Health Care Anal (2017) 25:191–211
DOI 10.1007/s10728-015-0290-2

# Critical Realism and Empirical Bioethics: A Methodological Exposition

**Alex McKeown**

Published online: 26 February 2015


**Abstract** This paper shows how critical realism can be used to integrate empirical data and philosophical analysis within 'empirical bioethics'. The term empirical bioethics, whilst appearing oxymoronic, simply refers to an interdisciplinary approach to the resolution of practical ethical issues within the biological and life sciences, integrating social scientific, empirical data with philosophical analysis. It seeks to achieve a balanced form of ethical deliberation that is both logically rigorous and sensitive to context, to generate normative conclusions that are practically applicable to the problem, challenge, or dilemma. Since it incorporates both philosophical and social scientific components, empirical bioethics is a field that is consistent with the use of critical realism as a research methodology. The integration of philosophical and social scientific approaches to ethics has been beset with difficulties, not least because of the irreducibly normative, rather than descriptive, nature of ethical analysis and the contested relation between fact and value. However, given that facts about states of affairs inform potential courses of action and their consequences, there is a need to overcome these difficulties and successfully integrate data with theory. Previous approaches have been formulated to overcome obstacles in combining philosophical and social scientific perspectives in bioethical analysis; however each has shortcomings. As a mature interdisciplinary approach critical realism is well suited to empirical bioethics, although it has hitherto not been widely used. Here I show how it can be applied to this kind of research and explain how it represents an improvement on previous approaches.

A. McKeown (✉)
Centre for Ethics in Medicine, University of Bristol, Canynge Hall, 39 Whatley Road, Bristol BS8 2PS, UK
e-mail: alexjmckeown@gmail.com

A. McKeown
Institute for Health and Human Development, University of East London, UH250, Stratford Campus, Water Lane, London E15 4LZ, UK

**Keywords** Critical realism · Empirical bioethics · Erythropoietin · Interdisciplinarity · Philosophy · Sports ethics

## Empirical Bioethics

Empirical bioethics is an interdisciplinary approach to the resolution of practical ethical issues within the biological and life sciences that integrates social scientific, empirical data into traditional philosophical analysis. It aims to achieve a balanced form of ethical deliberation that is both logically rigorous and sensitive to context [36, 56]. The aim of such an approach is that it will be more able to generate normative conclusions that are practically applicable to the context in which the problem, challenge, or dilemma emerges. Given that empirical bioethics incorporates both philosophical analysis and social scientific data, it is a field that is consistent with the use of critical realism (CR) as a research methodology.

In this paper I will explain what CR is and how it can be used to underpin research questions in bioethics, and I will give an example of how this can be done. In particular the example I have chosen will demonstrate how subjective epistemological statements can be sometimes mistaken for objective ontological statements when put forward in defence of a position on a bioethical issue. This confusion can lead to misleading conclusions, and I will show how CR can be used to elucidate and neutralise this confusion.

The example is drawn from an empirical study[1] carried out within a PhD project examining the ethics of human enhancement. The empirical data were collected in interviews with nephrologists and renal scientists whose work involves synthetic recombinant erythropoietin (EPO)—an exogenous copy of a hormone endogenously produced by the kidneys that is implicated in ensuring adequate blood oxygenation, the depletion of which occurs in chronic kidney disease. In a clinical context, EPO is a standard treatment for the restoration of satisfactory blood oxygenation level when production of erythropoietin by the kidneys decreases [48, 25]. However it has also been widely and illegally used in professional sport—most notably cycling—for boosting blood oxygenation to achieve enhanced endurance and exercise tolerance [25, 50, 55], for example in the high profile cases of Lance Armstrong[2] and David Millar.[3]

Other methods of achieving the same performance advantage, such as altitude training, are legal, however. In the example given, I use a CR approach to analyse claims made by two of the participants that training at altitude to increase the oxygen content of the blood is ethically acceptable, whereas training at sea level using EPO to achieve the same effect is unacceptable. The claims are grounded in the premise that the former is more 'natural' than the latter, and that the difference in moral status between the two follows from their relative 'naturalness'.

[1] Permission granted by the University of Bristol Faculty of Medicine and Dentistry Committee for Ethics on 20th December, 2011, ref: 111208.

[2] http://www.bbc.co.uk/news/world-europe-20026838.

[3] http://news.bbc.co.uk/1/hi/programmes/hardtalk/9571648.stm.

The project of integrating systematically collected empirical data with normative philosophical reasoning in bioethics has been controversial [81, 17, 14]. This is unusual, since it is uncontroversial to say that states of affairs in the world frequently have significant ethical ramifications and effects, and this is particularly true within the context of medicine and healthcare. Insofar as the views of people to whom these states of affairs pertain are morally relevant, a comprehensive and balanced analysis of the situation, and the determination of the most ethically appropriate response cannot be achieved by excluding them. This conviction underpins empirical bioethics, and CR is, as I will show, well suited to facilitating research informed by data in an ethically and logically rigorous way.

## What Is Critical Realism?

CR was developed primarily by Roy Bhaskar in *A Realist Theory of Science* [8], and *The Possibility of Naturalism* [9]. It was designed to 'underlabour'[4] for practices in social science [73, 2, 12, 74] by providing it with a philosophical underpinning that can respond effectively to empiricist, positivist, idealist, and postmodern critiques [10, 85].

In terms of the aims of empirical bioethics, CR is useful because it cleaves statements about phenomena from the phenomena themselves, and in doing so shows that they are non-identical. Or, expressed more technically, CR holds that ontology cannot be reduced to epistemology. CR gives a mind-independent account of the external world, and in doing so enables the possibility of statements about the world to be more or less correct. This in turn provides an anchor for the analysis of qualitative empirical data collected to seek the subjective views of individuals or groups of individuals to whom a given bioethical issue pertains.

Bioethics in general aims to resolve ethically contentious 'real-world' states of affairs. In separating these states of affairs from perceptions of them, CR provides a structure in which the situation under examination exists independently of any one particular observer's viewpoint. Where views are erroneous, expressing an opinion about a phenomenon that has been mistaken for a statement of fact about it, CR can bring the mistake to the surface in order to clarify what is and is not at stake in the ethical and/or philosophical analysis.

By giving an account of the external world which is ontologically objective, transcending our partial and subjective epistemological representations of it, CR derives utility from both deductive and inductive approaches. In doing so it upholds the value of both philosophical and social scientific methods for knowledge discovery. Most importantly for ethical analysis, CR can validate logical moral reasoning whilst accepting a moderate form of social

[4] This term originates from John Locke (1690) and his conception of the role of philosophical thinking as: 'underlabourer in clearing the ground a little, and removing some of the rubbish that lies in the way to knowledge'.

constructionism that is not vulnerable to the reduction of ethical claims purely to matters of opinion.

