Science, Scientism, and Anti-Science in the Age of Preposterism

We are in danger of losing our grip on the concepts of truth, evidence, objectivity, disinterested inquiry. The preposterous environment in which academic work is presently conducted is inhospitable to genuine inquiry, hospitable to the sham and the fake. Encouraging both envy and resentment of the sciences, it has fed an increasingly widespread and articulate irrationalism.

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> That is preposterous which puts the last first and the first last. . . . Valuing knowledge, we *preposterize* the idea and say . . . everybody shall produce written research in order to live, and it shall be decreed a knowledge explosion.
>
> —Jacques Barzun[1]

There is, to be sure, a lot of misinformation about, and that is, certainly, a problem. But what concerns me is a deeper and more disturbing development: a rising tide of irrationalism, a widespread and increasingly articulate loss of confidence in the very possibility of honest inquiry, scientific or otherwise.

A hundred years or so ago, C. S. Peirce, a working scientist as well as the greatest of American philosophers, distinguished genuine inquiry from "sham reasoning," pseudo-inquiry aimed not at finding the truth but at making a case for some conclusion immovably believed in advance; and predicted that, when sham reasoning becomes commonplace, people

will come "to look on reasoning as merely decorative," and will "lose their conceptions of truth and of reason."[2]

This is the very debacle taking place before our eyes: genuine inquiry is so complex and difficult, and advocacy "research" and politically-motivated "scholarship" have become so commonplace, that our grip on the concepts of truth, evidence, objectivity, inquiry has been loosened. I want to talk about how this disaster came about, and the role played by the phenomenon Barzun calls "preposterism" in encouraging it.

The genuine inquirer wants to get to the truth of the matter . . . whether or not that truth comports with what he believed at the outset . . . and whether or not his acknowledgement of that truth is likely to get him tenure, or to make him rich, famous, or popular.

Pseudo-Inquiry; and the Real Thing

A genuine inquirer aims to find out the truth of some question, whatever the color of that truth. This is a tautology (*Webster's*: "inquiry: search for truth . . ."). A pseudo-inquirer seeks to make a case for the truth of some proposition(s) determined in advance. There are two kinds of pseudo-inquirer, the sham and the fake. A sham reasoner is concerned, not to find out how things really are, but to make a case for some immovably-held preconceived conviction. A fake reasoner is concerned, not to find out how things really are, but to advance himself by making a case for some proposition to the truth-value of which he is indifferent.

Neither sham nor fake inquiry is really inquiry; but we need to get beyond this tautology to understand what is wrong with sham and fake reasoning. The sham inquirer tries to make a case for the truth of a proposition his commitment to which is already evidence- and argument-proof. The fake inquirer tries to make a case for some proposition advancing which he thinks will enhance his own reputation, but to the truth-value of which he is indifferent. (Such indifference is, as Harry Frankfurt once shrewdly observed, the characteristic attitude of the bullshitter.)[3] Both the sham and the fake inquirer, but especially the sham, are motivated to avoid examining any apparently contrary evidence or argument too closely, to play down its importance or impugn its relevance, to contort themselves explaining it away. And, since people often mistake the impressively obscure for the profound, both, but especially the fake reasoner, are motivated to obfuscate.

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The genuine inquirer wants to get to the truth of the matter that concerns him, whether or not that truth comports with what he believed at the outset of his investigation, and whether or not his acknowledgement of that truth is likely to get him tenure, or to make him rich, famous, or popular. So he is motivated to seek out and assess the worth of evidence and arguments thoroughly and impartially. This doesn't just mean that he will be hard-working; it is a matter, rather, of willingness to re-think, to re-appraise, to spend as long as it takes on the detail that might be fatal, to give as much thought to the last one percent as to the rest. The genuine inquirer will be ready to acknowledge, to himself as well as others, where his evidence and arguments seem shakiest, and his articulation of problem or solution vaguest. He will be willing to go with the evidence even to unpopular conclusions, and to welcome someone else's having found the truth he was seeking. And, far from having a motive to obfuscate, he will try to see and explain things as clearly as he can.

