SCIENCE AND VALUES (2)[*]

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The widely endorsed idea that science is (or ought to be) value free is best articulated as compounded of three views: "impartiality" (a view about the grounds for accepting theories), "neutrality" (about the consequences of accepting and applying theories), and "autonomy" (about the conduct of scientific practices and the character of scientific institutions). I will present statements of these three views (following my recently published: Is Science Value Free? Values and Scientific Understanding*). Then, I will argue that, while autonomy cannot be soundly defended and that neutrality is normally lacking, impartiality should be upheld as a valid ideal of scientific practice. Social and moral values do indeed play a central role in scientific practice at the moment of adoption of research "strategies", where theories are constrained and empirical data selected, but not at the moment of concrete choice of theory, where impartiality should not be by-passed. This permits that there be a variety of strategies, each of which reflects a different value commitment, under which theories may be generated and eventually impartially accepted, and that it can be legitimate to raise questions, at the center of scientific practice, about the role (and possible roles) of science in serving human well-being.*

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[*] This article, written for this volume as a tribute to Oswaldo Chateaubriand on the occasion of his sixtieth birthday, is a sequel to "Ciência e valores," Lacey (1997b).

Long ago Bacon warned us: "The human understanding is no dry light, but receives an infusion from the will and affections; whence proceed sciences which may be called 'sciences as one would' " (Bacon (1620/1960): aphorism 49), so that to engage in "good" scientific research we must resist the temptation to fit the world to our values. The advice has often been repeated. Poincaré put it: "Ethics and science have their own domains, which touch but do not interpenetrate. The one shows us to what goal we should aspire, the other, given the goal, teaches us how to attain it. So they never conflict since they never meet. There can be no more immoral science than there can be scientific morals" (Poincaré (1920/1958): 12).

I will argue[1] that values influence the character of the scientific understanding that we seek and gain, and the processes of gaining it, in much deeper ways than Poincaré recognized, but in such a way that Bacon's warning may (and should) be properly heeded. Before entering into the substance of the argument, I will begin with some summary remarks on each of the terms, "values" (VAC: ch. 2; SVF: ch. 3; Lacey & Schwartz (1996)) and "scientific understanding" (SVF: ch. 5).

1

Human agents hold values in (what I will call) **value-outlooks**, more or less coherent and ordered sets of mutually reinforcing values of various kinds: personal, moral, social, aesthetic, cognitive, etc. Let ϕ designate a particular kind of value (e.g., social); v some characteristic that can be *manifested* to a greater or lesser degree in ϕ (e.g., respect for human rights); and X an agent. Then:

v is held as a ϕ-value by X if and only if (1) X desires that v be highly manifested in ϕ; (2) X believes that the high manifestation of v in ϕ is partly constitutive of a "good" ϕ; (3) X is committed to act to enhance or maintain the degree of manifestation of v in ϕ; and (4) X is committed to a life trajectory in which the "gap" between what he *articulates* about v concerning the first three items and the *expression* of v in his behavior is progressively narrowed.

For some ϕ (e.g., social) it will often be a ϕ-value for X that (e.g.) a personal or moral value (e.g., individual initiative) be *embodied* in ϕ-structures: that they provide roles whose conduct requires its high expression in the behavior of those who fill the roles, that they support practices with such roles, and that their authoritative spokespersons articulate and endorse it. This makes likely that there will be close links between the values X holds and those embodied in the institutions in which he participates.

Holding a value-outlook rationally, is responsive to several criteria (VAC: 58; SVF: 40), but above all, I suggest, it **presupposes** *both* that the fuller manifestation of its component values is possible *and* that a higher degree of their manifestation contributes to further human well-being; and thus it also presupposes a view of human nature, and perhaps also of nature. Thus, holding a value-outlook rests upon presuppositions that – to some extent – are open to empirical investigation, and to support or rejection in the light of new scientific knowledge.

I will say that a value-outlook is **viable** provided that its pre-suppositions are consistent with soundly accepted scientific knowledge. Viability is a necessary condition for the rational adoption of a value-outlook. While not all value-outlooks are viable, the advance of science leaves open a range of viable ones. That is why (e.g.) it is coherent to see scientific developments as having played a rational role in the demise of the value-outlook of medieval Christendom (and some other old value-outlooks) and, at the same time, to maintain that science is impotent to adjudicate the great value disputes of our age.

It is often assumed that any value-outlook rationally held today must include certain values connected with the control of natural objects and with technological implementations, values that together constitute (what I call) **the modern valuation of control** (MVC). Thus, e.g., those who cite the value of organic farming over that of the agricultural practices spawned by recent innovations of biotechnology tend to be dismissed on the ground that they run counter to the trajectory being set by MVC (SVF: ch. 8). But not all viable value-outlooks include MVC – *unless* the key pre-suppositions of MVC (stated below) are established as part of soundly accepted scientific knowledge. A value-outlook may be viable and rationally worthy of being held, even though currently the conditions needed for the high manifestation of its component values may not be readily available, perhaps because their high manifestation cannot coexist with that of MVC or otherwise because there is little support for furthering it available in the current centers of power.

MVC derives historically from Bacon's "utility". It is indispensable, I will argue, not only for grasping the social history of modern science, but also for understanding its characteristic features. Before making the case for this, I will elaborate MVC a little more fully. Let me emphasize, however, that exercising control over natural objects or intervening into nature is a human univer-

sal; what is distinctive about control in modernity is its extent and its mode of relationship with other values (VAC: ch. 5; SVF: ch. 6):

> ... there is a qualitative difference between the preindustrial and industrial ideals with respect to the degree of human 'control' over nature which is considered necessary to insure happiness. ... The exploitation of the powers of nature, upon which all human art (however 'primitive' it may be) depends in some measure, has appeared increasingly important in the social visions of the modern world (Leiss (1972): 8-9).

MVC may be articulated as having the following components:

- The instrumental value of natural (material, biological) objects is dissociated from other forms of value; then the exercise of control over natural objects becomes *per se* a social value not systematically subordinated to (or balanced with) other social values.[2]
- Expanding human capabilities (*via* research and development) to control natural objects – expanding the range of objects over which control may be effectively exercised, and the

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[2] I contrast MVC, and its insubordination of control of natural objects, to cultural outlooks in which natural objects have their own integrity and value in virtue of their place in ecological and/or cosmic systems ("wholes"), and where control is balanced by general patterns of renewal, nurturing, cultivation, attunement, love (cf. Keller (1982), Maxwell (1984), Tiles (1987)), stewardship, restoration, mutuality – analogues of "dialogue" between humans. Such outlooks persist and have important roles in modernity (e.g.) in art and music. MVC is most dominant in productive and consumer domains of modern life, though it tends to expand into ever more domains of life. Within the outlooks that contrast with MVC, the distinction between "immediate effect" and "side-effects" of controlling interventions cannot be clearly drawn. There is not, e.g., a distinction between "production of a crop" and the side-effect of "ecological devastation"; they are just different aspects of one and the same activity.

range of phenomena that can thereby be brought about – is very highly valued, as is its widespread institutional embodiment. Creating new technologies is especially valued – the recursive "layering" of our powers of control; exercising control over objects for the sake of creating objects that enable expanded human control over the objects encountered in ever more domains of daily life.

Control is the characteristic human stance to adopt towards natural objects. Exercising control and, above all, engaging in the research and development projects in which our powers to control are expanded, are essential and primary ways in which we express ourselves as modern human beings, in which are cultivated such personal "virtues" as creativity, inventiveness, initiative, boldness in the face of risks, autonomy, rationality and practicality. Thus, an environment which is shaped so that many and varied possibilities of control may be routinely actualized in the course of daily life, one dominated by technological objects – so that natural objects increasingly become encountered in experience primarily as objects of control, is highly valued, as is the spread of technology into more and more domains of life; and wherever possible problems tend to be defined as having a technological solution.