## A (Very) Brief History of Bioethics

The first instances of what could be described as 'bioethical' scholarship were typically philosophical [57] or theological [24]. This theoretical rather than empirical leaning is understandable, since insofar as it is a sub-field of ethics, bioethics is to some degree irreducibly philosophical. However following the colonisation of bioethics by new disciplines from outside philosophy, and due to the socially embedded institutional nature of medical practice, it has diversified into a varied multidisciplinary field which includes the social sciences; law; medicine; and policy studies [16]. This diversification has raised methodological questions concerning how these varied disciplines can be successfully integrated such that bioethics can become a truly interdisciplinary field.

De Wachter [18, p. 276] writes that whilst efforts have been made towards interdisciplinarity, these have frequently fallen short of true integration, "producing at best a 'dialogue between sciences'" without achieving a genuine reconciliation of the reasons underpinning their opposition. Consequently bioethics has been "a field which is more likely defined de facto in terms of its issues than by any shared essence or scientific perspective". He is thus uncertain whether bioethicists have given sufficiently detailed thought to "defining the ways and methods of doing bioethics as (an) interdiscipline".

The result of critiques such as this is that bioethics has over the past two decades undergone what has been described as an 'empirical turn' [13, 27, 34]. The aim of this is to produce a means by which balanced, philosophically robust, but contextually informed conclusions can be developed for the resolution of practical ethical problems. The disciplinary schism between the tenets of (prescriptive) moral philosophical and (descriptive) social scientific analysis has caused antipathies across the field [1, 80]. These have occurred from the social sciences towards philosophy [31, 42, 49]; and vice versa [14, 32]. Borry et al. [13] write:

> The field of bioethics did not attract the collaboration of many social scientists. Their methods of gathering data were unfamiliar to ethicists, and the methods of ethicists were seldom known to social scientists…there was no 'easy and consistent flow of empirical data into ethics', and bioethics had a 'simultaneously aloof and strained relationship' with the social sciences.

Several attempts at integration have been made and a range of approaches have emerged as potential appropriate methodologies for 'doing' empirical bioethics more generally [3, 64].

### Previous Methodological Approaches

Hurst [34] argues that any philosophical scepticism concerning the value of empirical data for deriving normative conclusions is misplaced because states of

affairs in the world are always taken into account in moral reasoning. Similarly Alvarez [1] argues that the notion of doing bioethics, i.e. applied moral philosophy within the biological sciences, would be incoherent if we were to abstract the moral reasoning from the empirical context. Frith [27] conceives ethical dilemmas as inherently '*naturalistic*' since they arise from experience and are therefore not purely conceptual problems.

For similar reasons Hoffmaster and Hooker [33] also argue that a naturalist approach is essential to bioethics, and that a greater emphasis on "constructivist accounts of reason" will result in richer normative conclusions. Haimes [30] points out that since social science is interested in social change, and the conceptual object of ethical analysis, namely moral progress, is predicated on the possibility of change, the two are connected intrinsically to the extent that ethics seeks to promote social goods. Ives and Draper [35], De Vries and Van Leeuwen [15], and Nichols [59] ground their approaches in the earlier work of Rawls's [68] reflective equilibrium and its account of moral action (at least with respect to justice) as a balance between moral theory and empirical facts.

Widdershoven et al. [84] advocate a hermeneutic, 'dialogical' approach between the ethics researcher and participants. Leget et al. [45] recommend a 'critical applied ethics' and Molewijk et al. [56] have also developed a specific methodology entitled 'integrated empirical ethics'. Each of these attempts a validation of empirical ethics research by allocating equal weight to ethical theory and empirical data in the resolution of moral dilemmas.

Undoubtedly these attempts make progress in terms of offering procedures for doing empirical bioethics and showing why it is both valid and valuable. However each has one of two deficiencies. They either: (a) imply a realist ontology but do not make it explicit [1, 15, 27, 30, 34, 35, 45, 59, 84], espousing something akin to a critical realist position, perhaps without realising, by combining a realist ontology with a relativist epistemological stance; or (b) they are theoretically underdeveloped [33, 56].

Despite the advantages of these various approaches, what each of them lacks is an account of reality which excavates and makes explicit the connection between the validity of deductive reasoning in philosophical and ethical analysis, and the inductively apprehended social phenomena in the world to which we are applying this analysis. It is in its capacity to do this that CR represents a useful development for the field [52].

## World and Knowledge in Critical Realism

### Varieties of Realism

CR is, by definition, a variety of realism. Many forms of realism exist, including naive; direct; indirect; semantic; metaphysical; scientific; structural; mathematical; moral; aesthetic, all of which pertain to different questions and analyses. What they share, however, is a commitment to the mind-independence of certain phenomena

[21, 66]. All forms of realism hold that some of the things to which we refer are really 'there' in the world, not merely constructed by one's mind [21]:

> The very minimum that realism can be held to involve is that statements in the given class relate to some reality that exists independently of our knowledge of it.

It is not possible to deal with all forms of realism here. However insofar as CR is a philosophy of and for the social sciences [2, 9, 74], it is a methodology for understanding empirical phenomena, and must therefore give an account of scientific realism. Worrall [86] holds that scientific realism in general can be held as true on the basis of the "staggering empirical success" of the predictions that science can make. In relation to CR more specifically Murphy [58] writes that realism's legitimacy is underwritten by its explanatory power because "only realism can account for the success of science".

In accepting scientific realism and its method of discovery, CR commits to the scrutability of the world via both inductive (empirical) and deductive (a priori) means, viewing both as methodologically valuable. In this respect it attempts to reconcile opposing viewpoints which hold that one is epistemically superior to the other. Methodological schisms following from these oppositions have emerged across philosophy and the social sciences, a salient example of which is the tension between strict forms of empiricism and idealism. Meyer [53] explains this tension:

> Radical scepticism flatly denies the fact that we can have a criterion of truth, yet the fundamental problem of all knowledge is this: Can we have such criteria?…On the other hand, if we deny the objective measure of value (criterion) of truth, science is no more. In its stead there will be nothing but opinion…

CR argues that although radical forms of empiricism and idealism are incorrect, aspects of each are epistemologically useful. In order to carry out research which successfully harnesses the various benefits of both paradigms some methodological reconciliation of the dualism is therefore necessary. An example of why radical versions of these paradigms are inadequate is visible in the strong constructionist rejection of a priori justifications for the objective reality of the external world.

## Critical Realism and Social Constructionism

According to the strong constructionist view the knowledge required for a priori justification is (a) practically unattainable, and (b) logically incoherent, since any hypothetical 'comparison' of the world with my representations of it would involve my having to perceive the world, and this could only be done subjectively via the mediation of my senses. Von Glasersfeld [82] argues that any account of a reality beyond my perceptions is meaningless, since such an account would require verification in order to be judged as true and "to do this, we would need an access to such a world that does not involve our experiencing it".

