Science, Technology & Society

Curriculum Newsletter of the Lehigh University STS Program

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Editor: Stephen H. Cutcliffe

Number 15
December 1979

TECHNOLOGY, FREEDOM AND INDIVIDUAL AUTONOMY

A number of claims for contemporary "high technology" are advanced by its proponents as self-evident truths. They claim:

* That technology, by nature, is a passive tool which may be used beneficially or harmfully; it itself embodies no values and is a morally neutral means to whatever ends are desired; it plays a strictly passive role with respect to issues of political power and social control.

* That contemporary technology enlarges human freedom, widens available options and enhances personal autonomy; whatever ill consequences result from the deployment or utilization of technology are caused by man exercising this enhanced freedom of choice.

"Surely," proclaims Simon Ramo, "everybody understands that science and technology are mere tools for civilized man."[1] "... if anyone is to blame, it is not the tool but the human maker and user," adds Peter Drucker.[2] The reason why we have smog in Los Angeles, says Alvin Weinberg, is because too many individuals autonomously drive cars! "Many people by their individual acts (which are presumed autonomous) cause shortages...."[3]

"The negative effects of technology ... are traceable ... much more to the autonomy that our political and economic institutions grant to individual decision-making," says Emmanuel Mesthene.[4] Why megalopolis? Because "... people apparently want to live together in large agglomerations ..." explains Melvin Kranzberg.[5] "However much we deplore our automobile culture, clearly it has been created by people making choices ..." says Samuel Florman.[6] And Daniel Moynihan proves it with a syllogism: "Freedom is choice and technology enhances choice. (Therefore,) technology has vastly enhanced human freedom."[7]

It should be evident that the two major propositions -- that technology is passive and neutral, on the one hand, and that it enhances human freedom and autonomy, on the other -- are incompatible and mutually exclusive. If technology is neutral, how can it be biased toward freedom? And if it plays an active role with respect to *one* moral issue (freedom), then is it possible to claim that technology is neutral toward other ends? Notwithstanding

the contradiction, the same individuals who make the one claim often also make the second one.

But quite apart from this logical fallacy, even if both claims together cannot be true, perhaps one or the other is valid. In order to judge, it is important to understand the fundamental nature of contemporary technology. One-dimensional observations -- as of the proverbial elephant -- are inadequate to describe this multi-dimensional abstract concept. The dimensions or elements of technology might be classified as follows.

1. *Physical objects* - hardware - tools, instruments, machines, weapons, appliances. This is the original, elementary conception of technology.

2. *Knowledge* - not abstract, scientific knowlege but *know-how* - methods, processes, *technique*. For Harvey Brooks, this dimension *is* technology.

3. *Human beings* - not autonomous individuals but people who are largely interchangeable with one another - have the appropriate know-how to operate the hardware.

4. *Organization and system* - the organized structures, the integrated networks within which the hardware is embedded and technique employed; the linkages that tie together the hardware and the technique with the social institutions.

5. *Political and economic power* - this dimension is implicit in the preceding one but it should be acknowledged explicitly.

Science, Technology & Society, supported by a dissemination grant from the National Endowment for the Humanities, is a newsletter devoted to material in the general area of science, technology, and human values. We will publish short articles on the theoretical and speculative aspects of curriculum development, in-depth course descriptions, reviews of texts and audio-visual aids, and current bibliography (annotated). In addition, we would welcome articles on successful techniques for such tasks as instituting and evaluating a course or program, arousing faculty and student interest, overcoming administrative reluctance, obtaining visibility on campus, running a lecture or film series, or editing a newsletter. An "Open Forum" section exists for readers with questions or comments regarding any curriculum need. Our goal is to help generate new courses and to provide an information exchange in the STS field. Please address all contributions and correspondence to: Dr. Stephen H. Cutcliffe, STS Program, 216 Maginnes Hall #9, Lehigh University, Bethlehem, PA 18015.

Technology is not simply the computer, for example, but large-scale computer networks linked through telecommunications systems; it is computer operating and managing systems; it is data banks, the know-how and the programs to manipulate them and the power implicit in controlling them. Any analysis of contemporary technological society which fails to account for this multidimensional nature of technology -- especially the notion of technological system -- will be deeply flawed.

In this light, how can we interpret the preceding technological litany? Do these claims help to explain reality or do they create illusion? Do they provide an accurate description of contemporary technological society -- as a science is descriptive? Is it "man" in the abstract who is the culprit, or more specific agents? Does not somebody's profit enter the picture at all? Is the nature of technology independent of the social order?

It is my contention that neither the technology-is-neutral claim nor the technology-enhances-freedom claim is tenable. Furthermore, a strong case can be made that the assertions purporting to explain the nature of technology contain a large dose of ideology. They serve the instrumental function of image-making, of inducing people to behave *as if* the ills experienced by society are consequences of objective decisions carried out for such objective reasons as efficiency. By failing to take political power and economic interests into account they conceal the existence of specific powerful corporations whose activities in pursuit of their interests are major determining factors of the ills ascribed by the ideology to the exercise of individual autonomy.

