective when issuing practical political proposals (Kidd 2016).

[5] References to Marx are to the Economic and Philosophic Manuscripts (EPM), Early Political Writings (EPW), Karl Marx: A Reader (KMR), and *Theses on Feuerbach* (TF), the latter in KMR.

[6] A good example is Feyerabend's engagement with scholarship on classical Greek history and literature as discussed by Heit (2015) and Preston (2016).

[7] I am very grateful to an anonymous referee for offering this suggestion and for explaining that this was a main reason why Soviet scholars criticised the enthusiasm of their Western colleagues for EPM.

A useful label for the general features or character of the philosophical anthropology found in those early writings is *Prometheanism*. It is named for the Greek Titan, the exemplar of ambition, creativity, and all those attitudes oriented to the transformation of things 'for the sake of Man'. Prometheanism emphases our creative and practical capacities and so our necessarily embodied engagement with the world and the goals and imperatives that drive us to engage in the purposeful ordering and shaping of the world, including ourselves (see Cooper 2002: ch.4). Humans are essentially defined by their capacities for creative, engaged, self-assertive agency.

By appreciating the Promethean character of the early Marx's anthropology, we will be better placed to appreciate the profound existential significance he assigns to creativity and to the sciences. There are three main aspects to a Promethean anthropology. First, there will be celebration of the virtues of creative production, such as authenticity, individuality, self-sufficiency, strong commitment, and, of course, creativity itself. Such dispositions show up as virtues – as admirable, desirable excellences of character – precisely because they tend to dispose us to initiate and prosecute creative activities and projects. Second, Prometheans emphasise the non-instrumental value of those creative capacities. By exercising our creative capacities, we not only secure the material necessities of life, but also secure profound existential goods – authenticity, for instance, or the overcoming of our state of alienation. Marx characterises 'free conscious activity' as the defining trait of those 'real, active' human beings, especially the emancipated person who 'truly produces in freedom' (EPM 76, 77).

A third aspect is the emancipatory imperative to transform the material, social, and intellectual conditions of life to scaffold and nurture our creative capacities. That aspiration can take many forms. It could, for instance, mean dismantling oppressive structures, like the class system or religious dogmas that stymie appreciation of the sensuous dimensions of life. More positively, it might mean creating structured opportunities for creative activity, this being the 'revolutionary' aspect that Marx diagnosed as absent from Ludwig Feuerbach and the Young Hegelians who, famously, merely described the world without actually changing it (see Löwy 2005: 107ff). Unfortunately, these efforts to creatively transform the world require time and immense energy, hence Marx's vision of humanity as caught up in an ongoing act of 'coming-to-be—*history* … a continuous self-transcending act of coming-to-be' (EPM 153, 156).

The robustly Promethean character of Marx's anthropology is signalled in the *Theses on Feuerbach*, the first and third of which declare that our essential 'species-being' (or species-essence') is '*life activity, productive life*', obliviousness to which was the 'chief defect of all hitherto existing materialism' (TF §§ 1, 5). The aim, argues Marx, should be to return human beings to their 'species-life' – that is, to the modes of living characterised by the full cultivation and exercise of our creative and productive powers. During that process of cultivation, we start to see the world not as 'exterior existence', whose forms and order must simply be accepted. Instead, the world comes to be seen as a space for meaningful productive agency – as opportunities for mixing 'work and reality', for changing the world from something 'independent and alien' to an intelligible realm that increasingly bears the marks of human purposes and agency (EPM 135, 140, 139).

It is by understanding creativity in this sense that one sees the existentially charged aspects of Marx's ideas about creativity. By working together to creatively transform the world to make it better fit our values and purposes, we overcome a feeling of

alienation or estrangement from that world. The more we shape and control the world, the more we feel at home in the world and, even better, the more we (to quote some of Marx's terms) 'affirm', 'express', and 'realise' our creative capacities. Systematic creative transformation of the world simultaneously fulfils our essentially creative nature and helps overcome our alienation from the world. That is why the fundamental harms of oppression are not moral but *existential*, that is, matters of alienation, estrangement, and our lived relationsip to the world. The ultimate goal is the overcoming of alienation, not of the injustices of the class system or exploitation of the working classes. 'A nonalienated world', explains William Adams, would be 'one in which economic practices were designed to realise and nurture rather than undermine human creative powers' (Adams 1991: 251). Within such a world, our energies can be devoted to free spontaneous creativity, populated by emancipated people free to 'form things in accordance with the laws of beauty' (EPM 79, 77).