- The implementation of novel forms of control (novel technologies) has *prima facie* legitimacy. In particular, a measure of social disruption is tolerated for the sake of implementing novel technologies; the values that may be manifested in social arrangements are, to a significant extent, subordinate to the value of implementing novel technologies. It follows that it is

legitimate to attend to side-effects of technological implemen-
tations largely as "second thoughts".[3]

MVC is highly manifested and embodied throughout the
world today and endorsed by the predominant institutions and
wielders of power; it is capable of much higher manifestation – in
more societies, in more domains of life; and we may expect that
the trend to its higher manifestation will continue for quite some
time.[4] Its expression, then, in the behavior of increasing numbers
of people is readily explained. But the rational grounds for adopt-

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[3] This is reflected in the fact that practices for the systematic empirical
investigation of "side-effects" – especially social and ecological ones – are
much underdeveloped compared to those that deal with novel possibili-
ties of control. Note that MVC concerns the control of material and bio-
logical objects, not human beings directly. Nevertheless, when technol-
ogy dominates the productive process, the control of material objects
may *de facto* require practices in which human behavior is also subject to
control (SVF: ch. 9). How we interact with material objects in intricately
connected with how we interact with other human beings (Lacey,
1997c). This creates permanent tensions in the human condition, cur-
rently: to exercise control over material objects only to the extent that it
does not imply control over human beings; to introduce controls for the
sake of human autonomy and choice, not for the domination of humans.
It is not at all clear that the MVC can be manifested to a high degree
without being implicated in the domination of (some) human beings
and in considerable social and ecological devastation. Since issues con-
cerning the latter are "second thoughts" where MVC is held, they might
not be seen as pressing matters, as one attends to the wonders of "pro-
gress". Holding firmly MVC can induce a measure of tolerance to exercis-
ing control over human beings. This is reinforced by some of the presup-
positions (below), especially presupposition (e) when it is expanded into
full-blown materialist metaphysics. Then, human beings are thought of in
terms of the same categories (underlying structure, process, interaction
and law) as material objects are, and so our stance towards them may be-
come essentially the same (control).

[4] The introduction of technology into a society does not *per se* involve
adoption of MVC; see my discussion of "appropriate technology" (VAC:
159-60; SVF: 188-90) – see also Tiles & Oberdiek (1995).

ing MVC, as distinct from the factors that explain its widespread adoption, derive (I suggest) from accepting most items in the following diverse set of presuppositions:

(a) Ongoing technological innovation serves the well-being of human beings in general since it is indispensable for "development", a prerequisite for a just society.[5]

(b) Technological solutions can be found (and will be put into effect) for virtually all problems, including for the problems occasioned by the "side-effects" of technological implementations.

(c) MVC represents a set of universal values, part of any rationally legitimated value-outlook today, whose further manifestation is *de facto* desired by virtually all who come into contact with its products.

(d) There are no significant possibilities for value-outlooks, not containing MVC, that can be actualized in the foreseeable future.

(e) Natural objects are not *per se* objects-of-value, and they only become such in virtue of their places in human practices; *per se* they can be completely understood in terms of the categories of underlying structure, process, interaction and law abstracted

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[5] In the capitalist-oriented world, this presupposition is typically supported by individualist views of human nature, which emphasize individual agency and the individual body and de-emphasize the social character of human beings and their relationships to cultures and groups – human beings as choosers, centers of creative expression, consumers, "preference or utility maximizers" and the like. Then, human well-being tends to be thought of primarily in terms of bodily and psychological health, and the realized capability to express a variety of ("authentic" or self-chosen) egoistic values (Lacey & Schwartz (1996)).

from any value they may derive from their place in human practices. When we exercise control over objects, informed by sound understanding articulated with these categories, we are dealing with them as they are in themselves as part of "the material world" – and that is why projects shaped by MVC have been so spectacularly successful.

I think it is quite clear that if a number of these presuppositions cannot be sustained, then the rational grounds for endorsing the modern valuation of control dissolve – regardless of its widespread embodiment in contemporary social structures and the support it gains from the institutions of power. I will return to issues about how and to what extent the presuppositions may be investigated in a systematic empirical way, and to what hinges on them.

2

The commonly stated aims of science can be placed on a spectrum defined by the extremes: understanding and utility. Utility is usually thought of as a consequence of having gained understanding, which is open to appraisal by criteria which do not include utility itself. *Understanding* a phenomenon (event, thing, state of affairs, regularity) involves description (and thus classification), explanation, and encapsulation of possibilities: answers to *What? Why?* and *What is possible?* What kind of phenomenon is it, what are its properties and behaviors, and relations and interactions with other phenomena, what are its temporal variations? Why does it vary and why does it behave and interact as it does? What possibilities – including hitherto unrealized ones – are open to it to change, to affect, be affected, to develop into, to become? Generally in order to answer *What is possible?* one must also answer *How?* How can the posited possibilities be actualized? The answers to all these questions are deeply intertwined (VAC: ch. 1; SVF: ch. 5; Lacey (1997a)).

Scientific understanding is expressed in **theories** and it is **empirically grounded**. The criteria for appraising the **cognitive value** of a theory, for appraising the soundness of the understanding expressed in it, will be called *cognitive values* (VAC: ch. 3; SVF: ch. 3; Lacey (1997d)). Many of the cognitive values involve relations between theories and relevant available empirical data: e.g., empirical adequacy, explanatory power. Others concern relations among theories: inter-theoretic consistency, consilience. Others still concern features of theories themselves: consistency, simplicity. Cognitive values designate features desired of *acceptable* theories; they may (in general) be *manifested* in theories to greater or lesser degrees. Modern scientific practices have had great success in gaining sound understanding, which in turn has been applied with remarkable success. Part of the explanation usually offered for this two-fold success draws from the view – pointed to in the opening quotes from Bacon and Poincaré – that *science is value free*, a view that is best treated (I believe) as jointly constituted by three distinct ideas: *impartiality*, *neutrality*, and *autonomy* (SVF: chs 1, 4, 10). I will identify each of the three as a value of scientific practices (and institutions), whose possibility of manifestation rests upon particular presuppositions. The succinct accounts that I offer in the next section should be treated as first approximations.[6]

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[6] For details, nuances, qualifications, variations and alternative proposals, see SVF: chs 4 and 10. In SVF, I treat *science is value free* as a **thesis** which I may paraphrase as having the components: (1) scientific practices and institutions embody the **values** of *impartiality*, *neutrality* and *autonomy* (as defined in this text); and (2) all the presuppositions I list for these values. Nothing hinges on whether the items in (2) are considered components of such a thesis, or presuppositions of the core components of a thesis. Either way there are the same distinct proposals to appraise. Note that (1) should not be identified with (1'): "scientific practices in **actual fact** manifest the values of *impartiality*, *neutrality*, and *autonomy* to a high degree." It is a trivial and empirically easy matter to refute (1').

3

Impartiality

Impartiality **presupposes** that cognitive and other values can be *distinguished*. It represents the value to be manifested and embodied in scientific practices that:

A theory is accepted of a domain of phenomena if and only if it manifests the cognitive values to a suitably high degree, according to the highest standards, in the light of available empirical data; and a theory is rejected if and only if a theory inconsistent with it has been soundly accepted, where a theory is **soundly accepted** if it accepted in accord with *impartiality*.[7] Note also that a theory is always accepted of **a domain or domains of phenomena and possibilities**. (I will take this as understood and not keep repeating it.)