It is almost universally accepted that technological innovations in production processes and in products serve such objective goals as efficiency, increase in productivity, and human needs satisfaction. Nevertheless, there is a small, but increasing, body of literature which challenges this perception. For example, David Dickson concludes from

his study of the development of the textile industry in Britain during the Industrial Revolution that the organization of work in factories and the introduction of many of the machines utilized in the textile industry were carried out -- not so much for technological reasons -- but largely for the managerial reasons of subduing and disciplining the workers; not so much for production efficiency as to maintain authoritarian forms of discipline, hierarchical structure and regimentation.[8] Richard Edwards reaches similar conclusions about the complex hierarchy of the modern large corporation.[9] David Noble of the Program in Science, Technology and Society at MIT shows how such a modern innovation as numerical control of machine tools is implemented in the U.S. in such a way as to remove control over the work from the skilled machinist.[10]

Most contemporary innovations arise from R&D activities carried out in the labs of technology-intensive corporations. The goals of these corporations are growth in sales and in profits. Product innovation -- no less than any other activities of the corporation -- serves corporate purposes and would be carried out quite independent of any existing human or social needs. It would not do for the lack of a need to thwart the corporation's desire to increase sales and profits.

There are several arenas in which human beings are presumed to exercise their freedom of choice and thus influence the development of technology. They are: the workplace, the market, the voting booth. That is, people are involved as producer, as consumer, and as participant in the political process. Let us briefly examine each of these areas.

It makes no sense to imagine an employee -- one of a vast number of others -- as exercising autonomy in the workplace; as using presumably neutral technology for his/her own desired purposes. (The absurdity of the notion has been clearly described by Langdon Winner.)[11]

As for the political arena, there is at best a tenuous relation between a citizen's exercise of the franchise and the deployment of technology. The configuration of any segment of technology as it now exists is not the consequence of open political debate on the merits of alternatives and then selection through the political process.

Political scientist James Carroll has provided some useful insight here. "Technological processes," he says, "frequently are the *de facto* locus of political choices .... In the absence of appropriately structured political processes for identifying and debating the value choices in what appear to be technical alternatives, technical processes become, by default, the locus of political value decisions."[12] These choices, says Carroll, are binding on individuals and groups, and they may have no immediate recourse from them.

Finally, the market. The image of the market as a neutral, objective determinant of social choice is a powerful shaper of the consciousness of Americans as autonomous choosers among many options. There are a number of things wrong with this image. One is the skewed asymmetry as between individuals and large, powerful corporations. Another is that individuals have become highly dependent on the technological systems that define the conditions of contemporary life: transportation systems, food production and distribution systems, energy systems, artifact production systems, health-care systems, communication systems, etc. For most people there is no alternative to utilizing these systems -- unless they drop out of society altogether. They are hooked on these systems and cannot detach themselves. It is estimated, for example, that low income families now spend 30% of their income on energy cost and this ratio will increase in the 1980's. They can either eat and freeze or heat and starve this winter -- clearly not by choice.

But even within the context of the regulation of technological developments by the market, is it possible to describe accurately the current status of specific technologies (e.g. the transportation system) as the consequence of untrammelled individual choice

guiding the invisible hand? Market prices can be kept artificially low by transferring some of the costs associated with production or use from the manufacturer and/or user to third parties in at least two ways:

(a) by subsidies from the government.

(b) by failure to account for "external costs" in setting prices.

In actual fact, both of these processes have operated widely to distort price structures. Vast sums have been transferred to corporations in subsidies by the federal government, either directly (through grants and low-interest loans or loan guarantees) or indirectly (through the taxing mechanism or by having the government assume responsibility for certain components of technological systems, like highways and airports). Similarly, inestimably huge external costs, both privately borne and socially borne, have been transferred to others. Purchasing decisions are obviously influenced by prices that are artificially depressed in such ways. If this circumstance permits a large-scale technological development to take place, which then induces major changes in the way people live, would it be meaningful to assert that the detailed forms of the resulting society are consequences of individual "free choice"?

An often-used illustration by the arguers for free choice is the transportation system. "The love affair of Americans with their cars" is an image commonly used to explain our automobile culture. In this era of fuel shortage, it is customary for American leaders to exhort the people to conserve gasoline by driving less. The implication is clear that driving by Americans is discretionary and it is only the perverse exercise of individual free choice that causes our current ills. But do individuals really have any choice? True, they can select this model car or that, this color or that, this upholstery or that -- but most people cannot choose not to have a car. The design of cities, the locations of services, places of employment, shopping centers, etc. are all predicated on the motor car as the dominant mode of transportation. These conditions induce an institutionalized style of living over which individuals have little control and to which they are compelled to conform.