With the general features of Marx's Promethean anthropology in place, we can easily see the ways it influenced Bohm and Feyerabend. There are the celebrations of creativity as a collectively scaffolded capacity, easily thwarted by what Bohm called 'tacit infrastructures', or the distorting individualist and mysterian conceptions criticised by Feyerabend. There are the same convictions about the vital existential and cultural dimensions of creativity, though Marx furnishes an accompanying account of our 'species-essence' and an analysis of modes of alienation. Given Bohm and Feyerabend's acquaintance with Marx, I think they were clearly riffing on the much more complex account of human nature, creativity, and alienation developed in the *Economic and Philosophical Manuscripts* and other early writings. Alas, they dispensed with much of the detail, hence the limitations of their accounts. Bohm and Feyerabend espoused forms of Promethean philosophical anthropology and used it to undergird their expansive claims about the significance of human creativity.

The outstanding issue is to ask whether a Promethean anthropological conception of the sort developed by Marx also provides an account of the special connections between the sciences and creativity. What we have so far is the underlying anthropological conception—the *Gattungswesen*—needed for a vertical explanation of the vital significance of creativity. But there are two problems. First, why would that conception assign specific value to *science*, as opposed to other creative human enterprises, like religion or the arts? Second, how does that Promethean anthropology justify expansive claims about a properly reformed science as a powerful vehicle for ameliorative transformation of the 'whole of life'? Answering these questions brings us to Marx's philosophical views on science.

4 Science and creativity

An initial difficulty is that Marx, unlike many nineteenth century European thinkers, never wrote a work on the philosophy of science. The most sustained treatments are some passing remarks in two short works, the *Grundrisse* and the *Notes on Wagner* (Farr 1991: 196). Fortunately, there are various scattered remarks on topics such as scientific methodology, the nature of explanation, and the aims of science. Some scholars therefore offer 'reconstructions' of his philosophical views about science, usually focused on what seems a very modern conception of science as a

methodologically pluralistic enterprise, conditioned by its material and social structures (an example is Little 1986). Granted, some features are less attractive to modern minds, such as Marx's anticipation of a future unity of science. Still, even without a canonical statement from Marx's own pen, we can make a good effort at working out the general form of a Promethean conception of science.

At the most general level, Prometheanism appraises activities and projects in terms of their capacities to advance the flourishing of human beings by providing means for their cultivation and exercise of their creative potentialities. Science, properly conceived, clearly serves that goal insofar as it provides expanded scope and novel means for epistemically and practically creative agency. Even a tender-hearted socialist, like Trotsky, declared that the 'social evaluation of science [is] determined by its capacity to increase man's power and arm him with the power to foresee and master nature' (Trotsky 1973: 210). Other than the obvious practical possibilities, the sciences offer distinctive forms of epistemic creativity, too: our creative transformation of the world requires us to self-consciously take up our potential as the creature who 'creates and posits objects', imposing conceptual and theoretical order onto the world (EPM 167).

Once decoupled from narrow 'bourgeois' motives, a Promethean science therefore enables 'the full development of human control over the forces of nature', encompassing the full range of our creative practical and epistemic potentialities. In a stirring Promethean declaration, Marx portrays the sciences as advancing 'the absolute creation of [our] creative dispositions', even allegedly 'pure' natural sciences. Cosmology, for instance, may not advance our powers in any practical sense, but still ultimately 'receives its purpose' from its capacity to advance 'the evolution of all human powers as such' (quoted in Adams 1991: 267).

