Abner Shimony
Boston Colloquium for Philosophy of Science:
"50 Years of the Center for Philosophy and History of Science"
Friday, October 22, 2010
Boston University

REMINISCENCES

I. OVERVIEW

It was an honor to be invited to speak at a 50th birthday celebration of the Boston U. Center for Philosophy and History of Science. I accepted, proposing the topic "Reminiscences". That was rash, because my memory of remote events has long faded, all the more because of massive anaesthesia for surgery in 2010. Fortunately, I was able to consult volume 100 of Boston Studies in the Philosophy of Science, entitled "Naturalistic Epistemology: A Symposium of Two Decades", edited by Debra Nails (who is present today) and myself, which contains versions or references to some lectures to the Center. With this book I am able to reminisce ideas of Judson Webb, John Heffner, Donald Campbell, Joseph Agassi, and myself. Incidentally, the volume number 100 is revelatory of the energy dedicated by Bob Cohen to the Center.

I shall organize my reminiscences about the enterprise of "naturalistic epistemology" – its basic theses, objections that have been brought against it, and attempts to refine its theses by serious attention to criticisms.

Theses: (a) Human beings, including their cognitive faculties, are entities In Nature. (b) The laws governing Nature have with remarkable success been explored by the natural sciences.

Objections: (1) "Nature" is best understood in Kant's remarkable synthesis of empiricism and rationalism as "the sum of appearances, in so far as they stand, by virtue of an inner principle of causality, in thoroughgoing interconnection" (Critique of Pure Reason B446). But since causality is a category imposed by the Understanding, that mental faculty is the source of lawfulness in Nature. Therefore Thesis (a) is an inversion.

(2) The findings of the natural sciences are descriptive, but the enterprise of epistemology is essentially normative – what we ought to believe. Hence Thesis b is a gross conflation of 'is' and 'ought'.

(3) The remarkable success attributed to natural science in exhibiting the laws of nature is a commitment to the reliability of induction, which is a part of epistemology. Hence Thesis (b) is a case of circular reasoning unless the essential part of the world view of natural science is directly founded without induction.

II. JUDSON WEBB's lecture "Immanuel Kant and the Greater Glory of Geometry" is a penetrating critique of Kant, whose transcendental epistemology dismisses theses (a) and (b) of naturalistic epistemology. It postulates instead cognitive faculties which impose "formal conditions of space and time" upon the sensibility, in addition to a faculty of Understanding which is the source of lawfulness in experience. The a priori validity of the principles of geometry follows from the imposition of the formal conditions of space: "to know anything in space (for instance, a line) I must *draw* it, and thus synthetically bring into being a determinate combination of the given manifold, so that this act is at the same time the unity of consciousness" (*Critique of Pure Reason*, B138). Kant's favorite example of this a priori intuition is that "between two points only one straight line is possible" *(ibid*., B204). Webb does not question the plausibility of this particular instance of conceptual construction, but he is shrewdly critical of other constructions proposed by Kant, as, for instance, "in the proposition that three points always lie in a plane" (*ibid*., A733=761). Webb comments, "But how can we draw a *plane* in thought? Even to draw one literally on paper requires all the *conventions of perspective*. In fact, Kant had continued the passage …. by insisting that 'we cannot represent the three dimensions of space save by *setting* three lines at right angles to one another from the same point' " (*ibid*.,B154). But how can we 'set' them in thought without prior knowledge of perspective?"

In addition to these difficulties facing Kant's attempts to account the for the a priori construction of a basic geometric concepts such as the plane, there is a general problem posed by J. F. Herbart -- "whence the definite shape of definite things?" and sharpened by Webb. They argue that to ascribe the shape to a thing-in-itself is inconsistent with the a priority of geometrical concepts and propositions, but to ascribe the definiteness of the shape of a **particular** object to the faculty which imposes the formal properties of space is a violation of its ideal character. (Webb, pp. 59-60). Kant appears to be struggling in his *Opus Postumum* with this dilemma, and Webb finally reacts by citing an evolutionary treatment of human experience, which is a component of naturalistic epistemology (Webb, p.61).

