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VALUES AND THE CONDUCT OF SCIENCE: PRINCIPLES¹

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ABSTRACT

*In this paper I will propose six principles governing the proper role of moral and social values in the conduct of scientific investigation. I offer them for your consideration, and hope that together we can sharpen their formulation, explore their implications and test their acceptability. In making my proposals I draw considerably from my recent books, *Valores e Atividade Científica* (VAC, Lacey 1988) and *Is Science Value Free? Values and Scientific Understanding* (SVF, Lacey 1999a). The detailed argument, and elaboration of the technical notions that I use are to be found in them (and summarized in Lacey 1999c). The sketch of the argument that I offer here is intended to display the motivation behind the proposed principles.*

In common self-portrayals of the modern scientific tradition there is no proper role for moral and social values to play at the core of scientific activity: values have nothing to do with accepting theories or with providing direction for “fundamental” scientific research. At the core, the rationally-relevant work is done by the empirical data, the cognitive values, and the ability and ingenuity of scientists who, in the light of available data, aim to accept theories that manifest the cognitive values highly (Lacey 1997a), and whose research gains direction from aiming to obtain high (and sometimes higher) manifestations of the cognitive values in theories that progressively provide understanding of large

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classes of phenomena. From this account of the core of scientific activity there follows just one principle concerning the place of values in relation to it, I state it (roughly) as follows

The “no-values” principle Permit no role to moral and social values in the judgments involved in the choice (acceptance and rejection) of theories and in setting the direction of “fundamental” scientific research

Fundamental scientific research, of course, has material and social conditions, and whether or not they are provided depends on moral and social values, and on how highly science itself is assessed as a social value. But then the values influence not the content and direction of the investigation but its historical rhythms. The relative ranking of science as a social value leads also to another principle, not one that addresses the core of inquiry, but one reflecting that the pursuit of science does not justify any means

The “ethical restraints” principle The conduct of science, especially of experimental inquiry, is subject to ethical constraints

Clearly how this principle is interpreted concretely will draw upon subsidiary principles about what counts as “ethical” — a matter that cannot be settled internally by science

Generally the two principles do not conflict. On occasion, however, research may have to be re-directed in the absence of ethically-acceptable means for following a desired research direction. But that does not bring values into the judgments involved in choosing theories, at most it may

require withholding judgments on certain theories I will not discuss “ethical constraints” further in this paper (but see Appendix 1)

Clearly not all actual science accords in fact with “no-values” For the proponents of the principle this shows that sometimes, regrettably, “bias” and “distortion” enter into the core of science Nevertheless the aim remains (for them) to provide sound understanding of the natural world — as it is independent of its relations with investigators — free from human-originated distortions In order to ensure fuller adherence to “no-values,” the principle may be supplemented by institutional and practical procedures and prescriptions (e g)

- Engage in empirical sociohistorical investigation of the (possible) sources of biases, and take steps to eliminate them in practice This may involve the identification and adoption of secondary principles (e g) “use double-blind methods in the evaluation of clinical trials,” or (in studies with significant social implications) “make sure that a wide range of value-outlooks are represented among the members of the research community ”
- Train scientists to adopt the “scientific ethos” (Cupani 1998)

The “no values” principle concerns the core of scientific activity Those who endorse it recognize that, when we move away from the core, values may come to play a variety of legitimate roles with respect to (e g) setting the direction and aims of applied research, appraising the legitimacy of applications, providing sources of ideas in the “context of discovery” and of motivation to engage in research I will leave these “peripheral” matters aside (see SVF 12–19)

The account I have just sketched is readily recognizable, and its attraction is obvious. It is reinforced by widely held views about scientific realism, materialist metaphysics, and the subjective character of values. Nevertheless, “no-values” is systematically violated throughout the practices of modern natural science — and, I believe, there is no way in which they could be reconstituted so as to conform to it. At first sight this may seem to be quite implausible. How could values be playing a role at the core? After all, the very categories deployed in scientific theories preclude that theories have value judgments among their entailments — for they are chosen so that they can represent phenomena and their possibilities in terms of their being generated from underlying structure, process, interaction and law, in abstraction from any place they may have in relation to social arrangements, human lives and experience, from any link with value. Theories simply do not address matters of values, scientific methodology has been designed to ensure this. Yes! But theories constructed with these categories are suited to application much more for those value-outlooks that endorse the shaping of society on the basis of technological implementations, more precisely those that include (what I call) “the modern valuation of control” (see below). Concerning matters of application (for the most part) modern science is not *neutral* (SVF ch. 10). We will see that this reflects a role that the modern valuation of control is playing in setting the direction of scientific research. The methodological rule, “Don’t deploy value-laden terms in the construction of theories,” is not sufficient to ensure compliance with the “no-values” principle.

