Critical Realism and Statistical Methods—A Response to Nash

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Abstract

This article offers a defence of critical realism in the face of objections Nash (2005) makes to it in a recent edition of this journal. It is argued that critical and scientific realisms are closely related and that both are opposed to statistical positivism. However, the suggestion is made that scientific realism retains (from statistical positivism) a number of elements that result in misleading accounts of social processes and events: indicators are used which do not reflect the close relationship between structure and agency; indicators refer to reified and not real properties of both structures and agents; and indicators do not refer to causal properties of objects and entities. In order to develop a narrative of causal processes, as Nash argues researchers should, then some adjustments need to be made to the principles that underpin scientific realism.

Introduction

Roy Nash's (2005) defence of scientific realism addresses some of the fundamental problems with, as he terms it, statistical positivism, as well as providing an important rationale for the inclusion of both quantitative and qualitative approaches to collecting and analysing data. Its particular strengths are that, in contrast to many of the proposed solutions to the quantitative–qualitative dilemma, it acknowledges that researchers have to engage with ontological as well as epistemological issues, and, as a consequence, accept that educational research cannot be reduced to 'method and objectivity' (cf. Hodkinson, 2004).

Nash (2005, p. 200) further suggests that some, though not all, statistical modelling of educational settings has operated through indicators which marginalise the dispositions, practices and self-beliefs of agents, and concludes that an 'explanation in its most complete scheme has a structure-disposition-practice form that requires the adequate description of structures (properties of social entities), positions (properties of individuals that lead to action), and practices (established ways of doing things and hence structures of agency)'. His solution is a 'multilayered' account, and a 'hierarchical' linking of the various levels in order to provide a complete explanation of social processes.

In developing his argument, he distinguishes between scientific and critical realism, and since the model of critical realism that Nash takes issue with is one that I have articulated (see Scott, 2000), it is important to offer a response. Such a response acknowledges, however, that my version of critical realism and his version of scientific realism are closely related and, further to this, that philosophical positions, and indeed disputes that involve the taking of any such positions, need to respect both the complexity of the arguments that are being made and their origins in the work of others (cf. Hammersley, 2005). Both of us also accept that one has to be careful about referencing a particular social theory to one source, such as critical or scientific realism, and that one has to take account of a range of views which may at a later point in time be labelled as a school of thought. There are, as Nash suggests, other accounts than my own which provide a different emphasis on the principles underpinning critical realism. For instance, I take issue with Bhaskar's (1979) contention that both the social and natural worlds can be examined experimentally, because, firstly, as Manicas (1998, p. 336) argues, 'the mere fact that, necessarily, the social world is mediated by consciousness makes it impossible to say how controlled changes are related to what stays the same and how the new condition is then experienced by agents'; and secondly, the social world as an object of investigation is different from the physical world (which can be examined experimentally), because physical phenomena do not have the capacity to change their form as a result of

either being investigated or described, whereas social phenomena do. What, however, these different realist perspectives share is a belief that a correct account of social processes has to engage with ontological as well as epistemological issues and that the relationship between the two has to reflect the principles established in both. Finally, both of us believe that the philosophical issue which we address in different and conflicting ways—the appropriate relations between ontology, epistemology, strategy and method—is central to the work of empirical researchers in the field of education.

My argument in Scott (2000) ends with the adoption of a similar position to Nash, which is that, regardless of how sophisticated the subsequent statistical manipulation of the data is, unless the data in its unanalysed form reflect in some sense the way the social world works then an inadequate account of social processes is likely to result. The form that my argument here will take is to: (i) set out the principles of critical realism, and justify the emphasis critical realists place on the agency–structure relationship; (ii) show how these principles are different from the principles of scientific realism, as Nash articulates them; (iii) develop a relational model of structure; (iv) suggest that the variable/indicator model adopted by statistical positivists is flawed; and finally (v) provide a critical realist alternative to both scientific realism and statistical positivism.