The reason for smog in los Angeles, says Weinberg, is that too many people drive cars. A much more accurate reason is that General Motors bought the Pacific Electric Railway System and destroyed it in order to promote the use of the private automobile.[13] (During the 1920's the PER operated 1200 miles of interurban rail service. When the population of the area was only 1 million in 1924, the system carried a volume of 109 million passengers. By comparison, almost half a century later when the population was 800-900 per cent greater, public transit using buses carried only 75 per cent more passengers.) Not individual autonomy but the technological order, capped by the power of large corporations, is the major cause, not only for smog but for the fact that over half the land area of Los Angeles -- including freeways, streets, driveways, parking lots, gas stations, auto show rooms, etc. -- is dedicated to the automobile.

To conclude:

From the analysis presented in this brief essay, it is clear that the nature of contemporary technology reflects the dominant ways in which reality is interpreted in society. It is not independent of issues of economic and political power and social control. A society in which rapid economic growth is a high value necessitates a particular kind of technology; namely, one with a high level of innovation, quite independent of social need. Policies leading to economic expansion *have to be* reflected in the particular form of technology through which this expansion is achieved. Hierarchical forms of social control become reflected in the technology. Thus, large-scale, complex, interconnected technological systems require hierarchical structure for their routine operations. The presumed neutrality of technology then lends legitimacy to hierarchical structure and to any policies required to maintain them, however repressive and inimical to the public good these policies might be, for example, the recently proposed Energy Mobilization Board.

Contemporary technology has outdistanced its simple, neutral-tool, liberating image. In its present pervasive, all-encompassing form, far from expanding human freedom, contemporary technology limits individual autonomy; it imposes conditions of life and a style of living concerning which individuals have very

little choice. To chide individuals for recalcitrance or perversity for their unwillingness "to give up" their refrigerator or automobile is to profoundly misjudge the nature of contemporary technology. It is like blaming the victim for the crime. Public policies resulting from such misperceptions -- such as the recently proposed synfuels program -- will deepen the pathology; they will lead to increased centralization and hierarchy and a further reduction of human autonomy.

Values are central in the configuration and structure of technology. The contemporary "advanced", highly-structured, centralized, inflexible, all-pervasive form of technology is incompatible with individual autonomy and human freedom. If the latter are truly valued ends, then it is essential that forms of technology with different characteristics compatible with these values by developed. A first step is the explicit placing of value issues up-front in the debate on technology.

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FOOTNOTES

1. Simon Ramo, *Century of Mismatch.* (New York: David McKay, 1970), vi.

2. Peter F. Drucker, "Technological Trends in the Twentieth Century," in Melvin Kranzberg and Carroll Pursell, eds. *Technology in Western Civilization.* 2 vols. (New York: Oxford, 1967), II, 32-33.

3. Alvin Weinberg, "Can Technology Replace Social Engineering?", *University of Chicago Magazine,* 59 (October 1966). Reprinted in Albert H. Teich, ed. *Technology and Man's Future.* (New York: St. Martin's Press, 1977), 22-30.

4. Emmanuel G. Methene, *Technological Change: Its Impact on Man and Society.* (Cambridge: Harvard University Press, 1970), 40.

5. Kranzberg and Pursell, eds., *Technology in Western Civilization,* II, 700.

6. Samuel C. Florman, *The Existential Pleasures of Engineering.* (New York: St. Martin's Press, 1976), 60.

7. Daniel F. Moynihan, Honors Convocation Lecture, Syracuse University, Reported in Syracuse University *Record,* February 1, 1979, p. 3.

8. David Dickson, *The Politics of Alternative Technology.* (New York: Universe Books, 1974).

9. Richard C. Edwards, *Contested Terrain: The Transformation of the Workplace in the 20th Century.* (New York: Basic Books, 1979).

10. David Noble, "Social Choice in Machine Design: The Case of Automatically Controlled Machine Tools," in Andrew Zimbalist, ed. *Case Studies in the Labor Process.* (New York: Monthly Review Press, 1979).

11. Langdon Winner, *Autonomous Technology.* (Cambridge: MIT Press, 1977), 201. (This book deals with many of the issues treated in this paper.)

12. James D. Carroll, "Participatory Technology," *Science,* 171 (February 19, 1971): 647-653. Reprinted in Teich, ed. *Technology and Man's Future,* 336-54.

13. Bradford C. Snell, *American Ground Transport,* 1974. Prepared for the Senate Antitrust Subcommittee.

REPORT OF A CONFERENCE AT WINGSPREAD CENTER ON HUMANITIES AND TECHNOLOGY

In February, 1979 fellows of the National Endowment for the Humanities Institute (at the University of Chicago) met with faculty from the University of Wisconsin-Green Bay at a round table conference at the Wingspread Center in Racine, WI to discuss the general topic Humanities and Technology. The work occupied the better part of two days divided into three meetings with a special focus for each. The meetings began with an introduction and discussion of some reading appropriate to the topic. The subjects of the meetings were:

1. What models exist for the humanistic study of technology?

2. Do the humanities require new departures, procedures and categories for this study?

3. What are the prospects for developing a general framework for the humanistic study of technology?

The participants offered a number of models for the study of technology usually based on their own particular interests. These were diverse and included the model of control and losing control; the study of technology as a social artifact; the conflict between humanities and technology as one between conflicting world views especially between an organic as opposed to a mechanistic view, or a mystical as opposed to a mechanistic view; and, finally, the study of technology as a source of mundane power.