This is not to deny that sham or fake reasoners may hit upon the truth, and, when they do, may come up with good evidence and arguments. Commitment to a cause, desire for reputation, are powerfully motivating forces which may prompt energetic intellectual effort. But the intelligence and ingenuity that will help a genuine inquirer to figure things out, will help a sham or fake inquirer to suppress unfavorable evidence or awkward arguments more effectively, or to devise more impressively obscure formulations.

Nor is this to deny that genuine, disinterested inquirers may come to false conclusions or be led astray by misleading evidence or arguments. But an honest inquirer will not suppress unfavorable evidence or awkward arguments, nor disguise his failure with affected obscurity; so, even when he fails, he will not impede others' efforts.

Of course, real human beings do not conform neatly to the three types I have distinguished; their motives are generally pretty mixed, and they are capable of many degrees and kinds of self-deception. A good environment for intellectual work will encourage genuine inquiry and discourage the sham and the fake; and will enable mutual scrutiny among workers in a field, so that the contributions to knowledge that sham and fake reasoners sometimes make despite their dubious motivation get sifted from the dross. Honest scrutiny is best; but scrutiny even by other sham or fake reasoners with different axes to grind may be effective as a way of exposing error, confusion, and obfuscation. A bad environment will encourage sham and fake inquiry, and/or impede mutual scrutiny.

The environment will be hospitable to good intellectual work insofar as incentives and rewards favor those who work on significant issues, and whose work is creative, careful, honest and thorough; insofar as journals, conferences, etc., make the best and most significant work readily available to others working in the area; insofar as channels of mutual scrutiny and criticism are open, and successful building on others' work is

encouraged. The environment will be inhospitable insofar as incentives and rewards encourage people to choose trivial issues where results are easily obtained, to disguise rather than tackle problems with their approach, to go for the flashy, the fashionable, and the impressively obscure over the deep, the difficult, and the painfully clear; insofar as the availability of the best and most significant work is hindered rather than enabled by journals and conferences bloated with the trivial, the faddy, and the carelessly or deliberately unclear; insofar as mutual scrutiny is impeded by fad, fashion, obfuscation, and fear of offending the influential.

I don't see how to avoid the conclusion that the environment in which academic work is presently conducted is an inhospitable one. I think this is true for all disciplines; but I shall focus, henceforth, primarily on philosophy—the discipline I know best, and the discipline in which disillusionment with the very idea of inquiry has been most overtly articulated.

A Preposterous Environment

"Everybody shall produce written research in order to live"; Barzun exaggerates, but not much. Everybody aspiring to the tenure-track, tenure, promotion, a raise, a better job, or, of course, academic stardom, had better produce written, published, research. "[A]nd it shall be decreed a knowledge explosion"; again, Barzun exaggerates, but, again, not much. It *is* pretty much taken for granted that this explosion of publications is a good thing, that it represents a significant contribution to knowledge.

Yet much of what is published is, at best, trivial stuff, putting me in mind of that observation: "Rubbish is rubbish, but the history of rubbish is scholarship." Seriously, though: few if any of us will have a truly original idea every few years, let alone every few months; genuinely important philosophical work usually takes years of frustration and failure. Nevertheless, we not only half-pretend that this written research that everybody must produce in order to live is mostly worthwhile; we breathe an atmosphere of puffery, of announcements in paper after paper, book after book, that all previous work in the area is hopelessly misconceived, and here is a radically new approach which will revolutionize the whole field. How did this atmosphere of preposterous exaggeration come about?