This argument is problematic for two reasons, however. Firstly, it fails to give an account of what there might be in virtue of which perception could be possible. The

reason why this is problematic is that the existence of a reality in which our existence is possible is a necessary pre-condition of our having the experiences that we do [2, p. 197]:

> When we ask what needs to be the case for x to be possible, we predicate any realisation of x upon the prior materialisation of the conditions of its possibility.

The second difficulty is that even if we are mistaken in believing that there is a reality external to us, we act as if there were. As social beings we assume that our existence is embedded in a 'real' world that would continue to exist even if we did not. Easton [23], p. 119) characterises this assumption as 'performative', since "we behave as if it was true". He argues that it is a reasonable position to adopt because "in general this supposition works, especially for the physical world".

Despite these problems, the influence of constructionism has been considerable within the social sciences. For the purposes of carrying out a coherent analysis in ethics it is important to show where constructionism errs, since the aim of ethical analysis is moral progress, and progress can only be made if some non-relative state of affairs obtains which can be used to orientate competing subjective viewpoints.

CR rejects strong constructionist theories which imply the existence of separate and discrete realities [7, 82] as theoretically incoherent. Berger and Luckman's (Ibid., p. 15) claim that each person's experience constitutes a separate reality can be interrogated to understand why:

> …reality is socially constructed…Sociological interest in questions of "reality" and "knowledge" is thus initially justified by the fact of their social relativity. What is "real" to a Tibetan monk may not be "real" to an American businessman. The "knowledge" of the criminal differs from the "knowledge" of the criminologist. It follows that specific agglomerations of "reality" and "knowledge" pertain to specific societal contexts

Note that here 'reality' is referred to with quotation marks. The implication is that reality *itself* is a construction. It is indeed true that the label 'reality' depends on the prior existence of a mind or minds which can generate and use it. It does not follow, however, that there is nothing objectively existent to which the concept 'reality' refers simply because these conceptualisations are made and experienced subjectively [6, 37].

The observation that the label 'reality' is part of a language, and language is a social phenomenon that is dependent on human minds, does not entail the conclusion that the label has no external referent beyond the subjective representations of it that we communicate in discourse [29, 10]. In conflating knowledge with the world the constructionist thus commits an 'epistemic fallacy' [8] by casting reality *as* our representations of it. In committing this fallacy Berger and Luckmann's (Ibid., p. 35) make the further claim that:

> My consciousness, then, is capable of moving through different spheres of reality. Put differently, I am conscious of the world as consisting of multiple realities.

The problem for this position is that it does not explain how the discrete 'realities' can interact with each other in such a way that the individuals inhabiting them can communicate with each other. If we are communicating as we believe ourselves to be we must inhere within a spatio-temporal realm that is prior and common to both of us. If we are not fundamentally *in the same world* then communication between us would be impossible, or some account must at least be given of how it could be done. An ontological reality external to all people is a necessary pre-condition for the possibility of engaging in social scientific investigation, because it is only in virtue of such a common reality that such investigation could be meaningfully carried out [26].

It is fair to note that Berger and Luckmann anticipate and accept the kind of criticism that I have just articulated. Despite this, however, the form of social constructionism that they defend is still inadequate for bioethical analysis which incorporates social scientific data (Ibid. p.1):

> …the sense in which we use these terms in the context of sociology, and that we immediately disclaim any pretension to the effect that sociology has an answer to these ancient philosophical preoccupations.

This disclaimer is acceptable where the aim of one's work is purely sociological, since if the terms are used in a way that is internally consistent to the suppositions of the discipline then there is no problem of methodological inconsistency. As Niiniluoto [60] argues, however, under close analysis philosophical assumptions in need of substantiation cannot be disaggregated from the allegedly non-philosophical sociological standpoint:

> …the 'strong' programmes of the sociology of knowledge, in spite of often pretending to be non-philosophical or even anti-philosophical, are in fact heavily laden with philosophical assumptions—and also draw very strong philosophical conclusions…the often concealed philosophical prejudices of the sociologists of knowledge should be made explicit and put into scrutiny.

Since in empirical bioethics we are attempting to combine philosophical and social scientific methods, the terms knowledge and reality cannot be bracketed. The interdisciplinary nature of the research thus obviates the need for an 'immanent critique' [44, p. 156] of the kind just carried out. An immanent critique of the concepts and arguments involved enables us to assess their mutual internal consistency, and arrive at a theoretical position that successfully negotiates and integrates the competing perspectives.

The outcome of this analysis is that despite rejecting the claim that true knowledge of the external world is impossible, CR does accept that all viewpoints are subjective, and it is therefore able to accommodate social constructionism on more moderate terms [26, 29, 74, 85]. An attenuated version accepts that the world is perceived and understood differently according to one's viewpoint, beliefs, and assumptions, whilst also stipulating that the objective and persistent reality of the world and its contents must be assumed in order for intersubjective discussion about it to proceed [19].

With all this in mind, it is possible to demur from committing to a realist account of the world, but the price to be paid for this in terms of plausibility is high, since to do so would threaten the possibility of carrying out social research that bears a sensible relation to anything beyond the representations of the researcher. It is in response to this that CR grounds its argument. All accounts of the world are undoubtedly subjective, partial, contextual, contingent, and of variable accuracy. Consequently these must be treated as revisable in light of new information. Nevertheless, they are accounts *of the world* [58].

It follows from this that if we wish to carry out research in which both: (a) epistemological claims are recognised as subjective, partial and fallible; and (b) we do not infer from the partiality of these the conclusion that there is nothing ontologically objective beyond experience to which epistemological claims refer, then methodological commitment to some form of external realism is unavoidable.

## Critical Realism as a Methodology for Empirical Bioethics

CR has been used in a wide variety of social research fields, such as human geography [65]; international studies [85]; management studies [23]; education research [75]; and information systems research [20]. It has also been used in health and medicine-related fields including disability studies [11]; social work [47]; family therapy [77]; nursing [51]; and pharmacy [61]. The diversity of these fields indicates CR's widespread applicability and explanatory power.

CR has only been applied explicitly as a 'lens' for bioethics on one occasion, in which it was used to overcome obstacles in combining lay and professional conceptions of health [62]. The authors use the theoretical insights of CR to show how human life is a composite of objectively real, mind-independent ontological features, and subjective, socially constructed epistemological interpretations of these features.

### Ontological Stratification

In CR the researcher is understood as a subjectively experiencing being enmeshed within and emergent from an objectively real and rationally apprehendable ontology. If this characterisation is correct then neither objective nor subjective considerations can be dispensed with if we wish to carry out applied ethics in a way that is tractable with the world, since both objective and components are aspects of it. In empirical bioethics we seek to generate normative conclusions that can be applied in practice. If this aim is achievable it implies that there is a world to which such conclusions can be practically applied. In recognition of the relativity of viewpoints it also accepts that subjective understanding of the world is influenced by other individuals acting and making decisions based on similarly partial viewpoints of their own. In this respect the account given by CR of the relationship between ourselves and the rest of the world is reflected in the suppositions and aims of empirical bioethics.