A theory may be soundly accepted and *at the same time* manifest certain social values (e.g., be useful on application for projects shaped by MVC). *Impartiality* only forbids a role to social values in making judgments of accepting and rejecting theories, not in making judgments of their *significance* (Anderson (1995); SVF: 15-16) – where a theory is *significant for a value-outlook* if it may be applied so as to further and not undermine the manifestation of (some) component values of the outlook. I have defined *impartiality* as a **value** of scientific practices and institutions; in actual fact numerous theories have been, and are, accepted in violation of it.[8] The historical record of these violations provides the empirical basis for some recent challenges to *science is value free*. Neverthe-

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[7] See SVF 13-14, where "acceptance" is distinguished from other stances that may be adopted towards theories. On "standards", see SVF: 62-6.

[8] For matters concerning the difficulties of *separating* cognitive and social values, and the mechanisms involved in the violation of *impartiality*, see Lacey (1999d). For a response to Longino's querying of the *distinction* between cognitive and other values, with the resulting implied questioning of *impartiality*, see SVF: 216-23.

less, departures from its being highly manifested are consistent with the adoption of *impartiality* as a value of scientific practice *provided that* there are exemplary cases that do manifest it highly; that attempts are made to identify the mechanisms that can cause violations of it and steps are taken to prevent their actual operation – ideally steps that are embodied in the communities of inquiry and the institutions that support them (Longino (1990): 76); and that the trajectory of scientific practices promises to lead to more and a greater variety of theories being accepted in accord with it.

Neutrality

Neutrality **presupposes** first that scientific theories do not logically entail that any particular values should be adopted, and second that the body of soundly accepted scientific theories leaves open a range of *viable* value-outlooks.[9] Then, *neutrality* represents the value to be manifested and embodied in scientific practices that:

Each *viable* value-outlook is such that there are soundly accepted theories that can be *significant* to some extent for it; and applications of soundly accepted scientific theories can be made

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[9] The first presupposition does not imply that accepting theories has no (logical) consequences concerning what are (*ceteris paribus*) rationally acceptable values (VAC: ch. 8, sect. 3; SVF: 74-82; Lacey (1997a)), for I have maintained (Section 1 above) that a value-outlook is rendered rationally admissible in virtue of various presuppositions about what is possible and about human nature, presuppositions which should be rejected if they are inconsistent with soundly accepted scientific theories; then, the consequences in the realm of values are not entailments but mediated by the role of the presuppositions. That the second presupposition (indeed that *any* value-outlook is left open) does follow from the first is assumed by common views – opposed by the account of values that I have offered – about the fundamental separation of fact and value, and emotivist theories of ethics (SVF: 7). The second presupposition may capture the residue of what is sound in these views.

evenhandedly, so that overall (in principle) there is no value-outlook for which the body of theories has special significance.

Scientific research provides, as it were, a menu of soundly accepted theories. Each value-outlook may pick from this menu the items that, on application, would serve its tastes (interests). While different value-outlooks may highlight different items on the menu, the menu can be sufficiently encompassing that any outlook can find theories to satisfy its tastes; and the menu does not (in principle) cater more to certain tastes than to others. *Neutrality* expresses the value that science does not play moral favorites: the presuppositions rule out that science can adjudicate among currently viable value-outlooks; the value itself permits the claim that scientists are the bearer of an expertise that (in principle) can be employed productively in the service of any interests at all (good or bad).

Clearly, manifesting *impartiality* is necessary for scientific practices to manifest *neutrality*, but it is **not** sufficient. Significance (for any given value-outlook) does not follow from sound acceptance. Like *impartiality*, *neutrality* is a **value** of scientific practices, but not always highly manifested in actual **fact**. It can be held as a value in the face of widespread actual departures from it, provided that conditions similar to those I listed for *impartiality* are in place. Within a wide range of mainstream modern scientific practices the trajectory is indeed in the direction of the higher manifestation of *impartiality* – and it is easy to point to exemplary cases of theories that are soundly accepted of certain domains. But, in the case of those same practices, a similar trajectory towards higher manifestation of *neutrality* is not discernible; and, *within* them, I do not think this can be reversed. Rather than being applied in an *evenhanded* way, the soundly accepted theories of modern science tend overwhelmingly to be significant for value-outlooks that contain MVC, so that actual practices of application provide little evidence that the theories of modern science *can be* significant to anything resembling a comparable extent for other

viable value-outlooks – and, unless the actual practices of application change their direction or a case can be made that it can genuinely be changed, I do not know what other evidence there might be to support that the practices embody *neutrality* as a value.

Autonomy

Autonomy is much more difficult to express in a single clear thesis than the other two (SVF: chs 4 and 10), partly because of its association with the disputed (and often self-serving) political norm: "Leave science to the scientists." On my version it **presupposes** that there is a (more or less) clear distinction between *basic* and *applied* research, and that the practices of *basic* scientific research aim to bring about higher and more widespread manifestations of *impartiality* and *neutrality*. I define it as the value that:

Basic research practices are conducted in autonomous communities (by researchers who express the "scientific ethos" – Cupani (1998)), supported by autonomous institutions – i.e., communities and institutions whose priorities are set without *interference* from "outside" interests (not only those linked with power but also those connected with particular moral and social values) – so that research priorities are set by the interest to heighten the manifestation of the cognitive values in the theories of the domains under investigation and to extend scientific research (with the aid of those theories that already have become soundly accepted) into new domains not currently within its compass.

These three ideas are meant to capture what Poincaré was getting at when he wrote of values and science not "interpenetrating". They remain, as all proponents of *science is value free* recognize, consistent with science and values "touching" in myriad ways: (e.g.) concerning the direction and legitimation of applied research and applications, values in fact improperly influencing theory choices, scientific practices having their own internal values, and motivations to engage in research (SVF: 12-19).

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To begin my appraisal of the various components of *science is value free* consider: Does and can the ideal (implicit in *autonomy*), that basic scientific research be effectively "driven by" the cognitive values, play a regulatory role in scientific practice? It might seem to follow from accepting that the aim of science is to gain understanding of the world or, more accurately, of as encompassing a range of phenomena and possibilities as possible, which (in turn) might appear to amount operationally to the aim: to generate and consolidate theories manifesting the cognitive values highly progressively of more and more domains of phenomena and possibilities.

The aim of science so stated, however, provides no *direction* to scientific investigation. It does not point to – for any domain – the relevant kinds of empirical data to procure and the appropriate descriptive categories for observational reports, and the kinds of theories to posit in order to put them into contact with the data, that are necessary in order that the cognitive values can play their role as criteria of choice among competing theories. Clearly for an aim like this to be pursued the "right" kinds of data and theories must be brought into contact, so much so that (logically) antecedent to engaging in inquiry (what I call) a **strategy** must be adopted (VAC: chs 1 and 5; SVF: ch. 5). The key (reciprocally related) roles of a strategy are to **constrain** the kinds of theories that may be entertained and to **select** the kinds of empirical data that acceptable theories should fit. (The neo-Kuhnian character of my concept of "strategy" will no doubt be apparent.)

Most of modern science tends to adopt virtually exclusively various forms of (what I call) **materialist strategies** (MS) (VAC: ch. 5, sect. 1; SVF: 68-9; Lacey (1997d), (1999b), (1999c)): theories are *constrained* to those that represent phenomena in terms of their being generated from **underlying structure, process, interaction and law**, abstracting from any place they may have in relation

to social arrangements, human lives and experience, from any link with value (thus deploying no teleological, intentional or sensory categories). Put another way, theories are constrained so as to encapsulate the **material possibilities** of things, those possibilities that can be represented as generable from the underlying order, in abstraction from whatever social, human, ecological and cosmic possibilities may also be open to them. (**Lawfulness** is at the core of MS, variations of which arise as additional constraints may be put on what counts as a law or on the variables that are admissible in laws.)