Critical Realism

Nash (2005), following Bhaskar (1998), suggests that there are three core elements to critical realism. The first of these is that the empirical world cannot constitute the totality of the social world. The second is that 'the domain of the real is more extensive than the domain of the actual' (Nash, 2005, p. 187); and the third is that the social world is stratified, consists of mechanisms at different levels and elements of these mechanisms cannot necessarily be reduced to those of the level from which they have emerged. Furthermore, entities have causal powers which may or may not be activated. Thus, complete explanations of social events and processes cannot be reduced to the intentions and beliefs of agents without reference to structural forms, or to structural properties without reference to the intentions and beliefs of agents.

Both agents and structures then have real causal powers and in part this is what distinguishes realist from empiricist and idealist accounts of social processes, and indeed from methodological individualism. Methodological individualism for a critical realist, and indeed for a scientific realist, is flawed because structural properties with real causal powers are marginalised—only the individual has a real existence. Society as a structure is treated as an abstraction or aggregate of individual actions. Buckley (1967, p. 32), for example, describes structural properties of objects as heuristic devices and what he means by this is that: 'the ''structure'' is an abstract construct, not something distinct from the ongoing interactive process but rather a temporary, accommodative representation of it at any one time'. Thus, as an abstraction, the only causal powers that can be attributed to it are those which are attached to ideas, mediated through individual human beings. If structural and indeed agential objects are real then they have to possess causal powers, or, to put it another way, they have to be causally efficacious.

And this is what Nash provides by way of his account of a stratified reality, where at each level, objects are irreducible to objects at another level, because if they were reducible, then the differently layered objects would not have independent powers. However, in order to avoid methodological individualism and structural determinism, an account of the relation between the different layers has to be provided and this is what Nash means by his phrase, 'a narrative of causal processes'. Researchers are dealing, then, with structures with independent powers, though these are not necessarily exercised, and people with independent powers, though these in turn are not necessarily exercised. They are also dealing with a relationship between the two, and the key issue, indeed the problem that exercises Nash, is whether it is

possible at the methodological level ever to have access to the real but not necessarily exercised powers that reside in persons or structures.

Archer (1995) provides a possible solution. She identifies four models for relating structure and agency. The first is where structural and agential properties are conflated so that action is treated as epiphenomenal. Such a holist approach marginalises the psychological level and treats agency as superfluous to explanations of social processes. Archer's second position is the reverse, where structures are understood as aggregates or abstractions of individual actions. Her third position is where agency and structure are tied so closely together that neither can be said to have independent powers. Archer's solution is what she calls a morphostatic/morphogenetic framework in which she allocates potential powers to both agency and structure by separating them in time, so that for every action endless cycles of structural conditioning, social interaction and structural elaboration take place. Morphostasis occurs when the powers and liabilities of a structure remain the same and morphogenesis occurs when new forms of structure and consequently new conditions for action are created. Thus, the structural level pre-exists the agential level, and this is what is meant by providing a condition or set of conditions for action. However, at the methodological level this creates certain problems because researchers can only examine those structural properties through their enactments or the exercising of their powers, and this can only occur through human actions.

Indicators which refer exclusively to pre-existent but real structural properties and from which causal sequences are subsequently inferred are likely to be misleading. Furthermore, critical realism is critical because educational and social researchers accept the idea that their investigations are fallible; and also because the various ways that the world is ordered, and this includes the categorical distinctions that constitute the social order, are not self-justifying, but are determined by particular decisions made by individuals and groups of individuals stretching back in time, and are therefore always subject to critique and their possible replacement by a different set of categories and relationships. Cruickshank (2002, p. 54) makes this point in the following way: '[c]ritical philosophy is therefore critical because it accepts neither the view that there are fixed philosophical first principles which guarantee epistemic certainty, nor the idea that first-order activities are self-justifying'. Cruikshank further develops a notion of internal critique which he applies to both the justification for a critical realist position and those categories and relationships which act to structure the social world. If it is accepted that picture theories or mirror images of the relationship between the social world and how it can be described are not adequate (cf. Rorty, 1980), then an alternative is required. However, even here any alternative theory has to be subjected to this internal critique and thus critical realists do not make the claim that it is possible to be certain about the correctness of the ontological framework that is being proposed. Fallibility therefore refers to both the fact that researchers may not for practical and ethical reasons be able to collect data about the causal sequence that concerns them, and also to the way they are positioned, whether this is geographical, cultural or epistemological. As a result, fallibility cannot just be equated with inadequacy or insufficiency, but also implies that no epistemic certainty can be guaranteed.