III. DONALD CAMPBELL's essay, "Neurological Embodiments of Belief and the Gaps in the Fit of Phenomena to Noumena" rejects Kantian transcendental epistemology. Instead, he formulates a version of naturalistic epistemology that he sometimes refers to as "descriptive" because it seeks to record "which decision rules science *has* used, implicitly or explicitly, in presumably valid decisions in the past, and thus can be seen as a hypothetical, contingent search for normative rules"(essay cited, p.166); and sometimes he refers to his view as "evolutionary", relying on the biological theory of natural selection for trusting human cognitive apparatus, which in turn justifies the presumption of validityof decision rules in historically mature science. "…the central insight is that biological natural selection and other selection processes allow the real world to edit and select among variations, providing the fit between belief or knowledge

and the real world." (*ibid*. pp. 169-170).

In a later part of this talk, devoted to "Integral Epistemology", I shall present a surprising quotation from Campbell modifying his commitment to "descriptive epistemology" by allowing a place in it for both the correspondence and the coherence theories of truth.

IV. JOHN HEFFNER's essay "Causal Relations in Visual Perception" is specialized in that it considers theoretical questions and empirical data concerning vision with little mention of other sensory modes, but broad in its attention to a variety of physical and mental factors in visual phenomena.

An illuminating example of breadth is the explicit discussion of "at least three different levels in which causal relations can be discovered in vision" (i*bid*., p. 198). The first level studies sensory processes as functions of physical factors impinging directly on the sense organs without attention to cognitive factors. The second level supplements the first by considers also cognitive factors, such as memory, expectation, and residues of culture. The third level of causal explanation considers its history within the organism and also (from an evolutionary point of view) within the biological ancestry of the organism. He notes that at this level a metaphysical intrusion of the mind-body problem may occur, but he characterizes this to be "unnecessary". Heffner strongly advocates conducting causal epistemology on all three levels, and he particularly regards a restriction to the first level as an uncritical commitment to an analogy between vision and the action of a camera.

The interplay of these three levels in visual causality is responsible for the amazing variety of visual experience. This variety contributes to the practical reliability of vision, but at the opposite extreme it is responsible for the production of illusions. A plausible example of its contribution to practical reliability occurs in visual geometry, which is based on the integration of direct sensory processes with informative memories. For example, "Perceivers in western culture … tend strongly to see photographs and line drawings as perspectival representations of three-dimensional objects. On the other hand the algorithms responsible for such valuable achievements can give rise to visual illusions" e.g., a drawing of a duck-rabbit figure can be taken to represent either animal according to suggestion or chance. Heffner concludes that the multivalence of the causal factors in visual experience is a striking example of the contribution of empirical data to philosophy. As the father of a painter I am also impressed by the potential and actual contribution of of this multivalence to an artist's technical repertoire.

V. A. SHIMONY and J. AGASSI. The most vivid, and I hope most reliable, of my reminiscences is a dialogue between myself and Joseph Agassi, beginnng with my lecture "Integral Epistemology", followed by Agassi's critique, "The Case of Abner

Shimony", and followed in turn by my comment on his critique. The first of these three papers is the result of my attempt to mesh various suggestions favoring naturalistic epistemology. The second is presented as a refutation of my proposals, The third paper is my reply, partly accepting Agassi's criticisms and partly attempting to answer them.

In my title "Integral Epistemology" the word "integral" is intended in two ways. The first way is meant to combine several different conceptions of epistemology, for example to mesh a 'descriptive' epistemology as envisaged by Campbell with an 'analytic' epistemology, of which there are various versions, ranging from Descartes' 'cogito' as the springboard of human knowledge to applications of logic and semantics to induction, explored by the Vienna Circle (notably Carnap). The second intended sense of "integral" is the meshing of methodology with results of scientific investigations. The second sense of "integral" is the target of an objection mentioned at the beginning of this talk: namely, that it is a lapse into circularity, in fact into *vicious* circularity, in that scientific results are accepted as the outcome of applying a methodology itself suggested by scientific results. I grant the accusation of circularity, but shall defend this philosophical strategy as *virtuous* rather than *vicious*.