In general the models expressed agreed with the perspective that technology was embedded in culture and that the possibility of establishing a common framework for studying it existed although approaches might vary considerably. But the possibility that science and technology would become more organic and less mechanistic in their procedures was strongly denied, especially by non-humanists. We were later to realize that this denial implied special responsibilities for humanists.

The second session began with a discussion of Leon R. Kass "'Making Babies' Revisited," The Public Interest (Winter 1979): 32-60, which all the participants had previously read. The principle discussant of the article, a mathematician, stressed

that the issue, the validity of carrying out experiments on blastocysts (3-6 day old embryos) which may have as their goal the relief of infertility, was entirely technological since the goal was not improved scientific information, otherwise the experiments might as well have been undertaken with animal tissues.

The participants readily agreed that Kass' essay was a true humanistic effort but, as the discussion developed, they became increasingly consistent in their criticism of Kass because he had established no objective standards. The humanists were additionally critical, it seemed, because they believed that humanists should clarify issues or raise problems rather than try to solve problems. Others emphasized that it is with decisions that humanists must be occupied primarily, otherwise scientists and technologists will make the decisions and do so on a mechanistic or reductionist basis. They asked, "Isn't it possible to describe dehumanized behavior or establish standards which will bracket technological choice on some humanistic continuum between good and bad?" Several humanists expressed doubt about this possibility.

Drawing on the consensus established in the first session, that technology was embedded in culture, some humanists questioned their society which would not provide the basis to allow them to appeal to shared values; a society in which they could not form any idea of the ideals to which humanists should aspire, i.e. to greater objectivity. Others argued that many of the standard procedures of academic humanists were addressing the ethical issues of technology and society in courses, etc. Still others seemed to feel that in the present situation there was more at stake than educational goals; that some kind of direct interface between humanities and technology should exist, but whether in the academy or elsewhere, they did not say. Discussion followed in regard to the urgency of developing an interface between the humanities and technology with the humanists generally arguing that, together with other institutions, academia was contributing to an improved ability of society to evaluate and assimilate technology.

Session Three began with a discussion of Hans Jonas, "Technology and Responsibility," Philosophical Essays (Prentice-Hall, 1974): 3-20, but turned into one dominated by the model, mentioned in Session One, of technology and the power relationships of society, especially the manipulation of technology for corporate ends. In this context, it was observed that the moralistic or individualistic approach would have a limited effect on technology since the decisions in any case would tend to benefit the corporation. Looking at it in this way would tend to take the burden off the individual.

But can the corporation and the economic and social values it represents be controlled except by individual decisions? Does not the issue necessarily come down to the courage of individual decision-makers, others asked? And does not that imply the development of some models for evaluating and making alternative choices. Otherwise the reductionist model will prevail, some feared.

The session closed with an expression of the view that humanists with others should be involved in the decision-making process: ". . . . let's get around to human beings who are intelligent and willing to talk about issues."

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For further information on the conference or a list of participants, please write directly to Dr. Abrahams.

CORRECTION

In the #13, October 1979 issue, Gerald Holton's *Thematic Origins of Scientific Thought* (Harvard) was referred to as an "expensive paperback," (p. 3). The price of Holton's book was inadvertently confused with that of another volume. The correct price for the paperback version is $5.95. *Editor*

PHILOSOPHY AND TECHNOLOGY

An experimental course entitled "Philosophy and Technology" was offered by two philosophers and a chemical engineer at Ohio University during the Spring quarter of 1979. Development of this course was made possible by a grant from the National Endowment for the Humanities under a project directed by Professor Donald Borchert of the Department of Philosophy. Professor David Stewart, also a member of the philosophy faculty, and Professor Nicholas Dinos, Chairman of the Department of Chemical Engineering, were the other participants in this team-teaching effort.

The course was cross-listed in both the philosophy and chemical engineering departments and was also unusual in that it was a cross-disciplinary effort spanning two distinct colleges within the university. Another distinctive aspect of the course was a Field Trip to three-technology intensive industries--a petro-chemical plant, a consumer-products firm, and a steel mill. These were selected to reveal a wide diversity against a background of similarities in contemporary industrial technology.

Twenty-seven students were enrolled in the course, with their numbers about equally divided between engineering and humanities students. The course met twice a week in the evenings for two and one-half hours, and the usual format was a 50-75 minute lecture followed by a discussion among the three professors. The overall aims of the course were to assist students in understanding the nature of the engineering/technological enterprise and to develop a philosophical posture from which to assess the value systems served by technology.

The course proceeded according to the following syllabus:

Philosophy and Technology
Call No. 1489 Ch.E. 490
4620 Ch.E. 490
4565 Phil. 369E

Spring Quarter 1979
Prof. Donald M. Borchert
Prof. Nicholas Dinos
Prof. J. David Stewart

Objective of the Course

This course will attempt:

(1) to explore the conceptual frameworks associated with developing technology;
(2) to achieve an understanding of how engineers pursue their enterprise;
(3) to develop a reasoned assessment of technological development.

