The Value Decisions We Know as Science

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VALUE JUDGMENTS are vital to science; there shall not—indeed cannot—be one without the other. This image of science as "value permeated" sharply distinguishes it from the erroneous but ubiquitous image of science as a "value-free" activity.[1] In fact, not only some, but all research judgments are value judgments, and the principal activity of science is to make well-supported value judgments.

SOME DEFINITIONS

Those who subscribe to the *value-free* image of science believe that individual scientists do not, or at least should not, make value judgments in their "official" or definitional capacities as scientists.

The term *science* means the central and ordinary employments of concepts such as "scientific research," "scientific activity" and "doing science." It does not mean the

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products, findings or outcomes of scientific activity.

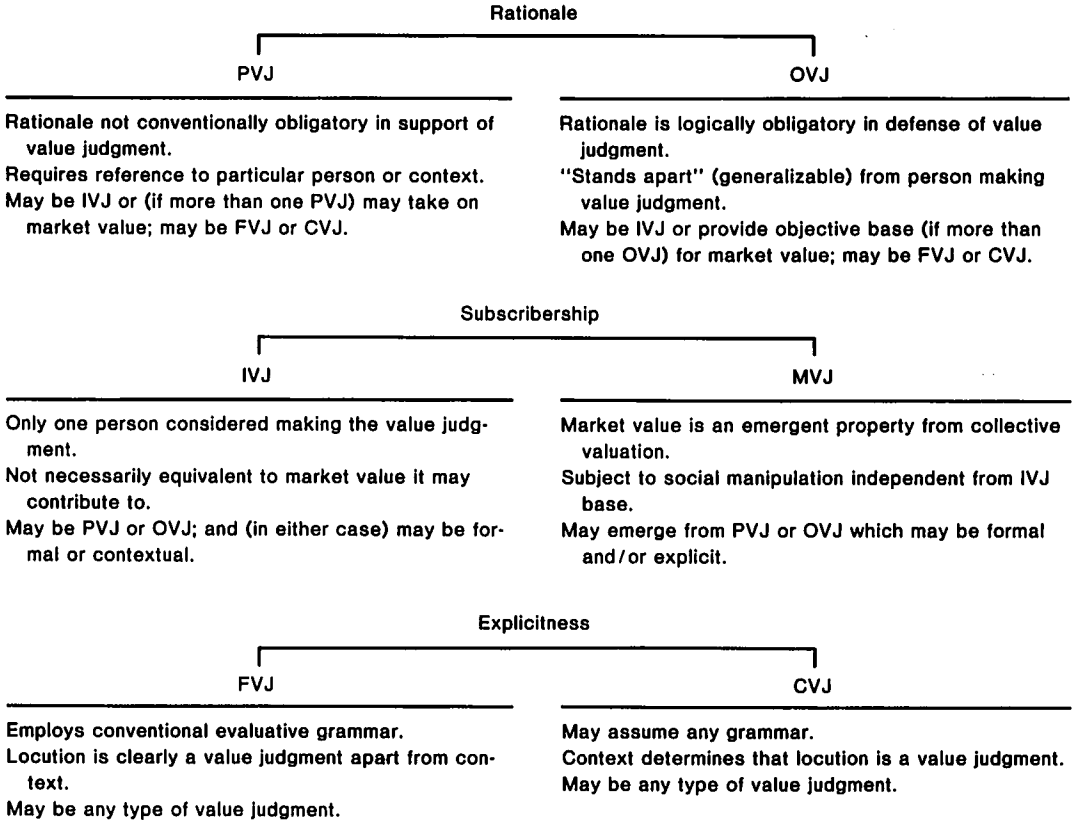
The products of science have always been understood to be associated with value judgments concerning their employment. But the *process* of science is yet seen (against considerable argument and all good evidence), by some who "do" science and many more who comment on it, as a value-free activity.

The terms *scientific activity* and *research* can be defined as formulating and choosing theoretical frameworks, hypotheses, strategies, designs, measurements, instruments, data systems, statistics and analysis.

WHAT ARE VALUE JUDGMENTS?

Value judgments can be classified along three dimensions, each with two more-or-less contrasting poles. These dimensions are: *rationale, subscribership* and *explicitness.* Figure 1 illustrates the three dimensions and the two polarities under each dimension, and lists three key features of each.

FIGURE 1. DIMENSIONS OF ORDINARY LANGUAGE VALUE JUDGMENTS



Rationale

Rationale is defined as the logical justification upon which one makes a value judgment. As Coombs points out, "A person making an evaluation commits himself to having supporting facts because value judgments are logically dependent to a degree on factual considerations."[2(p11)] But the substance of these facts may vary considerably.