CR holds that reality is ontologically 'stratified' [8, 74] into three[5] distinct levels: the real, the actual, and the empirical. These exist in a hierarchy in which the upper two 'transitive' levels—the 'empirical' and the 'actual'—are contingent on the prior existence of the foundational ontological domain of the 'real' [62].

This account of ontological stratification and depth has led to the categorisation of CR as a postpositivist approach [28]. Postpositivism is characterised by its opposition to the positivist assumption that only what is offered in experience may be accepted as a reliable basis for knowledge. If some aspects of reality remain beyond my ability to perceive them, we cannot rely on empirical data alone for an optimally accurate description of it. The postulation of unobservable entities, whose existence is inferred from a combination of other data and the rules of logical entailment, rather than by being seen, is central to the success of science [29, 70, 86]. That this is possible supports the claim that knowledge must be possible of more than simply those things that I am able to verify empirically.

Despite the limitations of empirical data, however, they perform a vitally important epistemic role, since they are nevertheless indications of the basic fundamental structures which permit their existence. Certainly empirical knowledge is far from useless, since I may have stronger reasons for believing that the relation between A and reality is B if I have observed that it is the case. CR therefore accepts the epistemological significance of empirically derived information, and by extension the value of social science per se [22, 74]. The combination of deductive and inductively derived knowledge seeks a best possible explanation for one's results, or an analytic generalisation that is justified by them. This form of reasoning, which is characteristic of CR, is 'abductive' and according to [38, p. 102]:

> …an approach to knowledge production that occupies the middle ground between induction and deduction…Unlike induction, abduction accepts existing theory, which might improve the theoretical strength of case analysis. Abduction also allows for a less theory-driven research process than deduction, thereby enabling data-driven theory generation.

It is indeed the case that one's individual perceptions, beliefs, and assumptions may inform one that the world is a certain way, and these beliefs may be consistent or inconsistent with the prevailing beliefs of one's actual socio-historical context. Reality, however, retains the ability to demonstrate when certain representations are fallible. In doing so it vindicates the presence of basic intransitive mechanisms that underpin the contingencies of a given social context, and the range of accurate epistemological claims available to its members. As Easton observes [22, p. 9]:

> Reality kicks in at some point. We can socially construct a world in which we can fly but put it to the test and we find that we can't.

[5] This is the case in Bhaskar's first 'basic' phase of CR. The later stages—his 'dialectical' CR and philosophy of meta-reality—advance a more complex model with further stratifications, however these are not necessary for the work at hand.

This observation highlights the need for the integrative approach found in CR. Although the domain of the real lies beyond experience and its structure must be discovered abductively, the apparent success of science underlines the legitimacy of the model that CR advances. The vindication of combining inductive and deductive approaches optimises the utility that can be derived from each, and enables us to shed light *on reality*.

## Critical Realism and Moral Reasoning

CR is valuable for ethics explicitly applied to discrete 'real-world' problems because it reflects plausibly the way in which we understand the world: we are jointly trying to make sense of a shared world beyond our perceptions in a way that produces mutually beneficial consequences. This gives a plausible account of moral progress as a dynamic process within which humans learn abductively about what is and is not ethically acceptable.

CR's monovalent account of reality thus does not imply moral realism in an absolute sense, but it does entail the view that the world is objectively structured in a particular way, and aspects of it have a tendency either to further or inhibit human flourishing. The account provided by CR, therefore, is moral realism of a kind, but one that is naturalistic and conditional. It is here that CR's heuristic character becomes relevant, since it conceives of humans as needing to discover and refine their understanding of the circumstances in which such tendencies do and do not obtain by trial and error.

The aim of ethical analysis when attempting to resolve 'real-world' dilemmas is not concerned just with the truth function of arguments constructed in predicate logic and abstracted from context. Rather, it seeks to strike a balance between purely rational argument and the contingencies of a situation which may preclude the realisation of the kind of 'ideal' solutions available in abstraction. This approach to the resolution of concrete ethical problems is expressed in CR's view of itself as a "unity of theory and practice" [12] which enables an "enhanced reflexivity" [2] between the two. Such an approach is vital in applied ethics because as Tallis [79] indicates, it may well be impossible to practically implement what one takes to be the ideal solution:

> What is an ideal ethical decision? It exemplifies the clear application of one ethical principle that everybody subscribes to, that nobody is going to dissent from, and it is consistent with all other fundamental ethical principles, including those of biomedical ethics, and/or is (preferably and) fireproof against criticism from people with strong beliefs about the sovereignty of one principle over another. Well, all I can say is, in your dreams…

It is important to point out here that none of this is intended as a criticism of the usefulness or value of the insights available from tools such as predicate logic or propositional calculus. Rather, my point is that there are regions of philosophical and ethical analysis where they are more usefully employed. Since explicitly applied work seeks a negotiation between theory and data, and aims broadly at policy, empirical bioethics is unable to enjoy the rarified and exclusively a priori

approach in which projects without firm practical goals can engage. Given the necessarily 'political' nature of policy, no practical solution will be perfect, since the formation of policy recommendations involves negotiation and compromise between practical constraints and the conflicting interests of the different moral agents involved.

In this respect to use CR in empirical ethics is to advocate a form of ethical naturalism of the kind defended by Railton [67]. According to this view the existence of moral properties is understood as contingent on the prior existence of human beings, and real only by virtue of their creation by human beings. Nevertheless they *are* taken to be *real* by virtue of the fact that these moral properties are used by humans to structure and regulate human social life in ways that conduce to their interests (Ibid. p. 201):

> …although I speak of the objectivity of value, the value in question is human value, and exists only because humans do…objective interests are supervenient upon natural and social facts…moral values or imperatives might be objective without being cosmic. They need be grounded in nothing more transcendental than facts about man and his environment, facts about what sorts of things matter to us, and how the ways we live affect these things.

This approach to ethical analysis is fundamentally heuristic, since it makes judgements about the kinds of things that have tendencies to be in or against people's interests. Such an approach is consistent with CR's treatment of knowledge as partial and revisable in the light of new information. It is also consistent with applied ethics in general because of the primary importance of deciding on what is *likely* to be the best course of action, given the contingencies of a given situation and the limits to knowledge that are present when one is faced with having to make the decision.

The dual benefit offered by adopting this position is that (a) it helps to neutralise worries voiced over the high level of abstraction and detachment from context which may characterise a 'pure' philosophical approach; whilst also (b) providing a sufficiently logical defence of the central importance of empirical information to philosophically acceptable (i.e. explicitly rational) ethical analysis and decision-making.