Reciprocally, empirical data are *selected*, not only to meet the condition of intersubjectivity, but also so that their descriptive categories are generally quantitative, applicable in virtue of measurement, instrumental intervention and experimental operations.

Selecting in this way excludes other kinds of empirical data, for the same observable phenomena can (while meeting the condition of inter-subjectivity) be described in indefinitely many ways, many of which involve the use of "non-materialist" categories (e.g., sensory, intentional). Under MS, data are reported without using these categories, thus representing them in abstraction from any place they may have in any human practices or their relations to human experience; in these reports the data have been stripped from all links with value.

Many objects – including experimental and technological phenomena – whose material possibilities are well grasped under materialist strategies are also social objects, objects of social value. Understanding them *fully* (VAC: 107-8; SVF: 99-100) requires reference to the human/social descriptions that can also be given of their boundary and initial conditions and of their effects – thus grasping the possibilities that these things have in virtue of their relations with human beings, social conditions and (more broadly) systems of things. Certain material possibilities cannot be actualized (in historical context) without also actualizing certain social possibilities (e.g., furthering the manifestation of MVC) and

undermining others. To focus on the former and leave aside the latter is to abstract; and to limit the domain of science to the former is just an arbitrary stipulation when systematic empirical inquiry that involves the latter can also be conducted. In principle, possibilities that are not reducible to material possibilities may be investigated in forms of systematic empirical inquiry, which will involve strategies different from MS. Elsewhere I have identified (anticipatory) strategies: for research in agriculture, strategies that are in continuity with traditional local forms of knowledge; for research in psycho-socio-biology, feminist strategies; and, prior to the dominance of MS Aristotelian strategies were dominant (SVF: ch. 8, ch. 9 and ch. 7 respectively). There are alternatives to consider, but modern science has been conducted almost exclusively under MS – and rarely is this deemed worthy of much comment.

Why has the modern scientific community adopted MS almost exclusively? I will not engage the sociohistorical dimension of this question, but instead will consider: What (if any) are the rational grounds for the virtually uncontested adoption of MS in modern science?

Many would cut this line of questioning short: It is of the very nature of science (they say) to adopt MS. Certainly it is widely taken for granted that science is **both** systematic empirically-grounded inquiry **and** inquiry conducted under MS. I do not want to argue about the use of the word "science", so I will rephrase the question: What are the grounds for generally privileging the adoption of MS in systematic empirical inquiry? My question does not address directly the choices made by individual scientists; it wants to get at the legitimation (if any) of the predominant form of institutionalization of research conducted under MS. Individual scientists can have all sorts of reasons of their own for adopting MS, including field-specific ones. Research conducted under MS is highly institutionalized (and in modernity has high social value) and uniquely so, so that the conditions are readily available for individual scientists to pursue this kind of research – then, the in-

dividual scientist does not so much make the choice to adopt MS as to enter the on-going practices of an institution, and he or she can be drawn into these practices (by direct apprenticeship) without considering any deeper rationale that adopting MS might have.

I will consider three proposed answers (cf. SVF: 104-9), one grounded in materialist metaphysics, one drawn from Kuhn, and the other from neo-Baconian ideas. From the discussion it will be clear that adopting MS is not determined by the cognitive values, and adopting it cannot itself be regarded as a cognitive value.

Since the 17th century numerous versions of the following answer have been given: Science aims to understand the world **as it is – the material world** – independently of its relations with human beings (except insofar as human life and behavior are understood as outcomes of causal powers and structures that are ontologically independent of human value, observation and investigation); MS (and only them) provide categories appropriate to this aim.

In response note that, whatever the "material world" may be, human beings are part of **the natural world: the world as it is** contains human beings and its possibilities include those that derive from human action and social practice. It is neither an implication of any soundly accepted theories nor a presupposition of the practice of systematic empirical inquiry that the "natural world" reduces to the "material world". If it does not, then the "material world" is an abstraction. Moreover, any understanding gained of the "material world" is not only expressed in theories, but also produced in scientific practices that give rise to the categories with which scientific understanding is expressed – thus opening the question: Can **what** is understood (the object of inquiry) be grasped independently of an account of the (logical, social, historical?) origins of the categories and the practices within which they are deployed.

It is, I suggest, worth aiming to understand "the world **as it is**", but that is not the same thing as "the world independent of its relations to human beings and the possibilities that derive from their action". Rather, we aim to encapsulate the genuine possibilities open to things – under various conditions, including those shaped by us – and this aim is best realized by consolidating theories that satisfy *impartiality*. There is no *a priori* reason why *impartiality* can only be satisfied under MS. There is more to "understanding 'the natural world'" than "understanding things under MS." The fact that science conducted under MS does not satisfy *neutrality* might be taken as a clue that values pervade its practices, and that the possibilities that are encapsulated in its theories – the material possibilities of things – do not exhaust the possibilities of things.[10]

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[10] The view that the material possibilities of things exhausts their possibilities – materialist metaphysics – has pervaded the modern scientific tradition, whose early developments are inseparable from the simultaneous and reinforcing developments of this metaphysics (where some used "dualism" to avoid the charge that "the material world" is an abstraction). Galileo and Descartes (e.g.) offered *a priori* arguments that the way the "natural world" **is** makes it open to being grasped (ideally) under versions of MS. Still today commitment to materialist metaphysics lies behind the widespread adoption of MS, particularly reductionist versions that dominate the philosophy of mind and the practice of "scientific" psychology. Its categories (continually refined as they are extrapolated from the latest scientific developments) seem to dominate the imaginations of contemporary scientifically-minded intellectuals, as if they must be constraints on our investigations. Why this should be is unclear. Few any more subscribe to *a priori* arguments to support materialist metaphysics. (Taylor 1982 – and, in a somewhat different way, Maxwell 1984 – argue that the best explanation of the "success" of modern science is that it produces a superior understanding of "the material world". My detailed criticism is in VAC: ch. 4 and SVF: ch. 6.) Furthermore, materialist metaphysics is not a presupposition of systematic empirical inquiry; and, as an extrapolation from the results of inquiries conducted under MS, it cannot ground their privilege. My own hunch is that the grounds for endors-

A different answer can be drawn from Kuhn. Not the nature of "the material world," but the current historically-contingent stage of our research practices, demands the adoption of MS. MS are deeply embedded in modern "paradigms." Adopted in the first place (rationally) because they helped to solve puzzles that had remained anomalous under old strategies, they have remained predominant because of their continued **fruitfulness:** under them the range of theories that have become soundly accepted is large and variegated and it continues to become more so. That, for Kuhn, is sufficient for the current privilege of MS for, according to him, the historical practice of science precedes best when the scientific community pursues the potential of a strategy single-mindedly ("normal science") until it is exhausted.

I do not find the Kuhnian answer compelling. Fruitfulness seems to me to be a necessary but not a sufficient condition for the continued rational adoption of a strategy (SVF: ch. 7). Thus, since by a certain time it became clear that Aristotelian strategies could not compete with MS with respect to **fruitfulness**, then it was no longer rational to adopt them. But Aristotelian strategies also could not compete with MS with respect to **utility**: informing the implementation of MVC and providing understanding of technological objects that were becoming (and have become) central to the conduct of daily life. There is little doubt that – eventually – where science conducted under MS has gained virtually hegemonic social support it has been because of its service to MVC, and that this lies behind the tendency to identify "science" with "systematic empirical inquiry conducted under MS". That, of course, might have nothing to do with the **rational grounds** for the virtually unchallenged adoption of MS in the mainstream scientific community – and, from the point of view of that community, it might be seen as just a happy convergence of interests.