The remainder of the article will be devoted to motivating and formulating a set of normative principles governing values and the conduct of science. I leave it open whether or not the set is complete, but I will argue that each princi-

ple can not only be defended, but also — unlike “no-values” — be conformed with in actual scientific practice

* * * * *

I think that part of the “no-values” principle is correct I’ll put it this way

Principle 1 — Impartiality Accept a theory of a domain of phenomena if and only if it manifests the cognitive values to a suitably high degree in the light of available empirical data, and reject a theory if and only if a theory inconsistent with it has been accepted — so, permit no role to moral and social values in the judgments involved in choosing theories

Impartiality does not depend on the above-mentioned methodological rule to keep value-laden terms out of theories, and it presupposes the distinction between cognitive and other kinds of values (SVF chs 4 and 10, Lacey 1997, 1999b, c) The only values to which it permits a role in making sound theory choices are cognitive values² To further the likelihood of its being adhered to Principle 1 should be accompanied by the subsidiary principle

- (a) Pay attention to empirical sociohistorical studies of the mechanisms of departure from *impartiality*, and test that one’s judgments of theory acceptance are unaffected by these mechanisms

One mechanism is particularly worthy of note (see Appendix 2 for further mechanisms) It has two sources (i) Theories are evaluated not only for their cognitive value but also for their *significance* (the potential social value of

their applications — SVF 15) (ii) Because of the material and social conditions needed for research, in their actual manifestation it may not be easy to *separate* cognitive from some other values (though they remain *distinct*), so that *under these conditions* judgments of acceptance and significance will effectively tend to coincide. Consider (e.g.) a statement I recently read that purports to state a simple fact not to suggest any criticism: “By its very nature, biotechnology tends towards privatization” (Postlewait, Parker & Zilberman, 1993). Given the material and social conditions under which biotechnology research currently proceeds, acceptance of biotechnology theories (in accord with *impartiality*) may be virtually inseparable from appraising them as especially significant for projects that express values linked with privatization. While this is compatible with *impartiality*, to *reject* theories because they are not potentially significant for a value-outlook is not. Where the manifestations of cognitive and certain other values appear to be virtually inseparable, this may become too fine a point to be genuinely sensitive to — *that* is the mechanism of departure from *impartiality* worthy of note, it involves subtly giving a social value play alongside (or above) the cognitive values. Thus (e.g.) theories in agriculture, which query the possibilities touted in the name of biotechnology and affirm the greater potential of developments of traditional approaches to agriculture, are often not only not investigated, but outright rejected by researchers with close ties to agribusiness. It may be soundly accepted that a biotechnology theory encapsulates agricultural possibilities, of interest given the values of privatization, it does not follow from this that a radically different theory (or set of theories) does not encapsulate possibilities of greater significance from the perspective of another value-outlook — e.g., one that especially values the empowerment of local farmers and sustaining

social and ecological conditions that support widespread well-being — or possibilities whose reliable encapsulation casts doubt on the legitimacy of some of the practices of biotechnology-informed agriculture

This discussion suggests two further subsidiary principles

- (b) Make every effort to separate judgments of acceptance of theories from judgments of their significance for particular value-outlooks
- (c) When a soundly accepted theory is significant for one's value-outlook, scrutinize rigorously the rejection of any theories that (if soundly accepted) would be significant for rival value-outlooks or that would tend to undermine the legitimation of practices informed by one's value-outlook