Textbooks to be purchased

Jacques Ellul, *The Technological Society*. New York: Vintage Books, 1964.
Samuel C. Florman, *The Existential Pleasures of Engineering*. New York: St. Martin's Press, 1976.
Lewis Mumford, *Technics and Civilization*. New York: Harcourt, Brace & World, 1963.
Charles Susskind, *Understanding Technology*. Baltimore: Johns Hopkins University Press, 1975.
Alfred North Whitehead, *Science and the Modern World*. New York: Mentor Book, 1925.

Part I: The Conceptual Frameworks Associated with Developing Technology, moderated by Dr. J. David Stewart.

Reading Assignments: Lewis Mumford, *Technics and Civilization* (in part).
Alfred North Whitehead, *Science and the Modern World* (in part).

Session #1 (March 29) - Eight contemporary definitions of technology were critiqued, and the lecturer offered his own definition for discussion. The nature of philosophy as a discipline was examined.

Session #2 (April 2) - The conceptual contribution of the Greeks to the development of science and technology was discussed in terms of

(1) the power of abstraction,
(2) the view that changes in quantity can generate changes in quality,
(3) the notion of the rationality of nature,
(4) the notion of the quantifiability of nature, and
(5) the development of logic.

Session #3 (April 5) - Whitehead's suggestion that a "sleep of reason" prevailed from the time of the Greeks to the modern era (17th century) was examined. Four factors were suggested to account for the awakening of reason and the mushrooming of science and technology:

(1) the desacralization of nature,
(2) the growth of an experimental attitude,
(3) the development of inductive reasoning,
(4) the belief that knowledge is power.

Session #4 (April 9) - The "machinification" of human thought and action with the attendant subversion of the human cogito during the 17th and 18th centuries was examined.

Session #5 (April 12) - The 19th century romantic reaction to machinification was explored particularly with reference to Kierkegaard and Nietzsche. The continuation of this reaction in 10th century existentialism was also discussed especially in the thought of Sartre and Marcel. Parallels to these movements were explored in the music of Bach, Mozart, Beethovan, Wagner, and modern jazz.

Session #6 (April 16) - Examination No. 1 covering Part I of the course was given. The test lasted 75 minutes, after which the movie "The Man in the White Suit" starring Alec Guiness was shown to enhance appreciation both for the engineer's delight in technological development and also for the unexpected mixture of good and evil which frequently attends technological advance.

Part II: Engineering Methods and Paradigms, moderated by Dr. Nicholas Dinos

Reading Assignments: Charles Susskind, *Understanding Technology* (in part).
Samuel C. Florman, *The Existential Pleasures of Engineering* (in part).

Session #1 (April 19) - The engineering enterprise was depicted as limited by three sets of constraints: the possible, the probable, the feasible. The possible over-against the impossible was discussed in terms of the three laws of thermodynamics.

Session #2 (April 23) - The second major constraint under which the engineer works -- the probable over-against the improbable -- was elucidated by discussing the mathematical models which engineers use to identify probably successful projects within the sphere of possible projects. In this connection, a brief historical survey of applied mathematics was presented, the distinction between linear and non-linear systems was explored, and the nature of computers was examined.

Session #3 (April 26) - The attitudinal, sociological, philosophical and scientific presuppositions of a "typical" engineer were suggested and discussed. Those presuppositions were explored further in a role-playing scenario in which Stewart adopted the position of a right-wing capitalist, Borchert assumed the stance of a left-wing Marxist, and Dinos acted as a middle-of-the-road "typical" engineer.

Session #4 (April 30) - The third major constraint for engineers -- the feasible over-against the non-feasible -- was discussed in terms of economics to give an analysis whose goal is not a perfect solution but rather an optimal solution.

Session #5 (May 3) - The engineer's acceptance of the physicist's stochastic, indeterminate universe was juxtaposed to the common engineering practice which depends upon a deterministic, causal universe. The puzzles and problems associated with this situation were explored.

Session #6 (May 7) - Examination No. 2 covering Part II of the course was given. The test lasted 75 minutes, after which the movie "Citizen Kane" starring Orson Welles was shown to illustrate the corrupting influence of unrestrained power by which the good can be transformed into evil.

Part III: Philosophical Assessments of Technology,
moderated by Dr. Donald M. Borchert

Reading Assignments: Lynn White, Jr., *The Historical Roots of Our Ecological Crisis*
Harvey Cox, *The Secular City* (in part).
Karl Marx, *The Economic and Philosophic Manuscripts of 1844* (in part).
Jacques Ellul, *The Technological Society* (in part).
Samuel Florman, *The Existential Pleasures of Engineering* (in part).

Session #1 (May 14)- The debate between ethical relativism and ethical absolutism was explored, and the position that the philosophical evaluation of technology presupposes a rejection of ethical relativism and the adoption of a set of norms against which to critique technology was suggested.

Session #2 (May 21) - Models of humanness from the religious and intellectual heritage of the West were generated as a position from which to evaluate technology. The relation of technology to the biblical perspective was examined and the positions of White and Cox were critiqued.