It is no longer possible to do important scientific work with a candle and a piece of string; ever more sophisticated equipment is needed to make ever more recherché observations. Research in the sciences has become very expensive; a culture of grants-and-research-projects has grown up; and science has become, *inter alia*, big business. The consequences for science itself are not altogether healthy: think of the time spent "writing grants," not to mention attending seminars on "grant writing," of the temptation to shade the truth about the success or importance of one's project, or of the price paid in terms of the progress of science when a condition of this or that body's supporting the research is that the results be withheld from the rest of the scientific community. But when disciplines like philosophy, where serious work requires, not fancy equipment, but only (only!) time and peace of mind, mimic the organization of the sciences, when the whole apparatus of grants-and-research-projects becomes so ordinary that we scarcely notice how extraordinary it is, when we adapt to a business ethos, the consequences are far worse.

Why worse? In part because in philosophy the circumpressure of facts, of evidence, is less direct; in part because there is no real analogue of the kind of routine, competent, unexciting work that gets the scientific details filled in; in part because in philosophy the mechanisms of mutual scrutiny are perhaps more clogged and probably more corrupted.

In part because it is so intellectually impressive, in part because it is so useful, and in part, no doubt, because it is so expensive, science enjoys enormous prestige, in which the rest of us would dearly like to share. And, inevitably perhaps, in consequence of universities' having become such big businesses, many university administrators have become enamored of a business management ethos which values "entrepreneurial skills," i.e., the ability to obtain large sums of money to undertake large research projects, above originality or depth, and which encourages conceptions of "efficiency" and "productivity" more appropriate to a manufacturing plant than to the pursuit of truth.

In disciplines like philosophy, feeling ourselves the poor relations in such a culture, we have adapted as best we could. Our adaptation has encouraged a kind of philosophical entrepreneurship which often diverts time and effort from real work, and is sometimes, to speak plainly, nothing more than philosophical hucksterism: centers for this and that, new journals for the legitimation and promotion of the latest fad, projects requiring secretaries, research assistants, or, better yet, more expensive and powerful computers or, best of all, a laboratory.

A good environment for intellectual work will encourage genuine inquiry and discourage the sham and the fake.

This adaptation damages the fragile intellectual integrity demanded by the genuine desire to find out how things are. It is part of the meaning of the word "research" that you don't know how things will turn out. Yet the whole apparatus of grants-and-research-projects, and the conception of productivity and efficiency it fosters, discourages candid acknowledgement that one may work for years at what turns out to be a dead end, and constitutes a standing encouragement to exaggeration, half-truth and outright dishonesty about what one has achieved. In principle, you might fill out the application explaining what important breakthroughs your work is going to achieve, and fill out the report, later, explaining what important breakthroughs your work actually did achieve, without your private estimation of the worth of your work being affected. In practice, inevitably, intellectual integrity is eroded.

It has been a poor adaptation which significantly affects what kinds of work get done, channeling effort into those

areas likeliest to attract funding. This is surely part of the explanation of the popularity of interdisciplinary work, especially work which allies philosophy with more prestigious disciplines such as cognitive psychology or artificial intelligence or medicine, etc.

Nor is it unduly cynical to suspect that it also significantly affects what kinds of conclusion are reached. Where effort is directed by the hope of large grants into, say, the border territory of epistemology with cognitive science, the probability rises that the conclusion that will be reached is that long-standing epistemological questions can be quickly resolved or as quickly dissolved by appeal to this or that work in cognitive science; where effort is directed by the hope of large grants into, say, the relevance of feminism to philosophy of science, the probability rises that the conclusion that will be reached is that feminism requires us, as Sandra Harding preposterously puts it, to "reinvent science and theorizing." (Challenged, nearly a decade later, to say what breakthroughs feminist science had achieved, Harding replied that, thanks to feminist scientists, we now know that menopause isn't a disease. Gosh.)[4] No one is so naive as to imagine that large grants might be forthcoming to show that cognitive science *has no* bearing on those long-standing epistemological questions, or even that its bearing is (as I believe), though real enough, oblique and undramatic; or to show that (as I believe) feminism *has no* relevance to the theory of scientific knowledge.