## Applied Critical Realism: Ethics and Enhancement in Sport

We can now turn to an example of how CR can be brought to bear on bioethical dilemmas. The example draws on qualitative data collected as part of a PhD project analysing ethical issues associated with the use of human enhancement technologies—in this case, synthetic recombinant erythropoietin (EPO). The participants were 25 nephrologists and renal scientists whose work involves this drug in a clinical and research context. The purpose of the study was to understand how they conceptualise and defend the limits of what constitutes 'appropriate' medical practice in relation to the use of medical products for 'off-label', non-therapeutic enhancement purposes. In one section of the interview, their views were sought

about the (illegal) use of EPO by athletes for increasing the oxygen content of their blood to achieve a performance enhancement in professional sport, as compared to other (legal) methods of achieving the same effect, such as high altitude training or the use of hypoxic chambers.

Certain ethical views expressed within the data were defended by reference to categories of 'natural' and 'artificial' that, whilst being treated as objective and mind-independent, in fact can be shown to be epistemological categories subjectively imposed on the world. These examples are clear instances of the 'epistemic fallacy' that CR identifies. In mistaking claims about one's perceptions of the world for claims about the world itself, ontology and epistemology are conflated. Once it becomes clear how this conflation occurs in appeals to nature, we will see how certain judgements then reveal themselves as more rationally cogent than others.

Several trenchant critiques of human biomedical enhancement have been made on the basis that certain applications of biotechnology in some morally important sense 'go too far' [40, 41, 43, 63, 69]. The most salient example of an appeal to 'nature' or 'the natural' among the participants related to athletic enhancement and the purported difference between EPO use on one hand, and legal methods of hypoxic training on the other. High altitude training [46] and low oxygen chambers [78] in sport are permitted, whilst EPO use is forbidden,[6] even though all share the goal of increasing the oxygen carrying capacity of the blood [39]. In two instances it was argued that that the key distinction justifying the difference in legal status was determined by their relative 'naturalness'. C4[7] claimed that:

> …the EPO that we give is not a natural product, it's a manufactured product, it's a pharmaceutical, that's what I mean by unnatural, compared to just going up to altitude is just something that humans do, you can do that normally, you can just climb a hill…sure enough you might need to get a plane somewhere, but it's pretty much achievable in nature to go up to altitude and train there, whereas giving yourself Aranesp for one month, bought from a dodgy doctor, is not achievable in nature

C3 claimed that the difference was constituted by the artificiality of exogenous EPO when compared to taking advantage of the low oxygen content of high altitude environments in order to achieve the desired performance enhancement:

> …there's a difference between drug products that have been manufactured, a chemical that you take, versus something that is more natural. A bike is a human creation, there's lifestyle and I see all of those things like lifestyle modifiable things, like exercise, taking exercise, changing the way you eat, riding a bike. Although it's mechanical—it's mechanical but it's human being powered

[6] http://www.wada-ama.org/Documents/World_Anti-Doping_Program/WADP-Prohibited-list/2013/WADA-Prohibited-List-2013-EN.pdf.

[7] The code specifies the participant in the study, e.g. C = clinician, 4 = the fourth interview carried out.

Dealing with C3's quote first, he accepts that both a bicycle and synthetic EPO are manufactured, but suggests that the difference between them is that the bike must be powered by human effort alone, rather than with 'artificial' assistance. The implied claim here is that, were the cyclist to use EPO, the power would be supplied by other, 'artificial', means beyond that which the unenhanced cyclist could apply, and that this would be morally suspect.

The claim is vulnerable, however. For example it is not the case that a cyclist is going to win the Tour de France *simply* by using EPO—it is still going to make a difference how hard he trains (which may include legal methods of hypoxic training) in combination with EPO use; how naturally gifted he is; how mentally committed he is to achieving victory, and so on [54, 71, 72]. All means used to enhance performance will contribute to how effectively *he* can power the bike. To illustrate this further a longer perspective is available that can be connected to C4's argument.

Bacon [4], Barilan and Weintraub [5], Warnock [83], and Soper [76] give accounts of nature in which it is understood explicitly as being prior to humans, and as providing the conditions for their existence. According to these accounts nothing happens which nature does not permit. Another way of expressing this is to say that everything which occurs obeys nature. Warnock (Ibid., p. 450) writes:

> …the natural world long predates humanity, but, as we have learned to understand, its laws are discoverable and gradual in their operation. We did not make them.

If we apply this to the present example we can say that once we discover the laws underpinning the systems that we wish to manipulate we may then take advantage of these discoveries. Variations in the oxygen concentration of the air are prior to the invention of exogenous EPO. However they are also prior to the technological means for travelling easily to places where we could derive a benefit from training at altitude, the use of which is apparently morally unproblematic according to C4. In this respect it is misleading to distinguish one route to successful enhancement as being obviously more or less 'natural' than another.

The ability to overcome the limitations of unassisted human ability—whether this is the aeroplane required for flying to the Andes, or the knowledge of amino acid chains required for being able to engineer new ones—depends on first correctly apprehending the system that we wish to manipulate or control. If we misunderstand gravity the plane will not fly; if we misunderstand how the kidney works then man-made erythropoietin will not successfully raise haemoglobin. On this view none of the modes of travel listed are distinctly more or less 'natural' than the creation of synthetic EPO. There are immovable physical constraints which determine what may and may not be done.

Perhaps the problem can be resolved by further clarification. It would after all be possible to forgo aeroplanes, boats, cars and so on in the pursuit of altitude training—it is for convenience that athletes choose to use vehicles to reach these altitudes, rather than 'naturally' going on foot. It could therefore be argued that we can *in principle* go and train at altitude without technological assistance, whereas access to an exogenous boost of erythropoietin will always depend on the prior

existence of the technological means required to produce it. This objection is vulnerable, however, because—again—it sets the boundary between 'natural' and 'unnatural' at an arbitrary point.

For example, C4 notes that one 'might need a plane'. A plane is, presumably, an 'artificial' creation, and yet its artificiality is considered irrelevant to the perceived moral difference between altitude training and EPO use. This inconsistency underlines a difficulty in C4's claim concerning 'availability' in nature. We might ask where, if not in nature, do Aranesp[8] (a widely used EPO product) and the raw materials for its invention and production reside? If nature is the source of availability for the raw materials of both EPO and aeroplanes, it is not obvious why one should be considered obviously more or less natural than the other.

One may criticise this line of argument by pointing out that modes of transport are not categorically equivalent to medical enhancement technologies such as EPO with respect to their relation to 'nature'. EPO is literally incorporated into the body, whereas the other technologies referred to are not, and in virtue of this obvious difference it may appear that they are too different to bear comparison.

The criticism is descriptively accurate insofar as it reminds us that one technology is external to the body and the other is internal. Even if one accepts the observation, however, it is not obvious what is significant about this difference unless one thinks that the term 'enhancement' can only be used to describe one intervention and not the other. To the extent that both are technological innovations which extend 'given' human ability in useful or valuable ways, they enhance. Moreover, despite the fact that EPO is necessarily medical in nature and an aeroplane is not, it is hard to see why this difference in particular has any bearing on the relative 'naturalness' of their use.