At one extreme the value judgment may be a purely autobiographical remark, or a personal value judgment (PVJ).[3] For example, the statement, "Strawberry ice cream is good," is a PVJ.

At the other extreme is the objective value judgment (OVJ), which uses fully objective information. Personal preferences do not enter into the judgment in any way.

Objective information includes: (1) facts, (2) criteria for establishing the relevance of the facts and (3) value principles in support of the value judgment.[4]

PERSONAL VALUE JUDGMENTS

Consider the value judgment, "Strawberry ice cream is good." Suppose the evaluator is asked why the value judgment was made—that is, "What reasons can you offer in support of your judgment?"

The evaluator may respond, "What do you mean? I just happen to like strawberry ice cream."

Thus, it is inappropriate to question the correctness of the value judgment. There are no definitive means of assessing PVJs other than to assess the cognitive state of the speaker, i.e., "Does the speaker *truly* value X?"

The PVJ fails in sensibility if made as a generalized or abstract proposition. It cannot extend beyond specific contexts to take on a general meaning. Therefore it is not sensible to consider a PVJ in the absence of this close link between the evaluator and the value object. We cannot say, "He values his free time" without stating objective reasons or indicating any particular "he."

It is this potential for partially closed or unassailable human judgments[5,6] that provides the rationale for the strictly personal value judgment and establishes its necessary internal reference and relational features. The PVJ plays a comparatively small part in the research process.

OBJECTIVE VALUE JUDGMENTS

OVJs, at the other extreme of the *rationale* dimension, are completely objective. A person making such a judgment is logically committed to having objective reasons in its support. The reasons are not necessarily forthcoming whenever an OVJ is made. However, they must be capable of coming forth upon request. In science, it is this potential for rational substantiation that distinguishes a scientific value judgment from similar expressions which might be performed unscientifically,[7] as when a layperson might repeat the value judgment from memory, or a six year old might read it from a book.

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In contrast to the PVJ, the OVJ is autonomous and does not express a

strictly personal relation to the speaker. The OVJ is independent of the person making the evaluation, and we are free to assess it from our own points of view.[4]

OVJs combine two kinds of information. On the one hand, there is descriptive information about the value object; on the other, there is a corresponding evaluation of each of these descriptive analyses. A surgical procedure may be described, for example, in terms of its statistical index of risk to the patient, cost or chance of success. These are objective features. Thereafter these features may be compared and contrasted with alternate surgical procedures. They may be assigned a valence (positive or negative evaluation) and a rank (degree of positive or negative evaluation) to arrive at the best surgical plan.

No valence or ranking can be assigned to the facts until some preliminary evaluations have been performed. These evaluations establish criteria to give relevance to the facts. Facts are always evaluated as relevant before they are used in any situation. Thus if we were not at all concerned with, say, the costs associated with the surgery, some facts would have no relevance for us, and there would be no criteria formed about cost.

OVJs are not limited to propositions about a value object's conspicuous attributes. A PVJ, for example, is certainly an objective matter and could take on relevance in a particular context. For example, it is much more important to know that the president made a positive value judgment with respect to a particular proposal (the value judgment is a social fact) than to know that the proposal was printed on 20-pound bond (a straightforward empirical fact).

Therefore the list of objective features can include: (1) PVJ, (2) PVJ with market-value extensions, (3) other OVJ, (4) OVJ with market-value extensions and (5) hidden value judgments in addition to the more readily discerned "empirical" attributes.

It is especially difficult to discern PVJs from OVJs when the phrases "I think" or "I suppose" are used. These phrases often suggest that the judgment is a PVJ, but the rationale must be investigated. If someone says, "I feel that the linear accelerator is superior to the cobalt machine in treating nonmetastasized tumors," and thereafter goes on to give precise reasons supporting the judgment, that individual is offering a proposition in science. Despite the preface of "I feel", there is nothing personal or autobiographical implied.

PVJs have often been misidentified as representing the sum and substance of all value judgments. This has prompted many scientists to advocate some form of the value-free thesis. It is unfortunate to have extensive lucanae in our common understanding perpetuated by such a narrow and erroneous conception of the value judgment.

Subscribership

The dimension of subscribership deals with properties of value objects in light of the group context. The polarities of this dimension are individual value judgments (IVJs) and market value judgments (MVJs).

The IVJ may be personal or objective, but it does not derive meaning from

institutional value, i.e., value in the marketplace. Market value, however, is just that value established by institutional means. Market value, therefore, is an emergent property which has no necessary relation to particular individual value judgments, although the two may have substantial interaction.