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The psychological mechanisms here are quite subtle. Simple, downright dishonesty is the exception; some degree or other of self-deception is the rule. And this is likely, naturally, to leave a residue of ambivalence, such as one can hear in this plea for the psychologization of epistemology: "[a] return [to a psychologistic conception of epistemology] is especially timely now, when cognitive psychology has renewed prestige. . . ." The relevance or otherwise of psychology to epistemology is a hard meta-epistemological question: on which, needless to say, the prestige of cognitive psychology has no bearing.

Still, all the puffery, the attempts to promote oneself or one's area, approach, or line, this academic boosterism, might be *only* a waste of time if, eventually, it all came out in the wash of mutual scrutiny and criticism. The waste of time, talent, and energy is significant; what real work might have been done by those who feel obliged, instead, to point out the absurdities of the latest fad? But, instead of efficient mechanisms of communication and mutual scrutiny, we have a mind-numbing clamor of publications, conferences, meetings, of "empty books and embarrassing assumptions,"[5] making it close to impossible to hear what is worthwhile.

The director of Rutgers University Press admits that "[w]e are . . . part of the university personnel system and . . . often publish books whose primary reason for existence is the author's academic advancement, not the advancement of knowledge."[6] The new editor of the *American Philosophical Quarterly* writes that publishing in the journals has become less a way to communicate significant ideas than a form of professional certification, and that being adequately informed in one's field of course no longer requires that one actually *read* all that stuff.[7] Even more startling than the candor of his observations about the real role of the journals is the blandness of his assumption that publication-as-professional-certification is perfectly OK. But it isn't perfectly OK; it gets in the way of—what is more than ever urgently necessary in a culture that positively encourages sham and fake reasoning—the mutual scrutiny that might separate the worthwhile from the dross.

Between 1900 and 1960, about forty-five new philosophy journals were founded in the U.S., Canada, and Britain; between 1960 and 1990, about 164. Inevitably, it has become impossible, except by sheer luck, to find the good stuff; inevitably, championship of a simple, startling idea, even, or perhaps especially, an egregiously false or an impressively obscure idea, has become a good route to reputation and money—as has the self-serving variation on a fashionable party line. Inevitably, too, finding referees with the necessary expertise, time, patience, and integrity has become harder, the power of editors to make or ruin careers has grown, and once-idealistic young philosophers begin to say to themselves, "they like controversy in their journal, so why bother spelling out the qualifications?". . .

And, inevitably, as it becomes harder to make oneself heard in the journals, one has to publish a book; and, as that book-published-by-a-reputable-academic-press becomes a requisite for tenure, we face the ever more bloated publishers' catalogues filled with ever more exaggerated descriptions and endorsements. And, inevitably, once again, it becomes impossible, except by sheer luck, to find the good stuff, and . . . But I won't bore you by writing the previous paragraph all over again!

It is not unheard of to find that the book of which a review has just appeared, having sold the few hundred copies which, these days, philosophy books typically sell, is already, a couple of years after publication, out of print. Better, then, from the point of view of sheer self-preservation, let alone of impressing Deans, etc., with one's "scholarly productivity," not to spend too long writing a book. How absurd, after all, to spend ten years writing a book which, if you are lucky, five hundred people might read, and the life of which, if you are lucky, might be four or five years.

It used to be an important role of the academic presses to publish significant books too specialized to be economic. Increasingly, however, as subsidies from their universities have shrunk, university presses seek to publish books they believe will make money. This too is discouraging, to put it mildly, to

the investment of effort in difficult problems. Better, from the point of view of making oneself heard, to write the kind of book that might interest a trade publisher, or at least the kind of book that will get reviewed in the non-academic press. And this too, inevitably, favors the simple, startling idea, even, or perhaps especially, the startlingly false or impressively obscure idea. . . . But I promised not to bore you by writing that paragraph all over again!