Impartiality captures the first part of the “no-values” principle, but the second part remains elusive. The goal to generate and consolidate theories manifesting the cognitive values highly progressively of more and more domains of phenomena and possibilities provides (and can provide) no direction to scientific investigation. Put like that, it is left completely unspecified (for any domain of phenomena) what are the relevant kinds of empirical data to procure, the appropriate descriptive categories for observational reports, the kinds of theories to posit for further investigation, the kinds of possibilities to attempt to encapsulate, and the kinds of questions that may be addressed effectively. Unless such matters are specified the cognitive values cannot play their role as criteria of choice among competing theories. I think that the goal just stated expresses in broad terms the goal of scientific inquiry (SVF ch 5) — where I include under “science” any form of systematic em-

pirical inquiry, but it can be pursued only under (what I call) a *strategy* (“*estrategia de restrição e seleção*” VAC, Lacey 1997a), whose key roles are to *constrain* the kinds of theories that may be entertained and, reciprocally, to *select* the kinds of empirical data that acceptable theories should fit. Only when a strategy has been adopted can questions be formulated so as to be open to effective empirical investigation, and different kinds of questions often require the adoption of different strategies. Which strategy to adopt cannot be settled by appeal to the cognitive values alone, and often not without appeal to moral and social values.³

Consider the following two questions (cf SVF ch 8, VAC ch 6). The “maximizing” question: How can we maximize production of a crop under conditions — use of fertilizers, pest and weed management techniques, water, machinery, strains of seeds, etc — that can be widely replicated? And the “local well-being” question: How can we produce a crop so that all the people in the region of the production will gain access to a well balanced diet in a context that enhances local agency and well-being and sustains the environment?

Both questions call for systematic empirical inquiry, both belong to the province of science. Adherence to particular social values might lead to prioritizing one or the other but, in both cases, sound answers will be rooted in empirical data and appraised in the light of the standard criteria, i.e., of how well they manifest the cognitive values: empirical adequacy, consilience, explanatory scope, predictive and explanatory power and the like. Answers to “maximizing” can be informed directly by current research in biotechnology (BT) on genetically modified plants; “local well-being” is addressed directly in research in agroecology (AE). Research projects of BT and AE are conducted under different strategies. Those of BT are typical of research conducted

under (what I call) *materialist strategies*

Most of modern science adopts virtually exclusively various forms of materialist strategies ⁴ 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 underlying structure, process, interaction and law, in abstraction from whatever social, human and ecological possibilities may also be open to them Reciprocally, empirical data are selected, not only to meet the condition of intersubjectivity, but also so that their descriptive categories contain generally quantitative terms, applicable in virtue of measurement, instrumental intervention and (above all) experimental operations

AE, it should be noted, is not conducted under materialist strategies (though it may include materialist research in a subordinate way), its immediate objective is to investigate the possibilities of agricultural systems considered as wholes, and so it does not abstract from the social, human and ecological dimensions of things (Lacey 1999c), so that the possibilities of principal interest to it — of plants, seeds, etc — will not generally coincide with the possibilities encapsulated under the strategies of BT There may be genuine possibilities of both kinds, even if — under current historical conditions — it may not be possible for both kinds to be realized together significantly (Lacey 1999c) ⁵

I now turn to the question Why has the modern scientific community adopted materialist strategies almost exclusively? (Why, e g , to consider a particular, does it tend to

be more interested in BT than AE?) What (if any) are the rational grounds for the virtually uncontested adoption of materialist strategies in modern science? Elsewhere I have considered and rejected several answers to this question that derive from such sources as materialist metaphysics, scientific realism (SVF ch 6) and Kuhn's philosophy of science (SVF ch 7) (See also Lacey 1999c) The answer I favor rests upon a mutually reinforcing interaction (deeply embodied in modern societies) between research conducted under materialist strategies and commitment to the modern valuation of control (The details and the argument are developed in SVF ch 6)⁶ I emphasize that I am putting social values at the center of the rational grounds for the general privilege granted materialist strategies in modern science, in particular inquiries, addressed to specific kinds of questions, there may be good reason to adopt materialist strategies that have little to do with the interaction that I have identified

If I am right that the interaction constitutes the key part of the rational grounds (and not just the social explanation) for the privilege, then there remains no compelling reason for those who contest the modern valuation of control (like those who engage in AE) not to explore alternative strategies that interact in mutually reinforcing ways with their prioritized values of local well-being, social justice and ecological stability, and (e g) to put at the center of attention "local well-being" rather than "maximizing" (SVF ch 8, VAC ch 6) Put another way, there is no rational obstacle to adopting strategies on the ground that theories that may become soundly accepted under them (in accord with *impartiality*) would be especially significant for the value-outlooks that interact in mutually reinforcing ways with the strategies

My answer to the question posed and the implications I

have drawn remain in accord with *impartiality*. They license neither rejecting soundly consolidated results gained under one strategy on the ground that they lack significance for value-outlooks linked with a favored strategy, nor accepting theories on the ground of their likely or hoped-for significance. The goal remains to generate and consolidate theories that manifest the cognitive values highly. Thus strategies should be held to the condition of *fruitfulness* under them theories that manifest the cognitive values highly actually are and continue to be gained. Fruitfulness, of course, can only be expected with the passage of time and the necessary material and social conditions being provided for carrying out the research, but, granted this, a strategy's failing to display fruitfulness is a compelling ground to discontinue research under it.