Another example of this second sense of integration is the combination of two well known opposing conceptions of 'truth', the "correspondence conception" and the "coherence conception" This integration is recommended by Campbell even though his descriptive epistemology seems at first view to incorporate a correspondence theory of truth; after all, a correct description of the outside world, which he advocates, is tantamount to a semantical correspondence between the language of the description and the objective constitution of the things described. In defense of Campbell' integration, however, I would say that his descriptive epistemology is sophisticated enough to recognize the occurrence of perceptual errors, which may be detected and corrected by attention to context. This sophistication permits his conciliatory strategy: "to accept the *correspondence meaning of truth and goal of science*, and to acknowledge *coherence* as the major but still fallible *symptom of truth*" (*ibid*., p.302)

I wish to dignify calling the circularity of Naturalistic Epistemology "virtuous" by noting its affinity to the *dialectic* of Socrates and Plato, where initial premisses are proposed by one of the interlocutors and refinements are eventually achieved by the interplay of intelligent questions and answers. The dialogue which I envisage as the path to a satisfactory Naturalistic Epistemology has not to my satisfaction been adequately composed, but I propose several procedural theses which should be useful for that eventual composition:

1. Commonsense judgments about ordinary matters of fact should not be discounted without clear positive reasons.

2. The road to inquiry should not be blocked (Peirce's famous maxim).

3. Epistemology and natural science should mesh and complement each other, especially via inductive reasoning

4. A *vindicatory* argument -- i.e., an argument that a certain method M will yield good approximations to the truth if any method will do so , so that nothing indispensable will be lost and something may be gained by using M –is a rational form of epistemological justification.

These theses can be illustrated by a brief discussion of the use of probability in scientific induction. Typically, given a background of knowledge B, a range of possible theories t_1 ….,t_n is probed by observation or experiment with outcome e. Three sets of probabilities connecting B, t_1 ….,t_n, and e are considered, where "probability of a proposition s given the proposition a" , designated by p(s/a), is understood in a sufficiently careful way as "the rational degree of belief in s upon assumption of the truth of a". The three sets are:

$p(t_i/B)$, for i=1,…,n --- the "prior probabilities" of the t_i assuming only B,

$p(e/t_i \,\&\, B)$, for i = 1,…,n -- the "likelihood" of e, assuming t_i and B.

$p(t_i/B \,\&\, e)$, for I = 1, … ,n -- the posterior probabilities of the t_i assuming B and e.

The four proposals concerning my conception of integral epistemology can be illustrated concerning these probabilities:

Proposal 1, concerning the acceptability of commonsense judgments of fact, is implicit in taking the outcome e as an appropriate element in each of the two types of posterior probabilities.

Proposal 2, against blocking the road to inquiry, is implicit in the open-mindedness of admitting a variety of theories t_i as possible explanations of empirical outcomes e, though it must be recognized that the character of this openness needs to be specified in detail. An influential proposal to achieve open-mindedness manageably is the "simplicity ordering" of Jeffreys and Wrinch (Phil. Mag. 38, 1919), according to which the admissible theories t_i have numerical parameters and the prior probabilities of the t_i diminish as the values of a parameter increases. Such orderings are aesthetic and amenable to calculation, but somewhat artificial. The concept of openness which I propose is the "tempering principle", prescribing that *no t_i compatible with background B be assigned a prior probability so low that any plausible empirical evidence e would give t_i a posterior probability lower than that given to each of its rivals*. My formulation of open-mindedness is informal, and imposes on the investigator the task of judging plausibility. It is an important epistemological question whether so large a role should be assigned to subjective judgment..

Proposal 3 is clearly satisfied by the fact that on the one hand the rules of probability theory are methodological tools, whereas on the other hand the background B and the

range of theories taken seriously in inductive reasoning are supplied largely by the state of natural science prior to the investigation in question.

A vindicatory argument as in proposal 4 is favorable to induction because the process of induction leading to preference of theory t from among the entire range of seriously proposed theories t_i is a remarkable balance between conservatism and radicalism: the conservatismenters in that the prior probability of t is a tentative acquiescence of scientific achievements of the past, while the radicalism enters in that the likelihood of t depends upon the empirical outcome e, an outcome which is controlled neither by the investigator's proclivities nor by those of scientific community but rather is Nature's choice.