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ing materialist metaphysics are the same as those for the virtual unanimous adoption of MS, the link with MVC (SVF: 126-30; VAC: 129-32).

To test this, suppose that one opposes the further implementation of MVC (say, on grounds connected with some conception of social justice – VAC: ch. 6; SVF: chs 8 and 9). Then, unless practices under MS were *neutral,* there would be good reason to seek out alternative strategies – which might maintain a subordinate role for MS – that might be able to generate and consolidate theories **significant** for the rival value-outlook. Thus, fruitfulness alone is not **sufficient** to grant privilege to MS; further arguments for the significance of theories developed under them are also required.[11] Then, arguments for privilege rest upon considerations of values.

To get at the third answer that I will consider, the one I find most compelling, consider the question: What strategies should be adopted in research if one wants to gain soundly accepted theories that would inform the further implementing of MVC? I think the answer is: MS; for the possibilities for human control of objects are a subset of their material possibilities (VAC: ch. 5; SVF: ch. 6; Lacey (1999b)). Why then have MS been granted privilege? The answer, I suggest, is: there is a mutually reinforcing interaction between research conducted under MS and commitment to MVC. This interaction may be described summarily in the following propositions (SVF: ch. 6):

- The furtherance of MVC is dependent on the expansion of understanding gained under MS.
- Engaging in research under MS fosters an interest in the fuller manifestation of MVC.

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[11] The issue may not have arisen explicitly in early modern science – I do not know the history well enough! Then in the absence of actual contestation of MVC (among those considered to belong to the research community) the role of significance alongside fruitfulness may not have been apparent. Whatever, it should now be clear that Bacon's appeal to "utility" is not rationally irrelevant to adopting MS.

- Understanding, gained under MS, is gained from the perspective of control.
- Any values furthered by research under MS (e.g., those associated with the pursuit of "basic" research) are manifested today within value-outlooks that also include MVC.

Note that theories, accepted under MS, often provide sound understanding of domains in which there is no genuine possibility of exercising control. That is why I do not subordinate understanding to utility, but stress mutually reinforcing relations between MS and MVC.

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Generalizing this third answer we get the following picture: When one adopts a strategy, in effect one lays out in the most general terms the kinds of phenomena and possibilities chosen to be investigated; in the case of MS, the material possibilities of things and phenomena in spaces where their possibilities are exhausted by their material possibilities. Subject to (potential) fruitfulness being a necessary condition for continuing rationally to adopt a strategy, there is nothing **logically** improper about social values strongly influencing this choice. **Then**, the acceptability of theories constructed under the strategies is judged in the light of the data and the cognitive values. The important thing is to keep the roles of the social and cognitive values separate. Their different roles reflect different (logical) moments connected with making theory choices. At **one** moment, when we ask: "What characteristics must theories have to be provisionally considered?", strategies play the key role. They serve to eliminate from consideration theories that do not fit their constraints. Logically they function first. In principle, with respect to a given domain, an array of incompatible theories will fit the constraints. Then (logically) at the **second** moment, when we ask: "Which (if any) of the theories, that fit the constraints, is to be accepted?", the play of the cognitive values alone, in the light of the empirical data and other accepted

theories, should be decisive. Values do not have a proper role at the second moment acting **alongside** the cognitive values, but at the first moment a strategy may be adopted because of the mutually reinforcing relations it has with values, for which theories developed under them are expected to have significance.[12] Theories that do not fit the constraints of the strategies are not investigated under them, not because they are held to be false (SVF: 234-6; Lacey (1999d)) – that would involve violating *impartiality* – but because they lack potential significance since they do not promise to identify possibilities of interest.

Whereas strategies lay out the general features of the possibilities desired to be encapsulated, a soundly accepted theory encapsulates what the genuine possibilities are.

I have mentioned that continuing to adopt strategies is subject to their fruitfulness. So, while adopting strategies may be linked dialectically with values, it also remains under long-term empirical constraint. But since the grounds for adopting (and continuing to adopt) a strategy must appeal to factors distinct from and additional to the cognitive values, it follows that *autonomy* is not (even in principle) realizable.

On the picture I am offering the success of research conducted under MS contributes to the *social consolidation* of MVC and to its influence in more and more spheres of life. This may

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[12] Moment 2 cannot be realized without the prior realization of Moment 1; but the **logic** of Moment 2 does not rest in any way on the dialectical relations between strategies and values. Actually being able to recognize the logic in play at Moment 2 may (psychologically) depend on engaging in research under the strategies. Note also that a theory may not become accepted unless it is (potentially) significant, for it can only become accepted (Moment 2) if relevant research (prior play at Moment 1) is conducted, and – devoid of potential significance – the research may not be conducted. It remains a serious error to derive the falsity of theories from their lack of potential significance, or from their failure to fit the constraints of favored strategies.

largely explain why MS are rarely contested and (more strongly) why it seldom enters mainstream scientific consciousness that there is a choice to be made about strategies to adopt. Then, science is thought of as the mode of inquiry conducted under MS – or simply as the next steps in the process of inquiry that has been under way for the past four centuries, the issue of strategies having been resolved with the demise of Aristotelian science (cf. my rebuttal of the Kuhnian answer in the previous section). When science is thought of in this way *autonomy* appears not only to be realizable but to be manifested to a high degree, and properly so; and the history of science appears to unfold in response principally to the cognitive values: Can a theory be generalized? Can it be rendered more parsimonious? Can it be reconciled with another theory? What does it predict under these boundary conditions? Can its predictions be vindicated experimentally, and can they hold up when we seek greater precision? What new domains of phenomena does it illuminate? What should we expect in new theories in order to address current anomalies? Much research is generated by asking questions like these, and they are fully intelligible without input from practical or valuative concerns (apart from the fact that the interest and urgency to explain particular phenomena often has practical roots) – provided that there is no contestation of strategies. Even so, it remains that research conducted almost exclusively under MS cannot manifest *neutrality* highly, and so *autonomy* is not rescued, unless it is redefined so that *significance* is expected not for all value-outlooks but only for those which include MVC. While *neutrality* is often thought of in this way (SVF: 236-48) it then becomes *value neutrality bounded by a value,* and it makes no claim on those who adopt viable value-outlooks that contest MVC.