The account of nature implied here therefore cannot withstand too much scrutiny. To the extent that nothing physical can exist which contravenes the laws of nature, everything physical must be a constituent of it. On such a view this narrow conception of nature collapses into a wider one. Here the boundary between the 'natural' and 'unnatural' has been identified according to the perceptions of particular socially embedded individuals with contextually bound views and values. Whilst we must concede that our own perceptions are also subjective and thus remain critical of them, we must nevertheless be aware that distinctions of the kind outlined have been *imposed* rather than *discovered.*

What we can now see is that a CR analysis demonstrates why arguments such as those of C3 and C4 are misleading. Claims about the moral unacceptability of performance enhancement via EPO use when compared to 'acceptable' methods of achieving the same end, such as altitude training, appeal to what these individuals perceive to be a substantive difference in the 'naturalness' of the two methods.

This difference is grounded on more foundational assumptions or beliefs about what is entailed by the concept of 'nature'. In doing so they posit an ontological difference between altitude training and using EPO: to stimulate erythropoiesis via the former is 'natural', whilst to do it using the latter is 'unnatural'. It is this postulated ontological difference which lays the ground for the further claim that it

[8] http://www.aranesp.com/.

is morally acceptable to do the former but not the latter, and the misleading implication that 'natural' methods are 'good', whilst 'unnatural' methods are 'bad'.

Following this we can see that *transitive* (moveable, flexible, value-laden, socially contingent) epistemological categories determining who may or may not receive medical assistance supervene on underlying ontologically objective and intransitive features of the world—in this case, the biological process of erythropoiesis. While there *may* be reasonable grounds for objecting to the use of EPO for performance enhancement (for example that its use is forbidden by the relevant professional bodies; that it can be dangerous; that access may be unequal; that its use is somehow corrosive to the 'spirit' of sport; and so on), the fact that it is 'unnatural' is not sufficient for doing so.

The general normative conclusion that can be drawn from this analysis, therefore, is that when trying to resolve ethical dilemmas concerning whether or not it is ethical to use performance enhancers in sport, the 'naturalness' of any given method alone cannot be adequately adduced for this purpose.

## Limitations of Critical Realism for Ethical Analysis

We have now seen an example of how CR can be applied towards resolving bioethical dilemmas. However, before concluding it is necessary to insert three brief caveats in mitigation of claims about the usefulness of CR in this context, since it is not an approach that is completely free of limitations.

Firstly, CR does not provide a final argument for the truth of moral realism in the sense of a morality which exists independently of human beings or other sentient creatures with the capacity to choose a particular course of action. It treats moral action as contingent on moral agency, and relative to whatever happens to be in or against the interests of human flourishing. Secondly, and because of this, it leaves some residual uncertainty concerning the supervenience of moral properties on natural ones. Certain states of affairs may be judged as good to the extent that they objectively conduce to ends that enable human flourishing, but they are not good or bad in any more fundamental sense within the non-sentient world.

Thirdly, as its criticism of strong constructionism indicates, CR presupposes rather than proves the objective reality of the external world. Although its account is plausible, it is heuristic rather than strictly a priori true. Consequently it does not give an uncontestable proof of the claim that the empirical objects of ethical deliberation are genuinely mind-independent of each observer. This heuristic approach is both CR's strength and its weakness. On one hand it treats knowledge acquisition, and thus moral development, as dynamic, remaining open to the possibility that ethical progress may require one to revise one's beliefs if new relevant information arrives which is contrary to those one presently holds. Equally, the critical realist must also accept the possibility that his or her conviction in the plausibility of an objective reality, and mind-independent objects of ethical deliberation, *may* turn out to be misplaced.

The trade-off inherent to advocating this kind of naturalistic ethical approach is that it can only ever provide a provisional account of what one ought to do, for the

future is unpredictable and there is always more that could be known empirically about a situation that may be relevant to the outcome of a particular chosen course of action. In this respect, to use CR within a form of bioethical analysis which treats empirical data as ethically significant—even if not unambiguously action-guiding—is to forsake the epistemic certainty of more stringent theoretical approaches such as forms of consequentialism or deontology.

Anybody using CR as a means of analysis in empirical bioethics must accept the uncertainty associated with this trade-off. However, for the reasons outlined I contend that it is valuable because (a) it gives a plausible account of the relation between ourselves, the world, and our knowledge of it; and (b) it can help to show where judgements and observations err, and in doing so reduce errors in understanding what is at stake in the situation under examination.

## Conclusion

A persistent issue of controversy in moral philosophy is whether ethical judgements are true in the sense that they genuinely show that someone else ought to do X; or whether such judgements are merely perspectival, only relatively true to individuals, and closer in nature to rhetoric or expressions of taste. The controversy is acutely controversial when moral reasoning is based on empirical data, since a diverse variety of contextually-bound moral viewpoints strongly indicate a plurality of ethical norms rather than a single ethical norm about which there can be no disagreement. The example given here of different accounts of 'the natural' is indicative of this.

An observation that moral norms are plural, however, is not especially helpful if practical ethical solutions are sought. Irrespective of the presence of a spread of opinions it is not possible to advocate one particular response or conclusion unless we have some set of values according to which that response can be rationally defended. This tension is brought sharply into focus in empirical bioethics. On one hand, insofar as bioethics is a sub-category of moral philosophy it attempts to produce conclusions that are normatively compelling. This is to say that it must be able to provide a non-relative justification for why someone should act in a particular way. On the other hand, the descriptive and interpretive nature of social science research emphasise the context-bounded nature of truth claims.

In upholding the equal importance of both philosophical reflection and empirical data CR vindicates the interdisciplinary aims of empirical bioethics. In this respect CR is valuable because it provides the means for discerning between better and worse justifications for a claim, statement, or belief. Previous methodologies have defended these aims; however CR gives an explicit account of the ontological connection between inductively derived data about discrete states of affairs—bioethical dilemmas in this case—and the deductive reasoning process which can be used to scrutinise them. In doing so CR provides a strong justification for the possibility and value of combining theory and data in ethical analysis. It is therefore well equipped to resist mutual criticisms between philosophers and social scientists concerning the relative validity of their methods within bioethics.

Mutual scepticism of philosophical and social scientific approaches to bioethics has been evident in the field since before the 'empirical turn'. Social scientific critiques of philosophy have doubted the veracity of truth claims generated by exclusively a priori argumentation. Similarly, philosophers have been critical of the relevance of descriptive social scientific data to an enterprise such as ethics which is inescapably normative, and thus inescapably theoretical to the same extent.

CR effectively negotiates these, giving an explicitly rational and philosophically acceptable account of the significance of empirical information for effective moral reasoning. I conclude that in being able to successfully respond to the various disciplinary criticisms that have beset empirical bioethics, CR can be usefully employed for successfully integrating empirical data into the process of normative philosophical reasoning, which is the primary characteristic of ethical analysis.