Joseph Agassi's critique of my proposals for Integral Epistemology is partly playful and teasing, and when I am in the right mood I am amused. Partly, however, it is serious, but even when it comments negatively I find suggestions that could enrich an Integral Epistemology. proposals for Integral Epistemology were intended to strike a balance between excessive reliance upon a rigid scheme for assessing competing theories and the anarchy of proceeding intuitively, when neither hard data nor precise logic suffice to compute the posterior probabilities. Agassi judges that I fail to achieve this aim, and instead my proposals are in his word "wishy-washy". He argues against their adequacy by pointing to exemplary chapters in the history of science in which great discoveries were made researchers who followed their own instincts and passions: e.g., "Faraday sought effects for decades, at times his search was crowned with success, and at times not, yet he stuck with all his hopes." (*ibid*., p.18) Certainly the case histories of great scientific discoveries are relevant to assessments of methodology, in at least two different ways. First they may be able to teach us how a discoverer conceived of a novel theoretical explanation t for the phenomenon of concern and thought of possible experimental tests for t; and second, they discoverer's procedure for comparing the credibility of t with other possible explanations of the phenomenon. I grant that the first lesson is very interesting for epistemology but it does not directly concern induction: the process of inventing theories is "abduction" in Peirce's terminology, whereas induction is concerned with comparing the probabilities of competing theories, given the empirical evidence. The second lesson does concern induction, because the open-mindedness of the "tempering condition" is psychologically different in case the discoverer is comparing his own proposal t with the recognized range of theories t_i from what the tempering condition requires when only the t_i recognized by the scientific community are probabilistically compared. should like to know Agassi's reaction to my admission of psychological considerations into the austere domain of probability logic.

More generally, I should like to hear from Agassi not just evaluations of my proposals for Integral Epistemology, but also some relevant statementsof his own formulation of scientific methodology, very much influenced by his teacher Karl Popper with his own variations. I should not be surprised if his formulation suggests some interesting ingredients for Integral Epistemology besides those which I and other contributors have suggested. Three articles on scientific methodology listed in the References of his paper may satisfy this request.

BASIC THESES OF NATURALISTIC EPISTEMOLOGY

(a) Human beings, including their cognitive faculties, are entities In Nature.

(b) The laws governing Nature have with great success been explored by the natural sciences.

OBJECTIONS

(1) "Nature" is best understood in Kant's remarkable synthesis of empiricism and rationalism as "the sum of appearances, in so far as they stand, by virtue of an inner principle of causality, in thoroughgoing interconnection" (Critique of Pure Reason B446). But since causality is a category imposed by the Understanding, that mental faculty is the source of lawfulness in Nature. Therefore Thesis (a) is an inversion.

(2) The findings of the natural sciences are descriptive, but the enterprise of epistemology is essentially normative – what we ought to believe. Hence Thesis (b) is a gross conflation of 'is' and 'ought'.

(3) The remarkable success attributed to natural science in exhibiting the laws of nature is a commitment to the reliability of induction, which is a part of epistemology. Hence Thesis (b) is a case of circular reasoning.

PROPOSALS FOR REFINING NATURALISTIC EPISTEMOLOGY

The dialogue which I envisage as the path to a satisfactory Naturalistic Epistemology has not to my satisfaction been adequately written, but I make several proposals which should be useful for that eventual composition:

1.Commonsense judgments about ordinary matters of fact should not be discounted without clear positive reasons

2. The road to inquiry should not be blocked (Peirce's famous maxim)

3. Epistemology and natural science should mesh and complement each other.

4. A *vindicatory* argument -- i.e., an argument that a certain method M will yield good approximations to the truth if any method will do so , so that nothing indispensable will be lost and something may be gained by using M –is a rational form of epistemological justification.

TYPES OF PROBABILITIES

Three sets of probabilities connecting B, t_1 ….,t_n, and e are considered, where "probability of a proposition s given the proposition a" , designated by p(s/a), is understood in a sufficiently careful way as "the rational degree of belief in s upon assumption of the truth of a". The three sets are:

$p(t_i/B)$, for i=1,…,n --- the "prior probabilities" of the t_i assuming only B,

$p(e/t_i \,\&\, B)$, for i = 1,…,n -- the "likelihood" of e, assuming t_i and B.

$p(t_i/B \,\&\, e)$, for I = 1, … ,n -- the posterior probabilities of the t_i assuming B and e.