Neither the social consolidation of MVC nor the rarely contested hegemony of MS *per se* rationally removes interest from competing value-outlooks and from research strategies with which they may be dialectically linked. My picture is consistent with there

being a multiplicity of fruitful strategies (and a progressive accumulation of scientific knowledge), each one in interaction with a particular value-outlook, each one exploring a different class of possibilities, and each one generating theories that become soundly accepted; so that each one enables the reliable encapsulation of possibilities of interest for the respective value-outlooks (SVF: chs 8 and 9; VAC: ch. 6). The (anticipatory) competing strategies I have in mind do not aspire to match MS in scope. Since they compete with MS, and gain part of their rationale from contesting MVC, we would expect to find them at the margins of society or in minority movements in predominant institutions. Consider agricultural research. Under one strategy – a materialist one – the possibilities for agricultural practice opened up by biotechnological research are explored; under another the possibilities of improving organic farming methods by developing "traditional" local, **agroecological** methods (SVF: ch. 8; VAC: ch. 6; numerous references cited in these chapters; Altieri (1987), (1990); Altieri, Rosset & Nichols (1997)).[13] Under the latter, MS would not be ignored but subordinated to forms of investigation in

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[13] "The agroecological approach regards farm systems as the fundamental units of study, and in these systems, mineral cycles, energy transformations, biological processes and socioeconomic relationships are investigated and analyzed as a whole. Thus, agroecological research is concerned not with maximizing production of a particular system, but rather with optimizing the agroecosystem as a whole. This approach shifts the emphasis in agricultural research ... toward complex interactions among and between people, crops, soil and livestock" (Altieri (1987): xiv-xv). Research in agroecology addresses both "traditional" agricultural practices and their contemporary developments (e.g., those directed towards "autodesarrollo campesino sostenido" – Delgado 1992; Delgado *et al.* (1990)) and "organic" farming practices in the advanced industrial countries.

which ecological and social relations are brought to the center of attention (e.g., Norgaard (1987); Lewontin & Berlan (1990)).[14]

The issues raised here are complex. On the one hand, if both strategies indeed turn out to be fruitful it would seem to be an unambiguous gain, enabling us to identify additional classes of possibilities, thus furthering the aim of gaining understanding of "the natural world." On the other hand, it may not be possible to actualize together two genuine possibilities: implementing bio-technology-informed agriculture on a significant scale, under the social conditions in which it is implemented, tends to undermine the conditions for agroecology, and *vice versa* (for the "mecha-nisms" involved, see Lappé & Bailey (1998); Pollan (1998)). Why, then, bother to explore possibilities unless they would or should gain the conditions to be actualized? Why engage in basic research unless applications are anticipated? So, while the picture permits a multiplicity of strategies, it also helps to explain why there could be pressures against actually multiplying strategies. These pressures do not negate that theories accepted under the dominant strategies may be accepted in accord with *impartiality*, but they put barriers in the path of any movement towards *neutrality*.

The issues are even more complex. It is not just that the two classes of possibilities cannot be actualized together (except in small-scale ways in different places). It does not seem to be coher-ent to aim to explore wholeheartedly **all** the possibilities of "the natural world" for, because of their incompatible conditions, even to conduct research exploring one class of possibilities can pre-clude probing exploration of another class. No single strategy suf-fices (even in principle, unless perhaps there were a compelling case for materialist metaphysics) for the exploration of all possi-bilities; and we cannot, as it were, create a "super" strategy by con-joining all of them. We cannot, not for narrowly logical reasons,

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[14] On the special place that should be accorded to MS among the ar-ray of (potentially promising) strategies, see SVF: 240-47; Lacey (1999d).

but because inquiry is conducted in a shared social space. Inquiry, whatever strategies it may be conducted under, requires the availability of appropriate material and social conditions; and the conditions required for inquiry under one strategy often cannot be present simultaneously in the same social space as those required for inquiry under another (SVF: ch. 7). Then, both inquiries cannot proceed, and at least one class of possibilities will remain under-investigated. Which inquiry proceeds will reflect the social value accorded the outcomes of research in leading contemporary institutions (SVF: ch. 8; VAC: ch. 6) – further building the pressures against multiplying strategies.

Research practices, then, at least when pursued forthrightly can be deeply incompatible; they cannot be conducted together in significant ways in the same social space. It follows that power – typically exercised *via* the mediation of values highly manifested and embodied in society – can be decisive in accounting for the theories that **come to be soundly accepted** or the kind of systematic empirical understanding that is actually gained and thus available for application; and thus that (at least anticipatory) social change may be a prerequisite for gaining the material and social conditions to develop research under strategies that interact in mutually reinforcing ways with value-outlooks that rest on presuppositions that contest deeply embodied values, such as those of MVC (SVF: chs 7 and 8).

These issues are well illustrated in the imbalance that exists in the conditions available for research in biotechnology-informed agriculture (and earlier in "green revolution" agriculture – SVF: ch. 8; VAC: ch. 6) and those for research in agroecology. While this does not undermine the positive discoveries obtained from the former (genuine possibilities are discovered and implemented), it makes it unlikely that we will come to gain appropriate knowledge pertaining to agroecological alternatives and to the ecological and social "side-effects" of biotechnology implementations (e.g., seeds becoming ever more fully turned into commodi-

ties – SVF: ch. 8; VAC: ch. 6; references cited in these chapters; Altieri (1987), (1990)). And indeed, the adequacy of the testing that has been done on alternatives and side-effects by those engaged in biotechnological implementations **has** been challenged by researchers in genetic theory (Lewontin & Berlan (1990)) as well as by (e.g.) environmentalists and agroecologists. Biotechnology theories that inform agricultural practices may be accepted in accordance with *impartiality*, and so we may expect that applying such theories (at least in the short run) will have the expected outcomes: high crop yields, fewer inputs, etc – and (if I may add in a social dimension) greater profits for those who can gain the conditions to engage in the practices. The research supports the *efficacy* (short run) of the applications; and, where MVC is highly manifested, efficacy may be taken practically to suffice for *legitimation*. But legitimation does not derive from power but from contribution to human well-being, and those who contest MVC (in the context of agricultural practice) do so on grounds that affirm that (at least in some locales) the effects of these applications undermine human well-being and the manifestation of values more conducive to furthering it. Thus the legitimacy of the applications presupposes the absence both of over-riding undesirable "side-effects" and of "better" agricultural alternatives.

Here, in summary, is the situation: The aim of science (to gain understanding) includes that of identifying the possibilities of "the natural world". This aim can be pursued only under a strategy. There is no reason to hold that (even in principle) the possibilities identifiable under any one strategy can exhaust the totality of possibilities. So research under any fruitful strategy contributes to satisfying this aim. But research under all (potentially) fruitful strategies cannot be conducted (since conducting it under one may preclude conducting it under another). So we cannot attempt to explore all classes of possibilities. To respond to the aim we must select a strategy – presumably one that will (in principle) enable us to

us to identify "interesting" possibilities. That selection must be informed by values (power or metaphysical commitments). *Autonomy* is not realizable.

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For many the picture I have sketched is profoundly disquieting. True, it takes Bacon's warning seriously, and denies values a role alongside or above the cognitive values in making theory choices. It gives no support to voluntarism, or to deriving fact from value.[15] But it portrays the pursuit of scientific research as standing within the framework of value disputes: the general privilege of MS (e.g., as distinct from its considered adoption in particular cases) is only as rational as the adoption of MVC. This permits (subject to fruitfulness) the adoption of alternative strategies in view of their having mutually reinforcing interactions with value-outlooks that contest MVC – apparently opening choice of strategy to the same kind of contestability as currently we find concerning values. Be that as it may: granting privilege to MS is not adequately grounded empirically, nor is commitment to materialist metaphysics. My picture pushes us to broaden the horizons for empirical inquiry.

How does it do this? Well consider again the question: Why grant privilege to MS? The answer is: because they are fruitful and they interact in mutually reinforcing ways with MVC. Why hold MVC? Part of the answer involves appeal to its presuppositions (section 1). But, for the most part, they cannot be investigated empirically under MS, and so research conducted exclusively un-

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[15] It does help us to identify the mechanisms whereby *impartiality* can be (and often is) violated in the modern scientific community (Lacey (1999d)).

der these strategies cannot feed back and provide them with support or criticism. We need multiple strategies for that.[16]

Earlier I defined *impartiality*, a value of scientific practices: accept theories if and only if they manifest the cognitive values to a high degree. Commitment to *neutrality* involves extending the range of domains of which we consolidate theories accepted in accord with *impartiality* – towards, I suggest, the ideal that any belief that plays a role in informing or legitimating a social practice of any salience be subject (appropriately) to critical empirical scrutiny. When research is conducted virtually exclusively under MS, we gain numerous soundly accepted theories that inform efficacious applications (generally of interest for MVC) but rarely do they speak directly to the presuppositions that legitimate MVC, or (e.g.) agricultural practices that are expressions of it.[17] Must we then conclude that covertly these presuppositions are accepted because they serve to legitimate MVC – that social values are in play alongside or in place of the cognitive values, and thus that the

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[16] But the possibility (and legitimacy) of research under strategies, other than MS, is widely queried in the mainstream. We find ourselves in a kind of conundrum here. My question concerns the legitimacy of granting privilege to MS. It does not arise from skepticism about the theoretical products generated under MS; it is about legitimacy, not epistemological foundations. But the legitimacy of the "legitimating discipline" appears itself to be in question.