There emerges from this discussion a picture in which there are two logically distinct moments involved in the processes that lead to choosing theories. At the first moment, a strategy is adopted when, in effect, one lays out in the most general terms the kinds of phenomena and possibilities chosen to be investigated, in the case of materialist strategies, the material possibilities of things and phenomena in spaces where their possibilities are exhausted by their material possibilities. Then (logically) at the second moment, from the array of theories provisionally entertained that fit the constraints of the strategy, one of them may come to be accepted in accordance with *impartiality*, and thus encapsulate what the genuine possibilities (of the kinds under investigation) are. Subject to fruitfulness, it is legitimate for moral and social values to influence strongly the adoption of a strategy (Adopt the strategies of BT in order to further the commercialization of agriculture, or those of AE in order to help to preserve biodiversity.) At the second moment, however, only the data (and other accepted theo-

ries) and the cognitive values are relevant. The important thing is to keep the roles of the social and cognitive values separate, and the legitimate role of social values strictly confined to the first moment. Social values do not have a proper role at the second moment acting *alongside* the cognitive values, but only at the first moment when strategies are adopted. Since continuing to adopt strategies is subject to their fruitfulness, adopting strategies is *both* linked dialectically with values *and* under long-term empirical constraint.

Motivated by this long discussion, I propose several further principles, and subsidiaries that should accompany them and help in their interpretation.

Principle 2 — Separation of strategy adoption and theory choice Keep the moments of strategy adoption and theory choice logically separate.

- (a) Define the strategies under which research is being conducted sufficiently explicitly so that the grounds for their adoption can be formulated and appraised.

Principle 3 — Multiple strategies Recognize the legitimacy and indispensability of systematic empirical research conducted under a variety of strategies, where a strategy may interact in mutually reinforcing ways with (different) particular values (and be largely motivated by the adoption of these values), but do not engage in research under strategies that, following extended and appropriately supported efforts, do not meet the test of fruitfulness.

- (a) Ensure that researchers, who hold a variety of value-outlooks, are represented among the community of investigators.

Principle 4 — Neutrality Permit research to be conducted under a sufficient range of strategies so that all viable value-outlooks can come to draw evenhandedly from the body of theories soundly accepted in accordance with *impartiality* those ones (respectively) that are significant for them, and so that the full range of side-effects of applications of theories can be systematically investigated and evaluated

Where the common view, stated at the outset, aims to achieve *neutrality* by acting according to the “no-values” principle and the methodological rule (effectively) to conduct research under materialist strategies, my alternative aspires to *neutrality* through expanding the range of available soundly accepted theories by permitting the deployment of multiple strategies each of which influenced by different value-outlooks (See SVF ch 10 for more on *neutrality*) I reject granting exclusivity to research conducted under materialist strategies Yet, I don’t want to consider them simply on a par with other strategies Their extraordinary fruitfulness precludes treating them in this way More importantly, control of natural objects plays a role in all forms of life regardless of value-outlook adopted — the modern valuation of control is not adopted in all value-outlooks but, where it is not, control subordinated to other social values is so that we reasonably expect that, for any viable value-outlook, some products of research conducted under materialist strategies will be significant to some extent Thus, research conducted under materialist strategies, appropriately subordinated to the desired social values and not (e g) adopted to the exclusion of indigenous forms of knowledge, will be a constituent of research under all strategies (SVF ch 10)

It should also be noted that under materialist strategies

alone important side-effects of applications cannot be appropriately investigated. Consider the case of BT in agriculture. Under materialist strategies the effectiveness and efficiency of certain of its applications can be soundly tested — questions like “maximizing” can be answered. But that, under the material and social conditions that enable the applications to be made, seeds become turned ever more completely into commodities is (for those whose compass is limited to materialist strategies) an externality to the scientific research. Moreover, that there may be important “lost possibilities” occasioned by displacement of traditional agricultural methods necessitated by the new methods simply cannot be addressed without investigation that takes into account the knowledge (and its possibilities for improvement, as in AE) that informed the traditional methods. That the supporters of BT-shaped agriculture take for granted that there are no important lost possibilities so that their methods provide the only way to feed the world’s growing population provides an instance of the operation of mechanism of departing from *impartiality* discussed earlier in this article (SVF ch 8, and the numerous references cited there, VAC ch 6, Lacey 1999b, c). That mechanism functions most powerfully, and imperceptibly, where the exclusivity of materialist strategies is not questioned and where the modern valuation of control is presumed to represent a universal — in the centers of power and influence of the advanced industrial countries and in the forces that are driving the entrenchment of “globalization.”