Scientific Realism

Nash's account of scientific realism cannot be easily summarised. However, it is necessary to attempt this because he wishes to distinguish between critical and scientific realism. At the ontological level, using his threefold hierarchical model of structure, disposition and practice, he sets out to provide a description of the social world which can be distinguished from positivist models of the social world. Indeed, he deplores the bypassing by statistical positivists of any attempt to provide a linkage between the three levels. However, his solution is to continue to adopt many of the tenets and procedures of statistical modelling, whilst at the same time arguing that they do not provide complete explanations of social processes. He does suggest some semantic reconfiguring to make clear what is being attempted here:

'It would certainly help were realist thinkers in this field willing to adopt a set of concepts that makes it possible to speak about indicators rather than 'measures'; of events, processes and states of affairs rather than 'phenomena'; of variables as a reference to terms employed in a model; and of properties when referring to those features of the social world that have provided the data expressed by the variable.' (Nash, 2005, p. 203) Furthermore, though he sidesteps the problems associated with the collection of data about these indicators for the purposes of the argument that he is making, he still wants to in the first instance operate through the standard procedures of statistical positivists. He therefore may be sound at the ontological level, though there is an argument even here for suggesting that he objectivises the different levels of social reality; however, he is not sound at the epistemological and methodological levels, which require different types of approaches.

In Archer's terms, Nash defends the use of quantitative modelling on the grounds that when morphostasis occurs there is some stability at the structural dimension or level. In other words, because reproduction rather than production has occurred, and it is likely that most morphostatic/morphogenetic cycles result in little change, then it is possible to argue that 'there is no obstacle to the identification of systematic patterns of a kind that will allow the possibility of empirical controls for the purposes of scientific enquiry' (Nash, 2005, p. 187). However, certain objections can be made to this. The first of these is that it ignores the possibility that morphogenesis rather than morphostasis has occurred; and second, it does not provide the means by which an investigator can determine whether morphostasis or morphogenesis is the end result of the cycle. Both of these objections create considerable problems, and again Nash's solution is to develop an authentic narrative of causal processes where researchers would investigate which has occurred and in what way. The problem for Nash is that at the same time and in thrall to statistical modelling, he still wants to operate at the methodological level through indicators and processes which assume that morphostasis rather than morphogenesis has resulted.

If his conception of structure is relational, and is manifested through dispositional properties, then at the methodological level it would seem more appropriate for his indicators to refer to lived processes, rather than that those lived processes be inferred from sets of variables which may or may not be a part of the causal narrative that he is ultimately seeking to develop. If objects in the world have potential powers, then at the methodological level, it is appropriate to examine how those powers are manifested; rather than collect information and data about social facts and then attempt to link these social facts together. The reason for doing it in this way is that those social facts may not actually represent what has gone on in the causal sequence that is the object of examination. Bhaskar (1979) expresses this in terms of his depth ontology when he suggests that there are trans-phenomenalist truths which relate to appearances, but these appearances may not refer to underlying structures or mechanisms; and even more significantly, there may be counter-phenomenalist truths where these deep structures or mechanisms may actually contradict, or be in conflict with, their appearances. However, researchers cannot know in any immediate sense what those deep structures are, because at the methodological level, the phenomena available for direct inspection are people's accounts of what they did and why they did them, and their behaviours.

This however, has not addressed the place of mathematics in providing explanations of social activities; and in relation to this, as Nash himself acknowledges, mathematical modelling based on traditional statistical notions is flawed. He takes my three objections to mathematical modelling (see Scott, 2000, pp. 36–48) and subjects them to argument and critique. It is worth in the first instance reiterating those three arguments. First, educational activities operate within open as opposed to closed systems, which in effect means that the properties of objects being examined change over time, and though they might be labelled in the same way as they were before, this acts to conceal the fact that researchers are now dealing with a different type of object with different types of potential powers to act causally. Second, because standard logic which underpins mathematical modelling of social events and processes is predicated on a notion of extensionality where 'any two expressions of the same objects, i.e. having the same extension, can be

substituted freely for one another without changing the truth of the larger context' (Wilson, 1987, p. 390), then intensional idioms, i.e. propositions that relate to beliefs, wishes, fears and intentions, have no place in standard logic, and thus within mathematical modelling. However, what this implies is not that mathematical modelling of educational events and processes is always inadequate, but that intensional idioms are reconfigured as extensional idioms so that formal calculations can be made and thus some meaning is logically bound to be lost. Third, because positivist and statistical explanations work through indicators which refer to properties of objects which may only exist at a particular moment of time this cannot allow causal explanations to be made.