Session #3 (May 24) - Technology was presented as a human activity that participates in the strange ambiguity of human freedom: humanizing activities often yield unintended dehumanizing consequences. Marx's view of technology and alienation was discussed.

Session #4 (May 31) - Ellul's assessment of technology was elucidated and Florman's critique of Ellul was reviewed and evaluated.

Session #5 (June 6) - Examination No. 3 covering Part III of the course and the Final Examination involving a comprehensive question were given.

The Field Trip (May 17-18)

To enhance understanding of a variety of technologies the class and instructors toured the DuPont polymer plant in Washington, W.Va. (an example of a high technology petro-chemical plant), the Proctor and Gamble Ivorydale plant in Cincinnati (an example of a medium technology consumer-products oriented firm), and the Armco steel mill in Middletown, Ohio (a basic heavy industry, capital-intensive technology). These sites were carefully selected to reveal a wide diversity against a background of similarities in contemporary industrial technology.

Internal and external evaluation indicated the course was successful in achieving its stated goals although, as is normally the case with experimental courses, a certain amount of fine-tuning will take place when the course is offered a second time during the Spring quarter 1980. Specific recommendations included:

(1) Textbooks: Whitehead was too obtuse and must be deleted. Susskind does not portray adequately engineering modeling and must be replaced. Ellul, though difficult, may be retained because of its seminal nature. Mumford and Florman were eminently readable and pedagogically useful, and would be retained. Marx would be retained, although difficult; and White and Cox might be retained as representatives of an important, but somewhat dated, debate.

(2) Part I: The Greek background (session #2) would be condensed and the discussion of 17th and 18th century developments would be enlarged (sessions #3 and #4).

(3) Part II: The analysis of the probable over-against the improbable would be strengthened by a clearer presentation of mathematical modeling and linear versus non-linear systems (session #2). Also, the laws of thermodynamics would be given additional clarification (session #1).

(4) Part III: The debate between relativism and absolutism would be condensed (session #1) and more time would be given to "developmental ethical absolutism" and to the critique of major philosophical assessments of technology (sessions #2, #3, and #4).

(5) The Field Trip: The travel time must be reduced by eliminating the Cincinnati segment of the trip and substituting similar site visitations in the Ashland, Kentucky/Huntington, W.Va. area. In addition, more post-trip time should be devoted to formal class discussion of the sites visited.

(6) Films: The film "Citizen Kane" seemed to fail as a pedagogical device whereas "The Man in the White Suit" seemed to be a winner. Accordingly, "Citizen Kane" should be replaced with a film such as "Bridge on the River Kwai" starring Alex Guiness in which the engineer's fascination for his enterprise carries him beyond concern for the moral struggles associated with war.

Persons desiring further information on the course should write to Professor Donald Borchert, Dept. of Philosophy, Ohio University, Athens, Ohio 45701.

LEM'S LUNATIC ROBOTS: CHARTING *THE CYBERIAD*

Introducing Stanislaw Lem, the little-known Polish science fiction writer! I have been intrigued by Lem ever since I read he had the temerity to *complain* that Isaac Asimov's three-lawed robots were "doomed to goodness," but his fiction has not been readily available in English until quite recently. Now that I have taught *The Cyberiad: Fables For The Cybernetic Age* (New York: Avon, 1976), I would like to report the near tumultuous response it evoked. And I have got to think that any book beginning "One day Trurl the constructor put together a machine that could create anything starting with n." will interest readers of STS.

Mankind in the *Cyberiad* is a memory, a myth, maybe even make-believe ("the Missing Clink"). The universe is inhabited by robots, and Lem's heroes are two knight-like constructors, Trurl and Klaupaucius, who have just received their Diploma of Perpetual Omnipotence, who can "kindle or extinquish suns as easily as shelling peas," and who "sally forth" to bring to distant lands the benefit of their expertise. Gawain and Lancelot must be rending their mail, however, for these cyberknights are a pungent mixture of Bugs Bunny, the Road Runner, Wile E. Coyote, the Three Stooges, Rube Goldberg, Jean Tinguely, and Monty Python --oh my yes, definitely Monty Python! While most science fiction writers solemnly humanize their robots, Lem humorizes them. Humor --antic and frantic, sick and slapstick, linguistic, ironic, always satiric--is both the fuel and the fruit of the *Cyberiad*.