Like books and journals, conferences might be, and occasionally are, important channels of communication. But we are all familiar with the reality that your home institution will pay your expenses *if* you give a paper; with the conference announcements which discreetly let it be known that, so long as you pay the large registration fee, your paper will be accepted; with the stupefying programs of day after day of umpteen parallel sessions; with the twenty-minute, the twelve-minute, even, of late, the ten-minute presentation; with the extent to which conferences have become less a matter of communication than of "contacts," of "exposure," and, of course, of expenses-paid trips to agreeable places. We have adapted to these realities, in part, by self-deceptively over-rating the usefulness of what we like to call "stimulation," and under-rating the need for time, peace of mind, mature reflection.

I am reminded of Santayana's character-sketch of Royce: an "overworked, standardised, academic engine, creaking and thumping on at the call of duty or of habit, with no thought of sparing itself or anyone else."[8] Preposterism can only too easily turn the best of us into just such overworked, standardized, academic engines—and can only too easily turn the worst of us into purveyors of philosophical snake-oil.

The Perils of Preposterism

Thus far it may seem that the perils of preposterism are much the same for philosophy as for the humanities generally. But philosophy is the discipline to which it falls to inquire into inquiry itself, its proper conduct and necessary presuppositions. And that responsibility exposes us to a particular peril.

Recent philosophy manifests two tendencies, on the face of it radically opposed to each other, which both result in part from our adaptation to a "research ethic" more appropriate to the sciences than to the humanities: scientism, i.e., linking philosophy too closely, or inappropriately, to the sciences; and radical critique of the sciences as no more than ideology masked by rhetorical bullying in the form of appeals to "rationality," "objectivity," and so forth. The former is the effect of envy, the latter of resentment, of the success of the sciences.

One manifestation of science-envy is the mathematical or logical pseudo-rigor with which much recent philosophical writing is afflicted. This, to speak bluntly, is a kind of affected obscurity. Not that recourse to the languages of mathematics or logic never helps to make a philosophical argument or thesis clearer; of course, it does. But it can also stand in the way of real clarity by disguising failure to think deeply or critically enough about the concepts being manipulated with impressive logical sophistication. And it has come to be, too often, what Charles Sykes calls "Profspeak"—using unnecessary symbols to convey a false impression of depth and rigor.

Science-envy is manifested also by those who—hoping to enhance their prestige by close association with the sciences—contort themselves in attempts to show that this or that philosophical problem can be quickly settled by some scientific result, or to displace philosophical problems in favor of scientific ones. The result is at best a covert change of subject, at worst a self-undermining absurdity.[9] No scientific investigation can tell us whether science is epistemologically special, and if so, how, or whether a theory's yielding true predictions is an indication of its truth, and if so, why, and so on; yet, unless these were not only legitimate questions, but legitimate questions with less-than-skeptical answers, it is incomprehensible how one could be justified, as the most ambitious style of scientism proposes, in doing science instead of philosophy.

Preposterism can only too easily turn the best of us into overworked, standardized, academic engines . . . and the worst of us into purveyors of philosophical snake-oil.

Now one begins to see why the revolutionary scientism encountered in contemporary philosophy often manifests a peculiar affinity with the anti-scientific attitudes which, as I conjecture, are prompted by resentment, as scientism is prompted by envy, of the sciences. Both parties have become disillusioned with the very idea of honest inquiry, of truth-seeking. One hears from Paul Churchland, on the scientistic side, that, since truth is not the primary aim of the ceaseless cognitive activity of the ganglia of the sea-slug, it should maybe cease to be a primary aim of science, and even that talk of truth may make no sense; from Richard Rorty, on the anti-science side, that truth is just what can survive all conversational objections, and that the only sense in which science is exemplary is as a model of human solidarity. One hears from Patricia Churchland, on the scientistic side, that "truth, whatever that is, definitely takes the hindmost"; from Sandra Harding, on the anti-science side, that "the truth—whatever that is!—will not set you free." One hears from Steven Stich, on the scientistic side, that truth is neither intrinsically nor instrumentally valuable, and that a justified belief is one his holding which conduces to whatever the believer values; from Steve Fuller, on the anti-science side, that good scholarship is a matter simply of "who[m] you are trying to court in your work."[10]