* * * * *

So far I have suggested some principles that should govern the role that values play in the conduct of scientific inquiry, ones that have import for epistemic and application issues,

but I have not discussed anything about the nature of values Elsewhere (SVF ch 2, VAC ch 2) I have developed a view in which values of various kinds (personal, moral, social, etc) are held together in complex sets or *value-outlooks* (Lacey 1999b) rendered coherent and ordered by certain presuppositions about human nature and about what is possible I cannot defend this view here According to it, however, the presuppositions of a value-outlook are open to some measure of empirical investigation, so that — while it remains true that theories have no value judgments among their entailments — the outcome of scientific inquiry can undermine the rational credentials of a value-outlook (SVF ch 4, Lacey 1997b) Let us explore what implications this may have for my claim that strategies may be adopted in view of their mutually reinforcing interactions with values I will begin this exploration by looking more closely at the modern valuation of control and its presuppositions

The modern valuation of control may be articulated as having the following components (SVF ch 6 VAC ch 5) ?

- The instrumental value of natural objects is dissociated from other forms of value, then the exercise of control over them becomes *per se* a social value not systematically subordinated to (or balanced with) other social values
- Expanding (*via* research and development, and the creation of new technologies) the range of natural objects over which human control may be effectively exercised, and the range of phenomena that can thereby be brought about, is very highly valued, as is its widespread institutional embodiment
- Control is the characteristic human stance to adopt towards natural objects Exercising control and,

above all engaging in the 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, 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 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 implementations largely as "second thoughts."

The modern valuation of control is highly manifested and embodied throughout the world today and endorsed by the predominant institutions of power, it is capable of much higher manifestation in more societies and in more domains of life, and we may expect that the trend towards its higher manifestation will continue for quite some time. At the same time, the rational grounds for adopting the modern valuation of control, as distinct from the factors that explain its widespread adoption, derive from the following diverse set of presuppositions (perhaps among oth-

ers) (a) Ongoing technological innovation serves the well-being of human beings in general since it is indispensable for "development," and thus for a just society (b) Technological solutions can be found (and will be put into effect) for virtually all problems, including those occasioned by the "side-effects" of technological implementations (c) The modern valuation of control 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 the modern valuation of control, that can be actualized in the foreseeable future (e) When we exercise control over objects, informed by sound understanding gained under materialist strategies, we are dealing with objects as they are in themselves as part of "the material world" — and that is why projects shaped by the modern valuation of control have been so spectacularly successful

I cannot make the argument here, but 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. Notice that, with the possible exception of the last one, all of the presuppositions are arguably open to empirical investigation, so that the rationality of adopting the modern valuation of control would be enhanced by their gaining positive empirical support.

This puts us into an interesting dialectical situation. I have claimed that the principal grounds for the almost exclusive adoption of materialist strategies in modern natural science lie in the mutually reinforcing interaction between them and the modern valuation of control. Its rationality,

then, is tied to the rationality of adopting the modern valuation of control, and thus to the acceptability of presuppositions (a)–(e). If these presuppositions lack empirical support, or especially if the evidence counts against them, the emphases of current scientific practices would have to be called into question. Ongoing research under materialist strategies itself cannot resolve the matter for its results barely speak to the presuppositions. Ironically, or paradoxically, evidence for the presuppositions — and thus rational support for the almost exclusive adoption of materialist strategies — could be obtained only by engaging in research under non-materialist strategies.