Nash offers a number of counter-arguments. With regard to the first, he cites Bhaskar to the effect that the social world's systemic openness does not rule out the possibility of expressing it in quantitative terms. Citing Bhaskar, of course, adds nothing to the argument because both Bhaskar and Nash might be wrong. It should also be said at this point that mathematical explanation may be adequate if the actual property of the object lends itself to such quantification; that is, if it relates to extension and not to intension. If the object under investigation has a property which allows it to be validly connected to other objects which have the same property, then a mathematical explanation will clearly suffice. In a similar fashion, Nash rejects my second argument by citing Bhaskar again to the effect that 'social science must attempt to explain social events, processes, and states of affairs regardless of whether the intentions of action, that is to say the meanings actors give to their actions, are known' (Nash, 2005, p. 190), on the grounds that it would unnecessarily restrict social scientists because such interpretations are not always available to the researcher, and furthermore 'cannot be taken at face value' (2005, p. 190). This is, I would suggest, a flawed argument, and the mistake that Nash makes is to equate what should happen with what does happen.

Critical realists do not expect to have such information readily at hand and indeed may never be in a position to collect it. However, all this tells us is that such explanation as a critical realist provides is always fallible on the two grounds that Nash identifies, not that the activity of explaining social events is adequate if such intentional activities are ignored. Bhaskar may insist that social science can proceed without due attention being given to the beliefs of social agents; but to argue that this is because such information is not always available (this is accepted) or that such information cannot always be taken at face value (again this is accepted) is a non-sequitur. Even if it is accepted that knowledge of beliefs and intentions is fallible, this does not mean that such knowledge is not an essential component of understanding social life. Explanations can be produced without recourse to such beliefs and intentions, but a judgement has to be made as to whether this is a better state of affairs than one in which fallible judgements of these intentional states are made when the ontology that has been accepted comprises in part such elements. A fuller defence of these three objections, and in particular, the third—that causal explanations cannot be safely made using the methods and procedures of statistical positivism—needs in the first instance a preliminary discussion of the structural element and how it can be known.

Structures

If the structural level is understood as independent of and irreducible to the agential level, then in order to make an assessment as to whether it is possible to know what the properties of a structure are, researchers have to try to understand what a social structure is. Porpora (1998) suggests that it has been given four distinct meanings. The first of these is 'patterns of aggregate behaviour that are stable over time' (1998, p. 339). The second is 'law-like regularities that govern the behaviour of social facts' (p. 339). The third is 'systems of human relationships among social positions' (p. 339); and the fourth is, following Giddens (1984), 'collective rules and resources that structure behaviour' (Porpora, 1998, p. 339). The first of these is methodologically individualist, in that social structures are treated as abstractions built up over time from observations of behaviours. Methodological individualism, as a social theory, is flawed because it

fails to take account of structural properties that are causally efficacious. Critical realists allocate independent powers to structure and agency; methodological individualists deny such powers to structures, and thus make redundant the separation of agency and structure.

The second idea of structure is law-like regularities that govern the behaviour of social facts. Such a holist position allows for the abandonment of any attempt to integrate the different levels of social reality, in that investigators would not need to know anything about the intentional dimension of human action. Furthermore, these law-like regularities would operate, in Archer's (1995) terms, behind the backs of human actors, and thus represent structures as relations between reified objects with redundant powers and potentialities. The collection of social facts about pre-existent structural forms without reference to intentional behaviours cannot logically be construed as law-like because those structural forms are always likely to change as a result of interpretations and mediations by individuals and groups of individuals.
Furthermore, critical realists avoid structural determinism by arguing that both structures and agents have independent powers. For example, certain types of social structure—properties of organisations—allocate (formally or informally) rewards and sanctions to specific actions. If an action is performed in the designated way, then the role-holder is rewarded. If that action is not performed in the designated way, then sanctions are imposed on the role-holder. Furthermore, the attachment of rewards and sanctions to particular types of behaviours changes over time, and in part this happens because institutional roles are embedded or nested in other structural forms. However, structural forms do not determine the way individual post-holders behave, since they can only provide a set of conditions for action.