A Promethean anthropology therefore assigns a specific value to science because no other human enterprise can so radically expand the scope and scale of our creative powers. Coupled to industrial technologies, the natural sciences enable nothing less than a reshaping of the natural order on a scale that cannot be matched by religion or the arts. Granted, Marx criticised wanton exploitation of nature for profit and the 'debasement of nature' under 'the domination of private property and money' (quoted and discussed in Smith 2000). Still, the transformation of nature is required for the 'evolution of human powers as such', which is why the sciences must be liberated from their debased, 'subordinated' condition of 'serving material production' (KMR 318). Liberating the sciences from those constraints is an urgent task for philosophy – a claim later repeated, of course, by Feyerabend and Bohm.

The unparalleled power of science to expand the scope of our creative powers also explains why what happens within the sciences will ramify throughout 'the whole of life'. A deep feature of the modern world is the entrenchment of science as a privileged cultural institution and the source of a dominant *Weltbild* – the schematic metaphysical vision or worldview that structures many people's understanding of the nature of reality and their relationship to it.[8] Marx usually makes this point by insisting on the need to challenge deficient conceptions of science: a main feature of 'bourgeois' science is that it 'fails to feel its own incompleteness', even while the fact of its debasement has also

[8] Feyerabend increasingly turned his attention to what he called 'the scientific worldview' in later writings (see, eg, Feyerabend 1999, Part I, chs. 2 and 3). Given his pluralism about the sciences, he emphasised that there *was* no uniform scientific worldview, even if the idea that there *was* did a lot of work.

'prepared [the way for] human emancipation' (EPM 110). Once that conception is repaired, the way is clear – or, at least, clearer – to appreciating that creative productive activity is 'the *exoteric* revelation of man's *essential powers*', displaying them through our practical dealings with the world. Moreover, the sciences are, for Marx, our most powerful means for manifesting and cultivating 'man's *real* nature', his 'true *anthropological* nature', since they provide the necessary scope and power for the fullest possible exercise of our creative powers. At some points, Marx becomes dithyrambic, declaring that our 'natural history' and 'natural science' will eventually become 'subsumed' as humanity increasingly realises its own nature, reshapes the world in its own image, and dispels alienation, across all of its modes, once and for all (EPM 110, 111). This is about as expansive a conception of the significance of creativity to science as one could imagine.

5 Conclusions

I suggest that the writings of the early Marx offer an excellent example of a vertically structured explanation of the significance of creativity to science. Without denying the ways that creativity matters epistemically and practically to science, the deeper claims invoke the Promethean anthropological conception of human beings as essentially creative, productive creatures. According to Marx's story, earlier stages of human society saw us using our creative capacities in very limited ways to serve our urgent practical interests, something that started to change in later stages of our social evolution.[9] The cultivation of our epistemically and practically creative capacities becomes an existential imperative – a vital means to overcoming alienation and achieving a state of authenticity and what Bohm called 'wholeness' and 'connectedness'.

Such issues are not often raised in mainstream philosophy of science, but are central to other philosophical traditions and are, anyway, important in a culture marked by an increasing contestation of the cultural authority of the sciences. Digging into these existential and cultural issues may help us to reiterate what is significant about the scientific enterprise to those increasingly prone to doubt it. Whatever one thinks of the early Marxist vision, it is stirring—science as uniquely placed to sustain existential and cultural transformation, if only we abandon shallower conceptions of it, dominated by utility or profit. To do this, we need a vertical explanation of the significance of science rooted in an underlying anthropological conception. A properly Promethean philosophy of science, one might say, honours the deep insight that cultivating and exercising 'the essential creative powers of human beings [is] the *path* to true *human actuality*' (EPM 85). Science, properly understood and deployed, serves that expansive ambition. When philosophising about science, virtues, or creativity, we don't always need to 'go deep', in this sense, since one can do a lot of good work at the horizonal level of scientific practices (Paternotte and Ivanova 2017). We should, though, be aware of the option to develop vertical explanations and corresponding deep conceptions of the virtues (Corneanu 2011; Kivisto 2014; Shapin 2008). Certainly, there are a handful of

[9] This genealogical story is doubtful, as it happens, since there are good reasons to suppose our ancestors were extremely creative (Mithen 2005).

studies in virtue epistemology of science that illustrate the fruits of this sort of work (Kidd 2017; Paul and van Dongen 2017). A deep conception of science of the sort urged by Feyerabend, Bohm, and the early Marx can be an inspiration for those interested in such work.

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