Remember Peirce on what will happen if pseudo-inquiry becomes commonplace: "men come to look upon reasoning as mainly decorative. . . . The result of this state of things is, of course, a rapid deterioration of intellectual vigor. . . . [M]an loses his conceptions of truth and of reason. If he sees one man assert what another denies, he will, if he is concerned, choose his side and set to work . . . to silence his adversaries. The truth for him is that for which he fights."[11]

I can match neither Peirce's prescience nor his eloquence, only add a little circumstantial detail to his diagnosis. Prepost-

erism encourages sham and fake reasoning. In the humanities, it also encourages envy of science, and thus scientism and a *certain kind of irrationalism, and resentment of science,* and thus an only-slightly-different kind of irrationalism. Within philosophy, furthermore, as the discipline to which the task of articulating the nature and goals of inquiry falls, the ubiquity of sham and fake reasoning has induced a factitious despair of the possibility of attaining truth by investigation—the despair revealed in the astonishing outbreak of sneer quotes with which so much recent philosophical writing expresses its distrust of "truth," "reality," "facts," "reason," "objectivity," etc.

When sham and fake reasoning are ubiquitous, people become uncomfortably aware, or half-aware, that reputations are made as often by clever championship of the indefensible or the incomprehensible as by serious intellectual work, as often by mutual promotion as by merit. Knowing, or half-knowing, this, they become increasingly leery of what they hear and read. Their confidence in what passes for true declines, and with it their willingness to use the words "truth," "rationality," etc., without the precaution of scare quotes. And as those scare quotes become ubiquitous, people's confidence in the concepts of truth and reason falters, and one begins to hear (from Richard Rorty): "I do not have much use for notions like . . . 'objective truth'," "'true' [is] a word which applies to those beliefs upon which we are able to agree," or (from Bruno Latour and Steve Woolgar): "a fact is nothing but a statement with no modality . . . and no trace of authorship," or (from Steve Fuller): "I don't see any clear distinction between 'good scholarship' and 'political relevance.'"[12]

The inference from the true premiss that what passes for truth, objective fact, rational argument, relevant evidence, etc., is often no such thing, to the false conclusion that the notions of truth, objectivity, rationality, evidence, etc., are humbug, is obviously invalid. But it has become so ubiquitous that it deserves a name; I call it "the 'passes for' fallacy."[13] The "passes for" fallacy is not only fallacious, but self-defeating; for if the conclusion were true, one could never have grounds for accepting the premiss from which it is supposedly derived. It should come as no surprise, therefore, to read (in Stephen Cole): "Given that facts can easily become errors, what sense does it make to see what is at Time 1 a 'fact' and at Time 2 an 'error' as being determined by nature?", and then, a few pages later, "the most important evidence in favor of my position is the fact that . . . ,"[14] or (in Ruth Bleier): "[I criticized various studies] for their sloppy methods, inconclusive findings, and unwarranted interpretations," and then, a few pages later, "there must be an irreducible . . . distortion or biasing of knowledge production simply because science is a social activity performed by human beings in a specific cultural . . . context."[15]

Sad to say, this last quotation is quite typical of much recent "feminist scholarship." The vast recent literature of feminist approaches to this or that area of philosophy—ethics, epistemology, philosophy of science, philosophy of language, lately even logic—is a particularly striking manifestation of the consequences of preposterism. Reading in this vast literature, one can hardly fail to notice how endlessly it is repeated that feminism has radical consequences for this or that area, and *how often those radical consequences turn out to be trivial, or* obviously derivative from some male philosopher, or manifestly false; by how determinedly practitioners avert their attention from serious criticisms, and how lavishly they praise the work of others of their own persuasion. Pondering on how this came about, one can hardly fail to think how many reputations and careers, how many centers, programs, conferences, journals, depend on the legitimacy of appealing to the feminist perspective on this or that. And one's darkest suspicions are confirmed when, in a moment of remarkable candor, Sandra Harding tells us that "[m]en who want to be 'in feminism' . . . can teach and write about women's thought, writings, accomplishments. . . . They can criticize their male colleagues. They can move material resources to women . . . ."[16]