The second part of Nash's ontological model is concerned with dispositions to act, and these are described as properties of individuals. By construing the agential level, as Nash does, as sets of dispositions rather than intentions and beliefs, he is in danger of reverting back to a form of structural determinism. If these dispositions are merely reflections of structural properties, then they have no independent existence, and thus cannot be treated as part of a narrative of causal processes. If they are merely abstractions from observations of behaviours, again they cannot be granted independent powers. Furthermore, these dispositions cannot be directly inspected, as structures in turn cannot be directly inspected; researchers can only observe sets of behaviours and then infer specific tendencies to act in specific ways. It would therefore be false to treat the structural part of the chain as a given from which dispositions of individuals can be read off, which leads to certain practices. At the methodological level, structures cannot be known directly, but only through examination of how they impact on agency.

The third of Porpora's models of structure is a relational one, in that social structure is treated as a nexus of relations between human beings so that agency and structure operate in a dialectical manner, both exerting an influence on the other, because both have independent powers. Porpora (1998, p. 344), for example, argues that: [t]he causal effects of the structure on individuals are manifested in certain structured interests, resources, powers, constraints and predicaments that are built into each position by the web of relationships. These comprise the material circumstances in which people must act and which motivate them to act in certain ways. As they do so, they alter the relationships that bind them in both intended and unintended ways. Giddens's (1984) structuration model, which comprises Porpora's fourth version of structure, is insubstantial in that those structures only have a virtual existence and thus exist exclusively in the minds of individuals. Some structures work in this way, and discourses have real powers to influence actions; however, to confine all structures to the realm of mind is to disregard their material existence. Both of these versions, Porpora's third and fourth models, avoid methodological individualism and structural determinism, and are thus to be preferred at the ontological level. Nash is clearly sympathetic to these positions, but is still content to operate at the methodological level by focusing on pre-existent structural properties which in effect marginalise agents as either the producers or reproducers of structures. My argument, therefore, now needs to address this methodological element and in particular Nash's use of indicators.

Indicators

Nash makes reference to the Programme for International Student Assessment (PISA) data set (Organisation for Economic Cooperation and Development, 2000, 2001) to illustrate his argument for the possibility of examining structures, dispositions and practices separately from each other. One of Nash's indicators (extracted from the PISA study) is a quiet place to study. The preferred method is to ask the sample of students whether they have a quiet place to study, and students are expected to provide an answer which can be subsequently expressed in aggregate form. In the case of the PISA data, this turns out to be 13% of the sample who claim not to have this facility. For our purposes here, it is important to ask what this might mean. The first and obvious answer to this question is that every room in the house in which the respondent lives is at all times when that person wants to study so noisy (this being the opposite of quiet) that study is impossible. The respondent to the questionnaire is presumably making a judgement about their capacity to cope with a degree of noise whilst studying and expressing it as a threshold above which studying becomes impossible. Further to this, they are making a judgement about how often this threshold is breached and generalising this in order to answer the question.

It is also important to examine the second part of the equation—the act of studying. Some pieces of work require greater degrees of concentration than others, and thus can only be completed in quieter conditions than other pieces of work. If we also add in the possibility that having a quiet place to study at home is not a requirement of the individual respondent because there is a quiet place of study readily available outside the home, then the relationship implied in the question—a quiet place of study in the home is a prerequisite for effective study—already looks shaky. Now, some of the issues raised by this analysis of the question being asked of respondents in the PISA study can be resolved by a detailed investigation of what each respondent means by not having a quiet place to study; however, they cannot be resolved by asking the question and then putting to one side the obvious differences in the assumptions made by respondents when they were answering it. If the question is being interpreted in different ways by those respondents, then no amount of statistical manipulation after the data collection event will compensate for this. Unless the researcher can assure themselves that all the respondents are interpreting and answering the question in the same way, the subsequent quantitative analysis is almost totally meaningless.