**Acknowledgments** I would like to thank the two anonymous reviewers for their helpful comments following the initial submission of this paper. I must also thank the clinicians and scientists who took part in the empirical study for the valuable insights that they provided. Finally, I dedicate the paper to the late Roy Bhaskar, to whom I am especially grateful for giving so generously of his time in helping me develop this work.

## References

1. Alvarez, A. A. (2001). How rational should bioethics be? The value of empirical approaches. *Bioethics, 15*(5–6), 501–519.
2. Archer, M., Bhaskar, R., Collier, A., Lawson, T., & Norrie, A. (Eds.). (1998). *Critical realism: Essential readings*. London: Routledge.
3. Ashcroft, R. E. (2004). Bioethics and conflicts of interest. *Studies in History and Philosophy of Science Part C: Studies in History and Philosophy of Biological and Biomedical Sciences, 35*(1), 155–165.
4. Bacon, F., & Sargent, R. M. (1999). *Selected philosophical works*. Indianapolis: Hackett Publishing.
5. Barilan, Y. M., & Weintraub, M. (2001). The naturalness of the artificial and our concepts of health, disease and medicine. *Medicine, Health Care and Philosophy, 4*, 311–325.
6. Barkin, J. S. (2003). Realist constructivism. *International Studies Review, 5*(3), 325–342.
7. Berger, P. L., & Luckmann, T. (1966). *The social construction of reality: A treatise in the sociology of knowledge*. UK: Penguin.
8. Bhaskar, R. (1974). *A realist theory of science*. London: Verso.
9. Bhaskar, R. (1979). *The possibility of naturalism: A philosophical critique of the contemporary human sciences*. London: Routledge.
10. Bhaskar, R. (1998). Facts and values: Theory and practice/reason and the dialectic of human emancipation/depth, rationality and change. In M. Archer, R. Bhaskar, A. Collier, T. Lawson, & A. Norrie (Eds.), *Critical realism: Essential readings* (pp. 409–443). London: Routledge.
11. Bhaskar, R., & Danermark, B. (2006). Metatheory, interdisciplinarity and disability research: A critical realist perspective. *Scandinavian Journal of Disability Research, 8*(4), 278–297.
12. Bhaskar, R., & Norrie, A. (1998). Introduction: Dialectic and dialectical critical realism. In M. Archer, R. Bhaskar, A. Collier, T. Lawson, & A. Norrie (Eds.), *Critical realism: Essential readings* (pp. 561–574). London: Routledge.
13. Borry, P., Schotsmans, P., & Dierickx, K. (2005). The birth of the empirical turn in bioethics. *Bioethics, 19*(1), 49–71.
14. Brassington, I. (2012). What's the point of philosophical bioethics? *Health Care Analysis, 21*(1), 20–30.
15. De Vries, M., & Van Leeuwen, E. (2009). Reflective equilibrium and empirical data: Third person moral experience in empirical medical ethics. *Bioethics, 24*(9), 490–498.
16. De Vries, R., Turner, L., Orfali, K., & Bosk, C. (2006). Social science and bioethics: The way forward. *Sociology of Health & Illness, 28*(6), 665–677.

17. De Vries, R. O. B., & Gordijn, B. (2009). Empirical ethics and its alleged meta-ethical fallacies. *Bioethics*, *23*(4), 193–201.
18. De Wachter, M. A. M. (1982). Interdisciplinary bioethics: But where do we start? A reflection on epoche as method. *Journal of Medicine and Philosophy, 7*(3), 275–288.
19. Denzin, N. K., & Lincoln, Y. S. (2005). *The SAGE handbook of qualitative research*. Thousand Oaks: SAGE.
20. Dobson, P. J. (2001). The philosophy of critical realism—An opportunity for information systems research. *Information Systems Frontiers, 3*(2), 199–210.
21. Dummett, M. (1982). Realism. *Synthese, 52*(1), 55–112.
22. Easton, G. (2010). One case study is enough. Lancaster University Management School Working Paper 2010/034.
23. Easton, G. (2010). Critical realism in case study research. *Industrial Marketing Management, 39*(1), 118–128.
24. Emmerich, N. (2011). Literature, history and the humanization of bioethics. *Bioethics, 25*(2), 112–118.
25. Fisher, J. W. (2010). Landmark advances in the development of erythropoietin. *Experimental Biology and Medicine, 235*, 1398–1411.
26. Fopp, R. (2007). Can social constructionism go too far? In *A refereed paper presented at the second Australasian housing researchers conference, chambers house, University of Queensland*, pp. 20–22.
27. Frith, L. (2010). Empirical ethics: A growing area of bioethics. *Clinical Ethics, 5*(2), 51–53.
28. Guba, E. G., & Lincoln, Y. S. (1994). Competing paradigms in qualitative research. *Handbook of Qualitative Research, 2*, 163–194.
29. Hacking, I. (1999). *The social construction of what?*. Cambridge, MA: Harvard University Press.
30. Haimes, E. (2002). What can the social sciences contribute to the study of ethics? Theoretical, empirical and substantive considerations. *Bioethics, 16*(2), 89–113.
31. Hedgecoe, A. M. (2004). Critical bioethics: Beyond the social science critique of applied ethics. *Bioethics, 18*(2), 120–143.
32. Herrera, C. (2008). Is it time for bioethics to go empirical? *Bioethics, 22*(3), 137–146.
33. Hoffmaster, B., & Hooker, C. (2009). How experience confronts ethics. *Bioethics, 23*(4), 214–225.
34. Hurst, S. (2010). What 'empirical turn in bioethics'? *Bioethics, 24*(8), 439–444.
35. Ives, J., & Draper, H. (2009). Appropriate methodologies for empirical bioethics: It's all relative. *Bioethics, 23*(4), 249–258.
36. Ives, J., & Dunn, M. (2010). Who's arguing? A call for reflexivity in bioethics. *Bioethics, 24*(5), 256–265.
37. Jackson, P. T. (2004). Bridging the gap: Toward a realist-constructivist dialogue. *International Studies Review, 6*(2), 337.
38. Järvensivu, T., & Törnroos, J. (2010). Case study research with moderate constructionism: Conceptualization and practical illustration. *Industrial Marketing Management, 39*(1), 100–108.
39. Joyner, M. J. (2003). o2max, Blood doping, and erythropoietin. *British Journal of Sports Medicine, 37*(3), 190–191.
40. Kamm, F. M. (2005). Is there a problem with enhancement? *The American Journal of Bioethics, 5*(3), 5–14.
41. Kass, L. (2001). Preventing a brave new world. *The New Republic*, *5*(01), 1–17.
42. Kleinman, A. (1999). Moral experience and ethical reflection: Can ethnography reconcile them? A quandary for "The new bioethics". *Daedalus*, *28*(4), 69–97.
43. Koch, T. (2010). Enhancing who? Enhancing what? Ethics, bioethics, and transhumanism. *Journal of Medicine and Philosophy, 35*, 685–699.
44. Lawson, T. (1998). Economic science without experimentation. In M. Archer, R. Bhaskar, A. Collier, T. Lawson, & A. Norrie (Eds.), *Critical realism: Essential readings* (pp. 144–169). London: Routledge.
45. Leget, C., Borry, P., & De Vries, R. (2009). 'Nobody tosses a dwarf!' The relation between the empirical and the normative re-examined. *Bioethics, 23*(4), 226–235.
46. Levine, B. D. (2006). Should "artificial" high altitude environments be considered doping? *Scandinavian Journal of Medicine & Science in Sports*, *16*(5), 297–301.
47. Longhofer, J., & Floersch, J. (2012). The coming crisis in social work: Some thoughts on social work and science. *Research on Social Work Practice, 22*(5), 499–519.
48. MacDougall, I. C., Hutton, R. D., Cavill, I., Coles, G. A., & Williams, J. D. (1990). Treating renal anaemia with recombinant human erythropoietin: Practical guidelines and a clinical algorithm. *British Medical Journal*, *300*(6725), 655–659.