It will be easier to understand the IVJ by first enhancing the meaning of the MVJ. The essential feature of the MVJ is that the thing evaluated acquires an emergent property, namely the value ascribed to it by a group of persons as well as the possibility of group extension. Scriven[3] and others hold that this category is a direct extension of PVJs, but it seems clear that market values can extend from OVJs as well. Market value may be built firmly upon objective evidence in the full sense of the distinction. This may be more typical of the MVJ than where market value extends from the PVJ.

Not all market value reflects an objective value base. For example, the massive multimillion-dollar advertising campaign for Cutty Sark Scotch began long before the product appeared on the market. The success of this effort demonstrates that market value may be manipulated in ways that blur objective value and personal value distinctions.

Explicitness

The third and last dimension of ordinary language judgment is explicitness. The substance of this distinction is grammatical. At one extreme are formal value judgments (FVJs), which are properly expressed in grammar (i.e., value object, verb, value term); at the other extreme are cases where a particular nonevaluative locution is used or employed evaluatively by the speaker. These are called contextual value judgments (CVJs).

FVJs are by definition easily understood and present no real problem. However, the structure of CVJs often obscures their true evaluative character. It is certainly a value judgment, for example, when a high school boy looks at his prospective transportation and pronounces (with obvious awe), "It'll do 172 in the quarter (km/hr)!" It is the same kind of value judgment when a clinical psychologist pronounces, "The patient has responded to his treatment and is now mentally well adjusted." These particular usages are employed frequently in science where, for example, one might say, "that's a value judgment," or "there's no empirical data to support that claim." No one would be misled by the simple descriptive grammar, especially in the spoken context. The evaluative component would be clear.

VALUE DECISION-MAKING CONTEXTS IN RESEARCH (VDMCR)

Research Process

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from which the researcher selects alternative courses of action. That the researcher must navigate these decision-making contexts in some way is noncontroversial. Runkel and McGrath, for example, distinguish eight "phases" of the research process, each of which contains a "bundle of choice points."[8]

Table 1 illustrates the eight major groups of value decision making contexts in research (VDMCR) and a few of the more central subdivisions. Each group brings together a large number of related value decisions the researcher must make.

(There is an important limitation to be placed on the interpretation of Table 1. The listing of VDMCR is in some ways comprehensive. It may not be inferred from this, however, that all the processes or strategies of scientific inquiry might be formalized as wholly explicit knowledge. There may well be tacit dimensions to scientific inquiry[9] or ways in which the knowledge of discovery is a personal and dynamic process which resists wholly explicit formulation.[10])

Analysis

A brief discussion of Table 1 follows, dealing with representative contexts from seven of the eight groups (the contexts to be discussed are denoted with an asterisk in Table 1).

Ideological Contexts: Image-of-Persons Example

The most general value question here is: "What image of persons will guide the conceptualization and execution of our research program?" Typical values (often in conflict) are: humans as free versus not free, determined versus not determined, deficiency motivated versus growth motivated, and rational versus irrational.

For example, the issue of seeing humans as self-motivated toward actualization (Maslow, Rogers, Erikson) as opposed to seeing them as primarily in the grips of their subconscious in which they are deficiency motivated (Freud et al.) carries straightforward implication for both theory and methodology. Freudian thinking has guided the production of a large number of psychological instruments which use unobtrusive and sometimes deceptive means. This is in keeping with the notion that one cannot directly ask persons how they feel. Contrasting with this are instruments which presuppose humans to be rational and, at least in part, consciously directed.[5] Under this image, questioning systems tend to be more direct and obtrusive, and interpretations rely more upon the face value of the response.

A typical value problem may be to decide whether deceptive data-gathering systems (value object) are good (value term), or deception in research (value object) is undesirable (value term) because it diminishes the dignity of the participant (relevant fact), and whether any research strategy that would diminish human dignity is desirable (criterion). Inroads to resolution may be made by adjudicating the values of participants' dignity and the value of the information to be gained. Note that this resolution takes place within the methodology facet.

Theoretical Contexts: Employment Example

In this context, the basic value question is: "Of what use is our theory to be put?"