My point isn't that the feminist-philosophy bandwagon is peculiarly awful; I don't know that it is *peculiarly* awful, and in any case my point is not to pick on the feminists, but to articulate how the epidemic of sham and fake reasoning encouraged by preposterism has loosened our grip on the concept of inquiry. The perception among these radical feminist philosophers that their profession is profoundly corrupt is, at worst, exaggerated; their profession *is* rife with pseudo-inquiry, and publication, promotion, stardom, etc., *are* cut loose from merit. And this perception of the ubiquity of pseudo-inquiry has encouraged the despair of the possibility of honest investigation ubiquitous in philosophy today.

Such a "factitious despair" is bound, as Francis Bacon eloquently put it long ago, to "cut the sinews and spurs of industry." (And all, as he observed, for "the miserable vainglory of having it believed that whatever has not yet been discovered and comprehended can never be discovered and comprehended hereafter.")[17]

But unbiased investigation is *not* impossible; only difficult, demanding, painful—and of almost incalculable value to us humans. Which is why I end this lay sermon with a text, from George Eliot's *Felix Holt the Radical*:

> Truth is the precious harvest of the earth.
> But once, when harvest waved upon a land,
> The noisome cankerworm and caterpillar,
> Locusts, and all the swarming, foul-born broods,
> Fastened upon it with swift, greedy jaws,
> And turned the harvest into pestilence,
> Until men said, What profits it to sow?

Notes

1. Jacques Barzun, *The American University*, Harper and Row, New York, 1968, p. 221.

2. *Collected Papers*, eds. Charles Hartshorne, Paul Weiss, and Arthur Burks, Harvard University Press, Cambridge, Mass., 1931–58, 5.520 (c. 1905), 6.6 (c. 1903), 1.128 (c. 1905). References by volume and paragraph number.

3. Harry Frankfurt, "On Bullshit," in *The Importance of What We Care*

PREPOSTERISM
continued on page 60

beginners.) Hypothesis (which is just a word scientists use when they mean having preconceptions) must precede discovery. We must have preconceptions, notions not based on much except some vague, lingering hunch, before we can even begin to conceive of the truth—or misconceive it. The trick comes, of course, in either getting the right preconception or, having a wrong one, realizing it and dropping it like a hot potato.

Circles are appealing in their simple perfection, and simplicity and perfection are as appealing to scientists as they are to everyone else. It is what they are continually striving to achieve: Organization. Simplicity. Perfection. Of concepts no less than of solutions. This results in elegance. Whether physicist or mathematician, it is elegance that is sought, and worshipped.

But suppose, just suppose, that the universe, at heart, is not as elegant as all that, is not elegant at all! Suppose it's all jerrybuilt and jury-rigged, a kaleidoscope of kludges, its underlying laws Darwinian, pragmatic, patchwork, messy, disorganized, out of joint. What then?

When the Roman soldier who was seeking Archimedes found him, the great scientist was sitting gazing intently at the circles he had drawn in the dirt with a stick. This time Archimedes did not shout "Eureka!" or declare that, given a place to stand, he could move the Earth. He merely muttered to the soldier not to disturb his circles, and the soldier killed him for his insufferable nonchalance. But perhaps the soldier, as well as his spear, had a point. Perhaps our circles, simple, perfect, timeless, and elegant, ought to be disturbed, at least once in a while, our preconceptions probed and poked at every so often . . . just to keep us, and our conceptions, on our toes. What could be more elegant than that? □

PREPOSTERISM

from page 42

About, Cambridge University Press, Cambridge, 1989, pp. 117–133.