Nash endorses the use of other indicators, for example, the number of books in a home, and then accepts the claim (made in the first place by the PISA researchers) that this tells us something about the relationship between reading attainment and socio-economic status. There are a number of other independent variables that he cites, and he also makes much of the relationships established through some fairly standard statistical procedures between these different variables. Once again, it is possible to suggest that a standard measure of books in a home, even if it were accurately given by respondents, tells us very little about the influence of those books on the educational achievement or reading score of each individual respondent.

There may be a large number of books in the home which are simply there for show and are not read. Even if an assumption is made that the types of books available to the respondent in their home environment are appropriate to the development of reading skills as measured in a standardised reading test, the information that has been collected does not tell us this. Only a detailed examination in each case will allow a proper judgement to be made of the worth of each indicator. Nash (2005, p. 200) is of course aware of this, when he argues that: '[e]ven if the implied equivalence could be given to an agreed interpretation, which is not the case, one would still be faced with the problem of constructing a narrative of causal processes. In fact, any substantive interpretation would have to be such a narrative. This is likely to be an area where reality is discontinuous, and subject to breaks with a qualitative effect, rather than linear in character.' And yet, he still wants to suggest, as part of that chain of reasoning to determine a

causal process, that indicators such as these (wealth, socio-economic status and number of books) can form part of this causal narrative, because, as he argues, they 'do contribute to the development of certain cognitive and non-cognitive dispositions effective in generating reading performance' (Nash, 2005, p. 200). Ultimately his argument is that such indicators are useful because they point to causal relationships between two entities. What is then needed is detailed qualitative work which fills in the gaps. However, if the two variables that are being analysed together are conceptualised in terms of indicators which provide only a partial and possibly misleading account of the lived reality of the individual(s), then they cannot be a substantive part of the causal narrative that is being developed.

Indicators are necessary to educational research. However, useful indicators as parts of a causal narrative need to conform to a number of principles: first, both agential and structural elements of the action being observed or being accessed through an account by a respondent are reflected in the indicator; second, such an indicator refers to real and not reified properties of both structures and agents; and third, appropriate indicators refer to causal properties of objects or entities. Nash's use of indicators fails each of these three tests.

What statistical positivists do (and Nash of course takes issue with such a position) is to search for indicators which can be understood in the same way by large numbers of respondents, are easily accessible, and can be quantified. So, for example, the indicator of the number of books in the home (used in the PISA study) meets the requirements of statistical positivists. It allows a simple form of counting by respondents (though in the PISA study the books themselves are not immediately available for inspection and thus have to be calculated from memory), is available for inspection by the respondent even if through memory, and is expressed already in quantitative terms. However, this measure is in reality a poor indicator since the number of books in the home cannot be a part of a causal narrative since books do not cause anything to happen. Only the reading and absorption of the knowledge in those books in the case we are considering here may cause an increase in reading skills for the individual. What the number of books does is provide a proxy for a process which then may be connected to a further process, and this is that the reading of these books causes learning to take place, which may or may not be reflected in an individual's subsequent score in a standardised reading test.

And the reason why it is a proxy is because that process of learning cannot be accessed in terms of the principles required by a statistical positivist. However, this is not to suggest that the presence of books in the home, or books of a particular kind, cannot form an important element in the causal narrative that is subsequently developed; only that it is neither a necessary nor sufficient condition for the outcomes that follow. The problem is that data are collected, to use Nash's terms, at a programme level rather than at a process level. What, however, cannot be avoided is the serious neglect of process when data are collected to represent a category of an individual action rather than a causal process at the agential level. However misguided or ignorant or perverse that person is, it is how they understand the impact of structures which influences what they do. But this only happens at each particular instance, and they may learn from that encounter/instance, as indeed they may learn from an encounter with a researcher, and thus their response to the same set of conditions the next time round may be different. Misguided, ignorant or perverse behaviour by an individual may have no effect on structural properties. However, researchers should not assume that it will not.