TABLE 1
Value Decision-Making Contexts in Research (VDMCR).
(Abbreviated Listing)

I. *Ideological Contexts*
- *A. Pertaining to image of persons guiding the research
- B. Pertaining to image of science guiding the research
- C. Pertaining to formal philosophical views guiding research
- D. Pertaining to diffuse values of science guiding research

II. *Theoretical/Conceptual Contexts*
- *A. Pertaining to kind of theory guiding the research
- B. Pertaining to scope of theory guiding the research
- C. Pertaining to soundness of theory guiding the research
- D. Pertaining to role of theory guiding the research

III. *Selection of Problem Contexts*
- *A. Broad social contexts guiding the research
- B. Institutional contexts guiding the research
- C. Personal contexts guiding the research
- D. Content of problem contexts guiding the research

IV. *Methodological Contexts*
- A. Formulation of problem contexts
- *B. Logic of design contexts
- C. Setting contexts
- D. Sampling contexts (including measurement)

V. *Inferential Contexts*
- A. Grouping and processing data contexts
- *B. Analysis of evidence contexts
- C. Interpretation of evidence contexts
- D. Metalevel inference contexts

VI. *Reporting/Integrating Knowledge Contexts*
- *A. Selecting audience contexts
- B. Framing report contexts
- C. Control of information contexts
- D. Revisionary/integrative contexts

VII. *Extra-Scientific Management Contexts*
- A. Funding contexts
- B. Institutional contexts
- C. Staff contexts
- D. Personal contexts

VIII. *Product Employment Contexts*
- A. Broad social contexts
- B. Institutional contexts
- C. Personal contexts
- D. Within science contexts

*These items are discussed in the text.

The adjudication usually points to a particular methodological or inferential context. Here are two examples:

- Value Judgment No. 1: "It is undesirable (value term) to be guided by Lewin's field theory (value object) because he employed topological concepts in an inappropriate way (fact criterion)." Here the various values of utility (e.g., heurism, organization, reduction of complexity) as well as a number of soundness, scope and kind of theory values are adjudicated as being of less merit than the value of logical precision.
- Value Judgment No. 2: "Freudian theory (value object) is unacceptable (value term) because it does not always generate disconfirmable hypothesis (relevant fact)." Here the values of Freudian theory (verisimilitude, heurism, therapeutic efficacy) are adjudicated against a particular value of science (refutable hypotheses).

Selection of Problem Contexts: Broad Social Example

The basic value question here is: "How do I justify this research program as a social enterprise?" The kind of resolution will depend in part on the kind of inquiry. If the case is a mental health study on causes and cures of headaches, the adjudication may rest solely on a cost/risk/benefit analysis since basic social-scientific justification seems to be present.[7]

The values typically adjudicated in social justification are: political (e.g., does the activity enjoy political favor?), educational (e.g., do we stand to enhance quality or efficiency of education?), technological (e.g., is it feasible?), health-oriented (e.g., will the findings contribute to enhanced health for an identifiable element of society?), social-scientific (e.g., does it enhance potential to predict, control, understand?), legal (e.g., will participants sue?), and economical (e.g., is the price right for what we are to get?).

A cost/benefit value judgment might adjudicate the value of researching a palliative response to an extremely rare and innocuous disease at a cost of $2 million as opposed to the value of researching a quick, nondrug cure for headaches costing, say, $50,000. The criteria must come from social need, social license (i.e., support) and social correctness (i.e., ethical propriety.[11,12]

Methodological Contexts: Logic of Design Example

Methodological value judgments probably constitute the largest group of decisions to be made by the researcher. They are, along with inferential value judgments, the ones most hotly contested by the value-free thesis advocates. Nonetheless, there is a rather large set of values typically adjudicated here. It is safe to say that no one executes a research program without assuming some stance on the various value questions at hand.

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The all-inclusive value question is: "What is the best way to conduct my

study?" In large part, decisions under this context are objective value judgments, although market and personal value will always form a part of the factual and criterial base upon which the rational PVJs are founded.

Typical values pertain to: valid conclusions such as system realism versus methodological precision; partitioning, as in microsystem versus macrosystem; treatment modes, such as generalizability versus standardization and power versus realism; or information potential—quantity versus quality, or scope versus detail.

Inferential Contexts: Analysis of Evidence Example

With the possible exception of methodological contexts, value judgments here are most likely to be less explicit than most other contexts, i.e., they are contextually present but grammatically opaque. The basic value question is: "What is the best way to organize and interpret our data?"

Sample values are: degrees of freedom versus manageability and realism; personal understanding of analysis procedure versus optimum procedure; personal control versus optimum procedure; go-for-maximum statistical power versus trade-off benefits; dichotomous versus multipoint or continuous scaling; and a priori versus a posteriori selection of statistical tools.

The most common value problem in statistical analysis is deciding which kind of error to risk most. There are many well-founded conventions (market values) at hand to serve as criteria for ranking and evaluating the facts in a particular case. For example, initial studies may generally wish to risk accepting false significance rather than overlooking true significance. Thus the significance level is set lower. The converse obtains for more advanced follow-up studies.