Consider, e.g., presupposition (d) that there are no significant possibilities in the foreseeable future for the significant embodiment of value-outlooks that do not contain the modern valuation of control (see Lacey 1997b for discussion of how to investigate “future possibilities”). It is backed by various more specific assumptions (e.g.) the “no lost possibilities” assumption (referred to above), one often deployed to legitimate the rapid and vast implementation of BT-informed agriculture. Now, research under materialist strategies can produce answers to questions like “maximizing,” but not to “local well-being.” But “no lost possibilities” can gain no empirical support apart from attempts to investigate questions like the latter empirically. It follows that it is important to define strategies (of AE) under which “local well-being” can be addressed in a systematic empirical way, if presuppositions like “no lost possibilities” are to be removed from the realm of the ideological. Such strategies, as already indicated, need not reject research under materialist strategies entirely, only subordinate it in a way that farming practices, and the objects interacted with in the course of them, are not abstracted from the social and ecological relations into which they enter (Lacey 1999c) — they may well

exhibit continuity with the “traditional knowledge” of a culture (SVF ch 8 VAC ch 6) They may turn not to be fruitful, but we cannot know that in advance of engaging in research under them

This reflection motivates another principle intended to complement Principle 4

Principle 5 — Rationality of adoption of strategy Permit research to be conducted under a sufficient range of strategies so that the presuppositions of the value-outlooks that interact in mutually reinforcing ways with particular strategies can be addressed (to the extent possible) in systematic empirical ways

Following this principle would serve to minimize the influence of ideology and of disputed values upon setting the direction of scientific research It would balance emphasis on materialist strategies with consideration of the presuppositions and conditions of their adoption, and thus permit the question of human well-being to be put right at the center of attention

Philip Kitcher has written

To claim that the sciences achieve certain epistemic goals that we rightly prize is not enough — for the practice of science might be disadvantageous to human well being in more direct, practical ways A convincing account of practical progress will depend ultimately on articulating an ideal of human flourishing against which we can appraise various strategies for doing science The extreme positions are clear At one pole it is suggested that science, as it is practiced, is a terrible thing, and that human beings want none of it, at the other, that science, as we have fashioned it, is already perfect Neither extreme is likely to be right (Kitcher 1993 391)

I conclude by proposing one more principle, whose institutional and political ramifications urgently need exploration for they concern the relationship of science to democratic institutions

Principle 6 — Impact on human flourishing Adopt a strategy only in the light of reflection, that draws upon relevant empirical investigation, of the likely (and potential) impact on human flourishing of conducting research under it, of providing the material and social conditions required for the research, and of its potential applications

- (a) Pay attention to the various conceptions of human flourishing that are carried by contemporary groups, not only within predominant institutions but also among movements which contest the values embodied in these institutions,⁸ and explore how their presuppositions could be submitted to empirical test, then ask should strategies be adopted in research (additional to or in place of those currently being followed) that interact dialectically with the values that flow from some or other of these conceptions?

Following these six principles would open up to empirical scrutiny the presuppositions that shape the directions of scientific inquiry and legitimate its applications, thereby expanding markedly the scope of systematic empirical inquiry — without impinging on, and indeed enhancing, the value of impartially gained knowledge. So, following them would further the cognitive (epistemic) ends usually linked with scientific practice and, at the same time, contribute to furthering human flourishing. It would keep us honest and serve humanity, it would also run counter to the reigning tendencies of our age

Appendix 1: ethical restraints

The “no-values” principle is a composite of *impartiality* (Principle 1) and *autonomy* scientific research (at least “basic” research) is or should be driven by cognitive considerations, thence, e g , government (other repositories of power and bearers of moral and social value) should not play a role in setting or restricting scientific agendas (On *autonomy*, see SVF chs 4 and 10 Lacey 1999b, c) But the genuine value of expanding the stock of theories accepted in accord with *impartiality* does not override all other values Certain ethical restraints upon the conduct of scientific (especially experimental) inquiry are clearly appropriate, e g , that the human rights of experimental subjects be respected and that public standards concerning health, safety and environmental protection be met Thus, even for those who endorse “no values,” there may be a need to “compromise” with *autonomy* Working out the details of the compromise, and who should be involved in working it out, are important moral and political issues

Where ethical factors restrain experimental research, gaining some of the data needed to test some theories’ acceptability may be hindered, then, the interest in testing these theories becomes superseded, at least temporarily, until some other (ethically acceptable) mode of testing is devised (The value of scientific knowledge always remains subordinate to that of the well-being of human beings) I doubt that anyone would deny the legitimacy of ethical restraints on experimental practice, even where they are likely to have some (negative) impact on the outcomes of scientific inquiry Where these restraints are appropriate, the public (and thus the state) has an interest in their being acknowledged and acted upon, and the state may legislate

to ensure that they are acted upon, though the scientific community tends to be reluctant to accept this, no doubt fearing that it might provide an excuse for more intrusive state intervention. To see how legislation for ethical restraints may be legitimate (and how its necessity can be circumvented), I offer a few thoughts about how to think about ethical restraints by looking briefly at the currently controversial issue of the use of animals in experimental research. (These thoughts need to be developed so that the proper balance between "ethical restraints" and my six principles can be articulated in detail.)