Let me chart the territory for you by dividing the fifteen stories into four, not mutually exclusive categories. First, the clear morals of several stories signal the didactic function of traditional fables. Aesop stands behind such lessons as *think before you speak, he who laughs last, laughs best*, and *love conquers all* in "How the World Was Saved," "A Good Shellacking," and "How Trurl Built a Femfatalatron." Lem's use of robots instead of animals, his substitution of the world of technology for the world of Nature as the didactic vehicle, however, surprises by suggesting our relationship with a mechanistic moral order. But Lem's lunacy almost shades the traditional form completely. The didactic punctuation does not dominate the story as it usually does in the fable. In the first story mentioned above the "machine that could create anything starting with n." (and that includes, alas, "dynamic, agressive Nothingness") rearranges natural order, causing comic juxtapositions, by substituting linguistic relationships for physical ones. The second story is based on a broad pun: *disassembling* the Machine to Grant Your Every Wish permits the *dissembling* which enables Trurl to triumph. In the third, Lem's language play takes over. The constructor hired to kill Cupid sees the Prince's love for Cybernella through the scientific jargon of "enamorization" and "unrequited amatorial superfixation," conceives of his task as "decaptivation" and "disenamorment," and concocts an (unsuccessful) femfatalatron replete with concupiscence coefficients, ardor dampers, alternating tantalators, and volupticles, which is powered by lascivicity measured in megamors and kilocupids.

Secondly, there are several stories in which Lem seems to be consciously invigorating such science fiction cliches as Frankenstein ("Trurl's Machine"), personality transfer ("The Mischief of King Balerion"), robot soldiers ("The Trap of Gargantius"), robot poets ("Trurl's Electronic Bard"), and robot toys ("The Offer of King Krool"). In contrast to Shelley's eight foot humanoid, for instance, Lem's Frankenstein is a sensitive eight story computer which rips itself off its foundation and thrashes about the countryside after Trurl and Klaupaucius insult it for declaring, over and over again, that two plus two is seven. Precisely because it is so basic, this comic math error threatens the whole rational order, and it takes an act of Nature to protect the two robots from the monster's hulking wrath. The constructors "solve" the natural desires of King Ferocitus and King Atrocitus for the perfect army, an army that literally functions

as one man, by inserting a plug in the front and a socket in the back of each soldier. With unity, however, also comes increased wisdom, a wisdom directly proportioned to the numbers involved, which turns fighters into philosophers. Thus, instead of a battle plan there is a painting of battlements; shock trooops and a firing squad write a sonnet entitled "On the Mystery of Being" while on guard duty; and the Eightieth Marlabardian Corps" maintained that the whole concept of 'enemy' needed to be more clearly defined, as it was full of logical contradictions and might even be meaningless."

A third kind of story, the best in the *Cyberiad* I think, presents new insights into such things as the mythos of science, bureaucracy, and the information explosion rather than invigorating older formulas. In "The Dragons of Probability" Lem hits at the abstraction of science, its divorce from reality, through the School of Higher Neantical Nillity, which delights in examining non-phenomenon empirically. One analyst discovers three kinds of dragon, each of which non-exists in an entirely different way, and then the invention of a probability amplifier provokes a plague of real dragons on peasants with cockney accents, necessitating dragon fighters armed with dragon dampers and dragon repellent. The machine based paradise of the Suess-like Steelypips ("We are the Steelypips, we have no fear, no spats in our vats, no rules, no schools, no gloom, no evil influence of the moon, for we have a machine, with springs and gears and perfect in every respect") is threatened by an intruder (a "that") as passive as Poe's Raven. "Trurl's Prescription" is to set up an office, create law, establish a bureaucracy replete with unacceptable forms, undecipherable rules, and illegible signatures, to treat the alien as normal, kill it with paperwork, and finally revoke its lease. "Pirate Pugg" is a pirate with a Ph.D. who steals only information, echoing white-collar crime, and whose great weapon is a menacing whistle. As punishment for his inordinate thirst for knowledge, Pugg is chained to a metainformationator and mentally crushed by an eternal avalanche of (useless) facts: all the words that rhyme with spinach, the thoughts of unmarried whales getting on in years, six ways to cook cream of wheat, the cloacal diameter of the tufted twit, the size of bedroom slippers on Cob....

The last four stories in the *Cyberiad* all deal with the search for perfection, and are characterized generally by a grimmer, more serious tone. On Legaria Trurl interrupts an angry mob in their daily ritual of resurrecting and then murdering the scientist Malaputz, whose revolutionary utopian theory of substituting electrical connection in series for that in parallel caused general "malaputzment" everywhere. "Take that for the Prophecy of Happiness! And have that for the Bed of Roses, and that for the Bowl of Cherries!" they chant as they rip Malaputz to pieces. Trurl tries to stop the carnage, but when he learns the scientist has learned nothing from his experience, that he has "an entirely new formula" for perfect bliss, "foolproof" this time, he permits the re-murder. Beware of scientists bearing gifts! Dark humor, indeed! And the trip to the land of Highest Possible Level of Development is a surreal nightmare. One H.P.L.D. has penny whistles for eyes, thuribles for ears, wears orchid pantaloons, high heels, and eats a gingerbread mandolin. Another has a bell-shaped head, three horns, and carries a jewelled pillow. A third has ears that flit like butterflies, hostile eyes in numerous moles on his cheeks, and holes filled with raspberry jam on his chest. A fourth picks his own nose as his face lays on his knees. These abominations have failed 64,513 times, most notably with 300 hunchbacks, to help others. The clear message is that no civilization can be helped, no revolution can change things. The humor turns skeletal. Just as Trurl's stories are stories within Lem's story, what if Lem's story --our reality-- is just a story in a higher story? What if, like Mymosh the Selfbegotten, we are just a consciousness accidentally sparked into temporary vigor by an accidental concurrence of a kitchen jug, shoe, and bird dung in the

mud puddle of a trash heap along some forgotten rural route at the edge of the universe? What if we are not the makers of fun but the objects of fun, not the shapers of humor but the subjects of humor? Whew, as Emily Dickinson said, would not the jest have crawled too far?