Self-reports of events and processes cannot provide complete knowledge of relations between different events and states of being, i.e. poverty, homework, school achievement. This is because respondents may not be able to articulate the actual reasons for their actions; or because they may not be aware of other forces or structures that either condition their thinking or their actions; or because most behaviours are routine; or because they may be driven by unconscious desires and impulsions; or even because the interview setting may be so structured that the reporting of the chain of reasoning is distorted or

inadequate in some way. However, the important point is that the researcher has to try to collect data about the process—involving a chain of reasoning, leading to a series of actions, leading to an understanding of events—and this can only be achieved by a detailed analysis of how individuals give meanings to the various parts of the process. Structural properties cannot be identified separately from their instantiations. Lay knowledge, for all its inadequacies, is therefore a crucial determinant in the causal narrative that is being prepared. Indeed, good educational accounts do not go far beyond lay accounts, though they are not reducible to them.

A programme investigation cannot tell us how the different levels of social reality interact. Social structures are the result of a myriad of decisions made by individuals and collectivities of individuals, have the potentiality to change their nature, and cannot be investigated separately from individual dispositions and practices; and if investigators choose otherwise, their findings are likely to be crude distortions of how those structures in fact worked as they impacted on individuals with their sets of dispositions, habits and beliefs. Nash suggests a way forward, and then refuses to follow the logic of his argument. Critical realists do not, as he suggests, argue that statistical explanation is always misleading, only that, in order for mathematical modelling of social processes and events to reflect real-life processes and events, agential and structural properties have to be reconnected at the indicator level, ontological emergence and epistemological transitivity have to be accounted for in the explanation, and intensional idioms are not conflated with extensional ones.

Lived Realities

The key here is to examine, as Nash indicates, sequences of causal happenings or the lived reality of the individual—the third of my objections to mathematical modelling. The methodological point of entry into this process is the relationships between the agential and structural objects. If researchers act otherwise then they are in danger of reifying the properties of the relationship by treating elements of the causal sequence as generalised to a group of people and not addressing how those people were actually implicated in the structural relationship, which may result in a misunderstanding of the nature of that structural relationship. The indicator therefore has to reflect the relationship between structure and agency in particular cases, and if researchers want to generalise then they have to examine the propensity of that relationship to be replicated in other cases. This is where extensional idioms can be legitimately used, and this also avoids the problem of using variables as expressions of an underlying reality. For example, racial categories, in the positivistic model, have to be externalised. In a critical realist model, racial categorisation, being a part of the lived reality of the individual, takes account of how individuals understand their racial and ethnic identities, and is thus real. Critical realism therefore does not preclude the use of statistical methods; but it does argue for the use of methods and indicators which reflect the close relationship between structure and agency, refer to real and not reified properties of both structure and agency, and allow a causal narrative to be developed.

The issue of much positivistic research actually imposing a set of categories on the way we live and thus not merely describing but creating reality is a consequence of the argument, but not one that will be pursued here in any great depth. Indeed, Nash (2005, p. 201) hints at this when he suggests that much positivistic statistical modelling is ideological: ‘ And when it is suspected, as critical realism does suspect, that the language of statistical modelling bears the taint of ideology, the accounts of statistical modelling seem not only inadequate and incomplete but systematically misleading and therefore to be rejected.
This happens because categories and relations which constitute the social order are reified at the methodological level, and ontological emergence is not given a prominent position in the scheme of things. Categories and relations are therefore treated as givens, rather than being understood as the results of decisions made by individuals and groups of individuals in the present and stretching back in time.

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Notes

1. The term 'positivism' has acquired a variety of meanings, and is even used by some theorists as a term of abuse. Outhwaite (1987) has suggested that there are three principal varieties of positivism, the last of which is relevant in this context. The first, popularised by Auguste Comte, is where causal laws can be derived from observations and these observations are value-free. However, this does not imply that a common method for the natural and social sciences can be developed. The second variant, known as logical positivism, espoused a form of nominalism, and at the same time suggested that the methods of the natural sciences could be applied to the social sciences. Finally, the third variant, variable analysis, led to the development of statistical explanations for social phenomena in the form of universal laws or generalisations, constructed from the constant conjunctions of events. This third variant has been critiqued extensively by, amongst others, critical realists who have developed a social theory based on a depth and stratified ontology.

2. Claims have been made that certain types of physical phenomena change their form as a result of being observed or investigated. However, no claims have been made that these physical phenomena consciously do so, through a process of reflection and transformation. Social phenomena have this capacity and this can be expressed as learnt behaviour during the process of investigation, as well as reflection on and transformation of those categorical distinctions that structure the social world.

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