[17] Power *de facto* tends to fill the vacuum, and legitimation draws upon "there is no evidence to support that there are harmful side-effects", etc – and puts the burden on those who contest the legitimation to provide the evidence. Often, of course, it is true that there is no relevant evidence available; then the argument (made from the perspective of rival value-outlooks) should be not that the applications are de-legitimated, but that their legitimation has not been established. Often also it is true because insufficient efforts have been made, or the conditions are not available, to conduct the relevant tests. *Neutrality* rejects that any party has a special burden in these cases – for when the burden is put on one party, and inadequate resources are made available for the relevant research, the outcome is bound to lack accord with *impartiality*.

presuppositions are not accepted in accordance with *impartiality*, but instead are ideological?

Ironically, or paradoxically, this impasse might be cut through by permitting research under multiple strategies. But the conditions required to carry out such research may not be readily available where MVC is highly manifested, so that to conduct it may already involve commitment to a value-outlook that contests MVC. Nevertheless, unless research is conducted under multiple strategies, any value-outlook will rest upon key presuppositions that have not been accepted in accordance with *impartiality*; then, *neutrality* will not be an approachable ideal and – since the scientific community often actually accepts presuppositions of the legitimacy of its applications and uses its "authority" to endorse them (Lewontin (1993)) – we may also doubt that the scientific community actually is committed to the expression of *impartiality* in a general way.

The pull of *neutrality* includes the desire to minimize the likelihood that one set of values dominate the direction of scientific research. The mainstream tradition has thought that the way to achieve this is to conduct research under MS, which permit no value-laden terms to be deployed in theories. But this way, we have seen, fails to realize high manifestations of *neutrality*, and it disguises the play of MVC in supporting the almost exclusive adoption on MS.

This is related to a "paradox" that Shapin has pointed to in common articulations of the self-understanding of the scientific tradition:

> The paradox ... concerns the relation between the objective and disinterested identity of the natural sciences and the everyday world of subjectivity, passions, and interests. This is the paradox: the more a body of knowledge is understood to be objective [*impartial*] and disinterested [*neutral*], the more valuable it is as a tool of moral and political action. Conversely, the capacity of a body of knowledge to make valuable

contributions to moral and political problems flows from an understanding that it was not produced and evaluated to further particular human interests (Shapin (1996): 164).

My alternative response to the pull of *neutrality* is to multiply strategies so that the interests of numerous value-outlooks can come to be informed by the sound results of scientific research.[18] It relieves the paradox since it recognizes that *impartiality* can coexist with lack of *neutrality*. Theories are evaluated in accord with *impartiality*, while produced under strategies adopted because of their significance with respect to particular values as well as because of their (potential) fruitfulness. Being accepted in accord with *impartiality* is sufficient to explain the efficacy of appropriately designed applications; the values (MVC) interacting with the strategies (MS) in this case explains its specific contribution to MVC.

When strategies are multiplied (as already suggested) key presuppositions of the value-outlooks that influence the adoption of particular strategies can be investigated empirically.

Consider, e.g., presupposition (d) of MVC that there is no genuine possibility in the foreseeable future for the social embodiment of value-outlooks that do not contain MVC (see Lacey (1997[a]) for discussion of how to investigate "future possibilities"). It is backed by various more specific assumptions, (e.g.) one often deployed to legitimate the rapid and vast implementation of biotechnology-informed agriculture: "there are no significant lost possibilities occasioned by these implementations," or: "apart from these implementations not enough food will be produced to feed the world's expanding population." Now, research under MS

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[18] This raises important questions about **who** are members of the communities engaged in systematic empirical inquiry, and whether their membership is limited to "professionals" with specified qualifications, or if it is also appropriate to require that there be a spread among the members of the communities of value-outlooks that are held (see discussion of *autonomy* in SVF: chs 4 and 10).

can produce answers to questions like: "How can we maximize food production under 'optimal' material conditions?" But not to questions like: "How can we produce food so that all the people in a given region will gain access to a well-balanced diet and so that social and ecological stability will be sustained?" But "no lost possibilities" can gain no empirical support apart from attempts to investigate empirically the second question. It follows that only if strategies – like those of agroecology – are developed under which this second question can be addressed in a systematic empirical way, can assumptions like "no lost possibilities" (and questions about enhancing and diminishing human well-being) cease to be ideological. Such strategies, which normally will incorporate MS in a subordinate role, aim to grasp farming practices, and the objects interacted with in them, without abstracting from the social and ecological relations into which they enter – they may well exhibit continuity with the "traditional knowledge" of a culture (SVF: ch. 8; VAC: ch. 6). They might turn out not to be fruitful, but we cannot know that in advance of engaging in research under them

The definition and development of such strategies would further *neutrality* (SVF: ch. 10); it would also involve mutually reinforcing interactions with various value-outlooks which are critical of MVC – those of some environmental groups and, of particular interest to me, grassroots movements in some third world countries that aim to enhance "local well being, agency and community" (SVF: ch. 8; VAC: ch. 6); and, if they were to prove fruitful their products would contribute to furthering the manifestation of such values – providing further grounds for challenging MVC. I think it is likely that the pulls of *neutrality* and MVC will be in opposite directions. Precisely for that reason those who wish to develop alternative strategies, and the social movements linked with them, will have to deal with the entrenched powers that are bearers of MVC.

7

Is science value free? It will now be apparent that a simple "yes or no" answer would be misleading. Rather we need to discern the ways in which science is and is not value free. Here is my conclusion: *Autonomy* is not realizable. *Neutrality* is susceptible of fuller manifestation in the practices of science (systematic empirical inquiry), but their current mainstream trajectories do not promise to bring about that fuller manifestation, so much so that one may query whether modern scientific practices are committed to the furtherance of *neutrality*. But *impartiality* remains a key value of all research practices conducted under any strategy.

The ground has now been cleared to permit us to keep at the center of attention the question: How should systematic empirical inquiry (science) be conducted and institutionalized today so as to be of greatest service to furthering the well-being, in all of its dimensions, of as many people as possible? In turn, this question will become interpreted concretely as related questions are posed (SVF: ch. 10): How widely should we multiply strategies – in response to what range of value-outlooks, expressive of what range of conceptions of human well-being, articulated by what range of social and political movements? How exactly do current scientific practices (and their forms of institutionalization) contribute to furthering and diminishing human well-being? What anticipatory alternatives might be worth exploring more fully?[19] Compare:

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[19] Recent work in the social studies of science casts light on many of these questions though much of it tends to ignore the separation of moments (strategy adoption/theory choice) that I have emphasized. Kitcher (1998) expresses an outlook which admits distinct places in the appraisal of science for both cognitive considerations and sociohistorical analyses which address questions of the impact of science on "human flourishing" (or "the quality of life", Kitcher (1997): ch. 13) – an outlook to which mine is close (apart from the fact that he does not recognize the possibility of multiple strategies).