4. Sandra Harding, *The Science Question in Feminism*, Cornell University Press, Ithaca, N.Y., 1986, p. 251; *Chronicle of Higher Education*, April 27, 1994, p. A15.

5. Peirce, *Collected Papers*, 1.645 (1898).

6. Kenneth Arnold, "University Presses Could Still Become the Cultural Force for Change and Enlightenment They Were Meant to Be," *Chronicle of Higher Education*, July 29, 1987; cited in Charles Sykes, *Profscam*, Regnery Gateway, Washington, D.C., 1988, p. 129.

7. Gary Gutting, "The Editor's Page," *American Philosophical Quarterly*, 31.1, 1994, p. 87.

8. George Santayana, *Character and Opinion in the United States; With Reminiscences of William James and Josiah Royce and Academic Life in America*, Charles Scribner's Sons, New York, 1920, p. 98.

9. See Susan Haack, *Evidence and Inquiry: Towards Reconstruction in Epistemology*, Blackwell, Oxford, 1993, chapters 6, 7 and 8.

10. Paul M. Churchland," The Ontological Status of Observables" (1982), in *A Neurocomputational Perspective: The Nature of Mind and the Structure of Science*, Bradford Books, MIT Press, Cambridge, Mass.; Richard Rorty, *Consequences of Pragmatism*, Harvester Press, Hassocks, Sussex, 1982, p. 165, and "Science as Solidarity," in John S. Nelson, Allan Megill, and Donald McCloskey, eds., *The Rhetoric of the Human Sciences*, University of Wisconsin Press, Madison, Wis., 1987, p. 187; Patricia Smith Churchland, "Epistemology in the Age of Neuroscience," *Journal of Philosophy*, LXXV.10, 1987, p. 549; Sandra Harding, *Whose Science? Whose Knowledge?*, Cornell University Press, Ithaca, N.Y., 1991, p. xi; Stephen P. Stich, *The Fragmentation of Reason*, Bradford Books, MIT Press, Cambridge, Mass., 1992, pp. 118ff.; Steve Fuller, e-mail message, May 4, 1994.

11. *Collected Papers*, 1.57–9 (c. 1896).

12. Richard Rorty, "Trotsky and the Wild Orchids," *Common Knowledge*, 1.3, 1992, p. 141, and "Science as Solidarity," p. 45; Bruno Latour and Steve Woolgar, *Laboratory Life: The Social Construction of Scientific Facts*, Sage, London, 1979, p. 82; Fuller, e-mail message, May 4, 1994.

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SEABORG INTERVIEW

from page 45

treatment with the same radioactive iodine (iodine-131).

SI: Here we are almost at the end of the century. How has the world changed—in science and technology and in society generally? Are you generally optimistic about the future of U.S. society?

SEABORG: Well, I think I would say "yes." As to how the world has changed, I really have spanned the gap. When I was a little boy in Ishpeming, Michigan, where I spent my first ten years, we didn't have a telephone in the house and I'd never heard the word "radio," let alone seen a radio. And when I first moved to the Los Angeles area, in what is now South Gate, I did learn about the existence of radio and began trying to build crystal sets. Through the years to today, I've watched the developments. Although I've never been interested in biological sciences, probably the big discoveries in the future will be in the biological sciences—the possibility of creating artificial life, the study of the mechanisms of disease, the discovery of chemical agents that can counteract and cure disease, and so forth. I believe the world is much better off—extremely better off—because of the gradual growth of science and its applications. My father's parents died of tuberculosis. That wouldn't be necessary today. There have been tremendous advances in medicine, the curing of diseases of all kinds. We're living in a much better world now than my grandparents did, or my parents. We can travel anywhere in the world, in just a matter of hours. We have a system of communications where we know what's going on all over the world within minutes. We have a much better understanding of nutrition. Many advances in medical science have prolonged life so that the life span has become much longer. All in all, we're living in a much better world than our parents or our grandparents lived in. □