Is passing legislation about the use and treatment of animals in research an appropriate way for the state to intervene in scientific research? In general, I think not, though there may be cases where such legislation may be expedient and, provided that it is developed in close collaboration with experienced members of the scientific community, constructive. I do not query that the trade-off between "animal rights" and "freedom of research" is properly a matter for public debate. In that debate, it is commonly argued that the potential gains for human health and well-being from the research using animals outweigh any claims made on behalf of animal rights. Nevertheless, the well-being and proper treatment of animals is itself a value, adhered to strongly by certain groups in contemporary society, even if — as I hold — it is one subordinate to the value of human life and well-being. Since it is a value, due respect should be paid to it in the course of scientific research. Thence, e.g., subordinate to the requirements of sound research, animals should be used to the minimal extent possible, their suffering avoided where possible, and they should be kept in decent conditions. They should not be used as experimental subjects if alternative methods are available, if the research in question (e.g., that involved in

testing new cosmetics) is motivated by market-driven considerations that have little to do with satisfying human needs, or if it (e.g., that aiming to “improve” biological weapons) occurs within projects that are morally abhorrent.

Frequently it is said that there are too many “useless” experiments conducted upon animals. No doubt it is true that many experiments simply disconfirm proposed hypotheses, replicate previous results, or fail to constitute advancements of knowledge or to engender applications that enhance human well being. That does not imply that they are “useless” (though some certainly are) for it is an integral part of the process of science that one cannot know in advance what will be the positive outcomes of research, otherwise there would be no need for experiments. On the other hand if it could be shown that relevant research (in a particular area) could be carried out productively without (or with less) use of animal subjects, then the argument about “useless” experiments would be strengthened. Certainly a strong case can be made, especially now that sophisticated computer simulations are available, that the regular use of animals in the routine experimental components of science courses is problematic — except in those relatively few cases where mastery of the experimental technique is necessary for the subsequent experimental or professional career of the student.

Too often the issue is put either *autonomy* of research practices or animal rights, instead of recognizing that two genuine values are in play and then addressing their proper balance and relative subordination. (In the case of *autonomy* only a limited version can be defended, and then only with qualifications — SVF ch. 10.) Looked at this way, responsible advocates for animal rights could play a constructive role by putting energy into attempts to create alternative research methodologies, and responsible scientific institu-

tions will themselves regulate the use of animals in research. I suggest that the state should assume a regulatory role only when it is clearly demonstrated that the self-regulation of scientific institutions is defective. Then, the responsible self-regulation of scientific institutions, rather than their engaging in defensive criticism of the behavior and tactics of those who prioritize other values, would be the best and most credible affirmation of the value of *autonomy* of scientific research.

Appendix 2: on departures from *impartiality* in actual scientific practice

If Principle 1 is to be adhered to it is vitally important to diagnose the mechanisms that can be found in scientific practices that underlie departures from *impartiality*. When *impartiality* is violated we would not expect to find moral and social values being put explicitly into play alongside the cognitive values. More subtle mechanisms are likely to be involved. In the main text [after the introduction of the subsidiary principle 1(a)] one mechanism has already been identified where conditions make it difficult to *separate* judgments of acceptance and significance of theories, enabling some theories to be rejected because of their lack of significance.

A second mechanism is *de facto* to include among the cognitive values consistency with religious or metaphysical (dialectical or “vulgar” materialist) viewpoints exemplified respectively in the Church/Galileo episode, the Lysenko affair, and the common insistence in cognitive science that intentional explanation must be reducible to or replaceable by accounts gained under materialist strategies. Consistency with materialist metaphysics (of any variety) is not a cognitive value, though it may serve as a heuristic connected

with stances that may be adopted towards theories prior to their acceptance or rejection. In contrast "Consistency with soundly accepted theories that are developed under materialist (or any other) strategies" is a cognitive value. When a metaphysical viewpoint has a pervasive grip on the imaginations of a culture, it may be difficult to discern this mechanism in play (SVF ch 6, especially 126-30), and when it is endorsed by a repressive power it may be difficult to resist. Sometimes consistency with a particular metaphysical viewpoint (materialism, behaviorism) becomes considered essential to the aims of science, then, e.g., science is considered to be not only systematic empirical inquiry but also conducted under particular versions of materialist strategies. Symptom of this mechanism being in play results are over-generalized, a subset of possibilities is identified with the totality of possibilities.