49. Marshall, P. A. (1992). Anthropology and bioethics. *Medical Anthropology Quarterly, 6*(1), 49–73.
50. Mayes, R. (2010). The modern Olympics and post-modern athletics: A clash in values. *The Journal of Philosophy, Science & Law, 10*, 1–17.
51. McEvoy, P., & Richards, D. (2003). Critical realism: A way forward for evaluation research in nursing? *Journal of Advanced Nursing, 43*(4), 411–420.
52. McKeown, A. (2014). *Re-thinking the distinction between therapy and enhancement: A study in empirical ethics*. UK: University of Bristol. Unpublished thesis.
53. Meyer, W. (1906). Hume Versus Kant. *The Monist, 16*(3), 461–468.
54. Miah, A. (2006). Rethinking enhancement in sport. *Annals of the New York Academy of Sciences, 1093*(1), 301–320.
55. Mignon, P. (2003). The Tour de France and the doping issue. *The International Journal of the History of Sport, 20*, 227–245.
56. Molewijk, B., Stiggelbout, A. M., Otten, W., Dupuis, H. M., & Kievit, J. (2004). Scientific contribution. Empirical data and moral theory. A plea for integrated empirical ethics. *Medicine, Health Care and Philosophy, 7*(1), 55–69.
57. Muller, J. H. (1994). Anthropology, bioethics, and medicine: A provocative trilogy. *Medical Anthropology Quarterly, 8*(4), 448–467.
58. Murphy, N. (1990). Scientific realism and postmodern philosophy. *The British Journal for the Philosophy of Science, 41*(3), 291–303.
59. Nichols, P. (2012). Wide reflective equilibrium as a method of justification in bioethics. *Theoretical Medicine and Bioethics, 33*(5), 325–341.
60. Niiniluoto, I. (1991). Realism, relativism, and constructivism. *Synthese, 89*, 135–162.
61. Oltmann, C., & Boughey, C. (2012). Using critical realism as a framework in pharmacy education and social pharmacy research. *Research in Social and Administrative Pharmacy, 8*(4), 333–337.
62. Owens, J., & Cribb, A. (2011). Conflict in medical co-production: Can a stratified conception of health help? *Health Care Analysis, 20*(3), 268–280.
63. Parens, E. (1995). The goodness of fragility: On the prospect of genetic technologies aimed at the enhancement of human capacities. *Kennedy Institute of Ethics Journal, 5*, 141–153.
64. Pellegrino, E. D. (1999). The origins and evolution of bioethics: Some personal reflections. *Kennedy Institute of Ethics Journal, 9*(1), 73–88.
65. Proctor, J. D. (1998). The social construction of nature: Relativist accusations, pragmatist and critical realist responses. *Annals of the Association of American Geographers, 88*(3), 352–376.
66. Putnam, H. (1975). What is 'Realism'? *Proceedings of the Aristotelian Society, 76*, 177–194.
67. Railton, P. (1986). Moral realism. *The Philosophical Review, 95*(2), 163–207.
68. Rawls, J. (1971). *A theory of justice*. Cambridge, MA: Harvard University.
69. Sandel, M. (2004). The case against perfection. *The Atlantic Monthly, 293*, 51–62.
70. Santayana, G. (1983). *Reason in science*. New York: Dover.
71. Savulescu, J., & Foddy, B. (2011). Le tour and failure of zero tolerance. In J. Savulescu, R. ter Meulen, & G. Kahane (Eds.), *Enhancing human capacities* (pp. 304–312). Oxford: Blackwell Publishing Ltd.
72. Savulescu, J., Foddy, B., & Clayton, M. (2004). Why we should allow performance enhancing drugs in sport. *British Journal of Sports Medicine, 38*, 666–670.
73. Sayer, A. (1997). Critical realism and the limits to critical social science. *Journal for the Theory of Social Behaviour*, *27*(4), 473–488.
74. Sayer, A. (2000). *Realism and social science*. London: SAGE.
75. Scott, D. (2005). Critical realism and empirical research methods in education. *Journal of Philosophy of Education, 39*(4), 633–646.
76. Soper, K. (2009). Unnatural times? The social imaginary and the future of nature. *The Sociological Review, 57*, 222–235.
77. Speed, B. (1991). 'Reality Exists OK?' An argument against constructivism and social constructionism. *Journal of Family Therapy, 13*(4), 395–409.
78. Spriggs, M. (2005). Hypoxic air machines: Performance enhancement through effective training—or cheating? *Journal of Medical Ethics*, *31*(2), 112–113.
79. Tallis, R. (2008). Medical ethics in the real mess of the real world. *Medico-Legal Journal, 76*(3), 95–112.
80. Turner, L. (2009). Anthropological and sociological critiques of bioethics. *Journal of Bioethical Inquiry, 6*(1), 83–98.

81. Van der Scheer, L., & Widdershoven, G. (2004). Integrated empirical ethics: Loss of normativity? *Medicine, Health Care and Philosophy*, *7*(1), 71–79.
82. Von Glasersfeld, E. (1991). *An exposition of constructivism: Why some like it radical* (pp. 229–238). New York: Springer.
83. Warnock, M. (2003). What is natural? And should we care? *Philosophy*, *78*(04), 445–459.
84. Widdershoven, G., Abma, T., & Molewijk, B. (2009). Empirical ethics as dialogical practice. *Bioethics, 23*(4), 236–248.
85. Wight, C. (2012). Critical realism: Some responses. *Review of International Studies, 38*(01), 267–274.
86. Worrall, J. (2009). Underdetermination. *Realism and Empirical Equivalence. Synthese, 180*(2), 157–172.