Studies in which the risk of being wrong is unusually costly will adjust significance levels up or down accordingly. Of course, studies which only seek to recognize true positive significance can entertain confidence levels approaching unity. But behind these conventional guidelines are, ultimately, matters of personal preference (PVJs), known in research as the "tough versus tender-minded value question."

The market values pertaining to common usage and conformance will dictate setting significance levels at 0.05 or 0.01 and not, say, 0.049 or 0.0093. But convention will not completely account for the directional preferences. Likewise, proper technical convention will suggest that 0.05 may be more appropriate for a given study. But the final adjudication—especially in borderline cases—may turn strictly on personal preferences within the conventionally acceptable range of choice points.

Reporting, Integrating Knowledge Contexts: Selecting Audience Example

The value questions here pertain to the intended audience. Are the findings only of merit to other professionals? If one is strongly committed to the value of one's findings, is dissemination justified? Is it obligatory? Where does dissemination leave off and unwarranted inculcation begin? Are extraconventional forms of advocacy ever warranted? Is it "unscientific?" Ought one to popularize scientific

information if it might be to the public's benefit? Who is to assess merit in the public market place?

Employment of Product Contexts: General Example

There is the obvious value judgment that to rationally employ any product in any context presupposes the value judgment that the product is good in that context. But product employment is not hotly contended anyway. Very few scientists are able to ignore the awesome value questions associated with employing behavior control techniques, recombinant genetic manipulation, nuclear products, psychosurgical techniques, artificial organs and life-extending medical techniques. Even some of the less obtrusive products of science, such as mood-altering drugs, are beginning to draw the close scrutiny they deserve as social instruments.

WHAT IS IMPLIED BY A VALUE-PERMEATED SCIENCE?

Of what significance is the fact that the processes of science necessarily involve the making of value judgments? That fact is to some, no doubt, a disquieting element of science. But of what consequence is this understanding to society at large?

There are a number of important and far-reaching implications. First, the ability to employ a system of understanding is not conclusive evidence that the system is *understood*. The mere utterance of a scientific proposition is not necessarily scientific. It is the *employment* of that proposition, in conjunction with the appropriate canons of reasoning, that constitutes a scientific nature. In short, any system of science is not merely a collection of propositions or rules of the game. A system of science includes *all* the evidence and the understandings which give meaning to the propositions.

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Second, the simple lack of awareness of a value decision-making context in research does not alter its evaluative nature. The value judgment may be tacitly performed, its outcome may be presupposed or stipulated, or it may be falsely labeled as a "technical" decision. But if the full range of options is not comprehended by the researcher and included in the decision-making process, the process is less than fully rational.

In many cases, choice points which are in fact open to rational appraisal are being seen as highly circumscribed or predetermined, and competing values are not being adjudicated. Scientists are acting against their own aims by maintaining an incorrect image of the forms of rational inquiry which are called scientific.

The remainder of the implications to be suggested here regard the unestablished relations between demonstrating the ways in which science is necessarily value

permeated, and is not, therefore fundamentally different from other social institutions.

Heretofore, the only strong case for considering the institutions of science as somehow unique, and requiring different standards, was the claim that the sciences—and only the sciences—were value free. If that is accepted as false, there remain no logical claims to special status, and the following implications may be drawn:

- Science ought not to enjoy a priori special authority in matters of social construction or regulation.
- Rational which implies that other forms of inquiry were inferior to science must be reevaluated.
- Science should enjoy no a priori claims to maintain a highly closed system as it does. This question is especially important where science is practiced under a democratic political image while closed social institutions are taken as antithetical to the principles of democracy.
- The aims and means of science ought not to be viewed as either logically or methodologically fixed. Rather, as Feyerbend suggests, they are always open for negotiation.[13] Moreover, the sources of relevant argument should not be limited to the traditional view of in-house controversy. Evidence should come from any portion of the social fabric that can demonstrate its relevance to the scientific question at issue.
- To the extent that science shares justification with all social systems, a general and broad social education should be a cornerstone of apprenticeship in science education.

STATUS SHOULD BE EARNED

This is not to say that science ought to be taken less seriously. Science has been granted privileges because of its benefits to humankind. What is being disputed is the argument of "science for the sake of science." The key is that the status of a scientific enterprise should be earned by the same general criteria which we would apply to any social institution, and not gratuitously accorded based on a quasi-moral claim to superiority of the aims of science.

Thus future claims of special status in the name of science—although it is against tradition—must be closely examined for whatever benefits it might bear.

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