... the most important topic in the philosophy of science, the relation of science to human values. What contributions can or should science make to human well-being? ... ... If there is one conclusion of overriding importance to be drawn from the increasing realization in recent times that science is a human product, it is that, like other human products, the only way it can ultimately be evaluated is in terms of whether it contributes to the thriving of sentient beings in the universe (Dupré (1993): 244, 264).
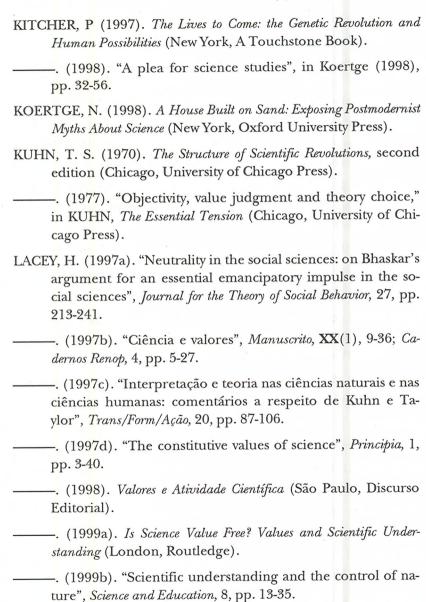
And:

Reflective people ... want to know whether research in various areas is skewed by the values of particular groups and, at the broadest level, how science bears on human flourishing. ......
It has been obvious for about half a century that research yielding epistemic benefits may have damaging consequences for the individual or even the whole species. Philosophical stories about science have been narrowly focused on the epistemic. Faced with lines of research that have the capacity to alter the environment in radical ways, to transform our self-understanding, and to interact with a variety of social institutions and social prejudices to affect human lives, there is a much larger problem of understanding just how the sciences bear on human flourishing (Kitcher (1998): 46).

These questions can no longer be brushed aside on the ground that values have no proper place in setting the direction of scientific research. One way or the other, some values (or metaphysics) must play such a role, ensuring that understanding gained under a strategy is primed to be significant for value-outlooks containing these values. Better that the role played be a consequence of discussion and deliberation, rather than a covert one played in subtle dialectical interaction with the reigning values of the age. Of course, it is important that the role be played at the right (logical) moment, that of adoption of strategy, and never at the expense of *impartiality*. Recognizing this should not obscure there are rich dialectical interactions among the questions: "How

to conduct scientific research?", "How to structure society?" and "How to further human well-being?" Science may be appraised, not only for the cognitive value of its theoretical products, but also for its contribution to social justice and human well-being.

REFERENCES

ALTIERI, M.A. (1987). *Agroecology: the Scientific Basis of Alternative Agricultures* (Boulder, CO: Westview Press).

————. (1990). "Why study traditional agriculture?" in CARROLL, VANDEMEER & ROSSETT (1990), pp. 551-564.

ANDERSON, E. S. (1995). "Knowledge, human interests, and objectivity in feminist epistemology", *Philosophical Topics*, 23, pp. 27-58.

BACON, F. (1620/1960) *The New Organon and Related Writings* (Indianapolis, Bobbs-Merrill).

CARROLL, C.R., VANDEMEER, J.H. & ROSSET P.M. (eds.) (1990). *Agroecology* (New York, McGraw-Hill).

CUPANI, A. (1998). "A propósito do 'ethos' da ciência", *Episteme*, 3, pp. 16-38.

DELGADO, F. (1992). *La Agroecología en Las Estrategias del Desarrollo Rural* (Cusco, Centro de Estudios Regionales Andines "Bartolomé de las Casas").

DELGADO, F. *et al.* (1990). *Agroecología y Saber Andino* (Cochabamba, AGRUCO-PRATEC).

DUPRÉ, J. (1993). *The Disorder of Things: Metaphysical Foundations of the Disunity of Science* (Cambridge, Harvard University Press).

KELLER, E. F. (1982). "Feminism and science", *Signs: Journal of Women in Culture and Society*,7, pp. 589–602.

KITCHER, P (1997). *The Lives to Come: the Genetic Revolution and Human Possibilities* (New York, A Touchstone Book).

————. (1998). "A plea for science studies", in Koertge (1998), pp. 32-56.

KOERTGE, N. (1998). *A House Built on Sand: Exposing Postmodernist Myths About Science* (New York, Oxford University Press).

KUHN, T. S. (1970). *The Structure of Scientific Revolutions*, second edition (Chicago, University of Chicago Press).

————. (1977). "Objectivity, value judgment and theory choice," in KUHN, *The Essential Tension* (Chicago, University of Chicago Press).

LACEY, H. (1997a). "Neutrality in the social sciences: on Bhaskar's argument for an essential emancipatory impulse in the social sciences", *Journal for the Theory of Social Behavior*, 27, pp. 213-241.

————. (1997b). "Ciência e valores", *Manuscrito*, **XX**(1), 9-36; *Cadernos Renop*, 4, pp. 5-27.

————. (1997c). "Interpretação e teoria nas ciências naturais e nas ciências humanas: comentários a respeito de Kuhn e Taylor", *Trans/Form/Ação*, 20, pp. 87-106.

————. (1997d). "The constitutive values of science", *Principia*, 1, pp. 3-40.

————. (1998). *Valores e Atividade Científica* (São Paulo, Discurso Editorial).

————. (1999a). *Is Science Value Free? Values and Scientific Understanding* (London, Routledge).

————. (1999b). "Scientific understanding and the control of nature", *Science and Education*, 8, pp. 13-35.

————. (1999c). "On cognitive and social values: a reply to my critics", *Science and Education*, 8, pp. 89-103.

————. (1999d). "Values and the conduct of science: principles," paper presented at Conference on "Principles" (Florianópolis, Universidade Federal de Santa Catarina).

LACEY, H. & SCHWARTZ, B. (1996). "The formation and transformation of values", in W. O'DONOHUE & R. KITCHENER (eds.) *The Philosophy of Psychology* (London, Sage).

LAPPÉ, M. & BAILEY, B. (1998). *Against the Grain: Biotechnology and the Corporate Takeover of Your Food* (Monroe, ME, Common Courage Press).

LEISS, W. (1972). *The Domination of Nature* (Boston, Beacon Press).

LEWONTIN, R.C. (1993). *Biology as Ideology* (New York, Harper Perennial).

LEWONTIN, R.C. & BERLAN, J-P. (1990). "The political economy of agricultural research: the case of hybrid corn", in CARROLL, VANDEMEER & ROSSETT (1990), pp. 613-28.

LONGINO, H.E. (1990). *Science as Social Knowledge* (Princeton, Princeton University Press).

MAXWELL, N. (1984). *From Knowledge to Wisdom: a Revolution in the Aims and Methods of Science* (Oxford, Blackwell).

NORGAARD, R.B. (1987). "The epistemological basis of agroecology", in ALTIERI (1987), pp. 21-27.

POINCARÉ, H. (1920/1958). *The Value of Science* (New York, Dover).

POLLAN, M. (1998). "Playing God in the garden", *The New York Times Magazine*, October 6, 1998.

SHAPIN, S. (1996). *The Scientific Revolution* (Chicago, University of Chicago Press).

TAYLOR, C. (1982). "Rationality", in M. HOLLIS & S. LUKES (eds.) *Rationality and Relativism* (Cambridge, MIT Press).

TILES, M. (1987). "A science of Mars or Venus", *Philosophy*, 62, pp. 293-306.

TILES, M. & OBERDIEK, H. (1995). *Living in a Technological Culture: Human Tools and Human Values* (London, Routledge).