A third mechanism. Research is conducted within an ongoing tradition of inquiry whose strategies are linked with particular values — but where the researchers perceive themselves to be attempting to make sense of the accumulated data, unaware of the play of strategies and that the data have been collected under their selective strictures. This is research that does not appraise the degree of manifestation of the cognitive values, especially empirical adequacy, against the toughest standards (SVF 62-6). Symptom: theoretical conclusions are drawn that reinforce particular "biases." Ask: Has a sufficient variety of kinds of data been gathered? And have a sufficient range of theoretical competitors been worked out enough to be put into serious competition with it? The absence of competitors (with some degree of empirical support) by itself does not mean that the theory has been accepted in accord with *impartiality* (SVF ch 9). Relations of power may account for the absence of well worked out alternatives, rather than the

cognitive deficits of nascent alternatives, or from the perspective of alternative value-outlooks and the strategies linked with them, certain kinds of “data” may be simply uninteresting

These three mechanisms can be in play while researchers maintain an “honest” commitment to the “scientific ethos” (Cupani 1998). Additional mechanisms are not consistent with there being such honesty: (a) Data that does not meet minimum standards of acceptability may be added to the array considered for the sake of quantitatively bolstering the case. (b) Research results may be withheld from publication when they are “inconvenient”, or research that might produce “inconvenient” results is not conducted — symptom applications are defended from allegations of harmful side-effects simply by appeal to “there is no scientific evidence that there are such effects”, or there may be outright deceit.

Scientific judgments that accord with *impartiality* can be made only when none of these mechanisms are significant causal factors in making them. As already mentioned, not all scientific judgments do accord with *impartiality*. Social and historical studies of science can help us discern which ones do and which do not — they can provide explanations of why certain theories are accepted by members of the scientific community despite not according with *impartiality*. In this way the empirical scrutiny of scientific practices and the making of scientific judgments contributes to the “logic of appraisal” of theories. There is an extreme position (nicely criticized by Hacking 1999 and Kitcher 1998) that holds that these (and perhaps additional comparable) mechanisms are always in play, so that no theory is accepted in accord with *impartiality*, thence we can only explain theory acceptance, not appraise theories for their cognitive value. (Even when a theory is accepted in accord

with *impartiality*, there remains much to be explained by social studies — SVF 231-6, Lacey 1999b, c)

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Notes

¹ Based on a paper delivered at the "First *Principia* International Symposium" Florianopolis, August 9-13, 1999

² On "acceptance" or "choice" of a theory, and the distinctness of acceptance from other stances (e.g., provisional entertainment, judge it applicable) that may be taken towards theories, see SVF 13-16, VAC 76

³ My notion of "strategy" is a descendent of Kuhn's "paradigm" (SVF 261) It has affinities with Hacking's (1999) "forms of knowledge," that would be worth further exploration

⁴ Most of the forms of knowledge that Hacking (1999) discusses are (transposed into my terminology) highly restricted versions of materialist strategies, and social values (which all deeply interplay with the modern valuation of control) play important roles in their being adopted in inquiry For detailed discussions of materialist strategies and their various forms, see SVF

⁵ See SVF ch 9 for another example of research conducted under strategies, "feminist strategies," not reducible to materialist ones

⁶ *Mutual reinforcement* does not imply subordination of scientific research to the objective of control, theories, accepted under materialist strategies, often provide sound understanding of domains of phenomena in which there is no genuine possibility of exercising control

⁷ The account of the modern valuation of control presented here summarizes material in SVF 110-15. The summary, and the statement of the presuppositions that follows, is largely borrowed from Lacey 1999c. Throughout the article there are also other inevitable points of overlap with Lacey 1999c, which is concerned with the appraisal of the view that science is value free — whereas this paper is concerned with the normative principles to adopt after having made this appraisal. The concerns of both articles draw upon the same lines of argument and use example of BT and AE.

⁸ I have in mind here especially the values carried by various popular organizations in Latin America (VAC ch 1, SVF ch 8).