This four part map of *The Cyberiad* hardly does justice to either Lem's virtuosity or versatility, but it should help you get started. Patricia Warrick provides a helpful context for studying the *Cyberiad*when she suggests that "the machine must be made laughable rather than threatening if man is to learn to live constructively with it," that we need a new mythology in which the machine is a buffoon rather than a bugaboo. Lem, who has written a major, but as yet untranslated, work entitled the *Summa Technologiae*, does indeed seem to be engaged in such new myth making. More revealing, though, is this following statement about the life of inanimate objects from Lem's autobiography: "To this day I have a special feeling for all sorts of broken bells, alarm clocks, old coils, telephone speakers and in general for things derailed...used up, homeless, discarded.... I used to be a philanthropist to old spark plugs, I would buy... fragments of incomprehensible gadgets... I would turn some crank or other to give it pleasure, then put it away again with solicitude." Simply put, Lem has a warm feeling for machines, and to me, whose cellar is a modern day elephant's graveyard, where Emerson television sets, Philco refrigerators, and Westinghouse fans have crawled to die, enriching my whimsy with their technological tusks, that is a joy.

And I haven't even told you about Lem's other works available in English translations: the planet where people believe that water is their natural element in *The Star Diaries*, the benignimizers and the chemocrats of *The Futurological Congress*, the cybernetic espionage center of *Memoirs Found in a Bathtub*, Sciss the statistician in *The Investigation*, the fly-like mechanisms of *The Invincible*, the colloidal sea of *Solaris* . . . .

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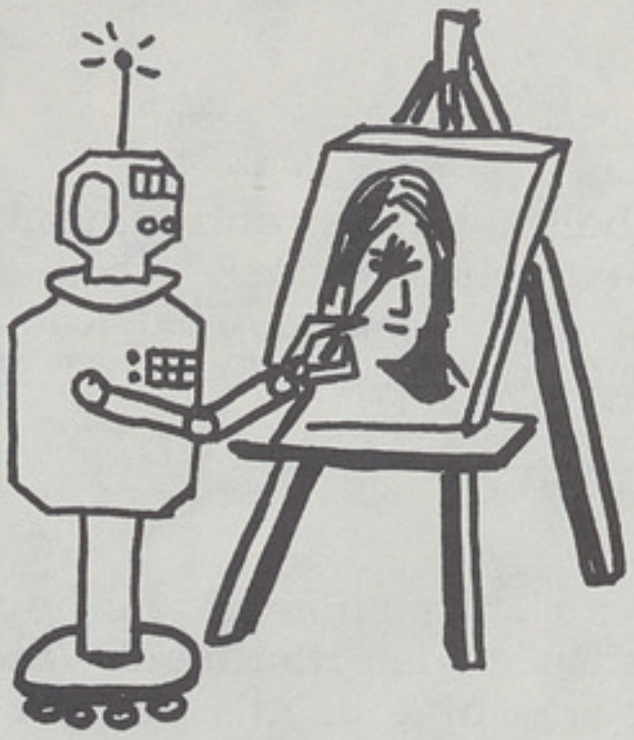
Rosenberg, Nathan and Vincenti, Walter G. *The Britannia Bridge: The Generation and Diffusion of Technological Knowledge*. Cambridge, Mass.: The MIT Press, 1978. 107 p. Ill., map.

In a monographic case study, Rosenberg, an economic historian, and Vincenti, an engineer, combine as the subtitle suggests to present an understanding of the development of technological knowledge and its subsequent diffusion to other spheres of technological activity. The Britannia Bridge, a wrought-iron tubular railway bridge completed in the year 1850, was erected to span the Menai Straits in Northwest Wales. The new knowledge of materials and design acquired in surmounting problems of government limitations on traditional building materials and minimum height requirements would ultimately be found to have applications in ships, cranes, machine tools, and commercial building generally. Within their broad belief that technological change can be viewed as "problem-solving activity," the authors suggest that the Britannia Bridge experience may serve as "a paradigm for a much larger class of events that collectively make up the historical process of industrialization."

This is the tenth volume in a series of monographs in the history of technology and culture published jointly by the Society for the History of Technology and The MIT Press. Rosenberg and Vincenti have produced an excellent piece of work which could very easily be incorporated into a history of technology course concerned with the nature of invention, innovation, and the transfer of technological knowledge, or perhaps a course designed to expose non-engineering students to the kinds of political, economic, and social as well as technical considerations which engineers face in design decisions. The book is well-illustrated with contemporary paintings and engineering drawings making the text readily understandable. The authors have also included a separate, fold-out facsimile of an 1851 map of British railways. Don't miss this little gem.

SHC, *Editor*



M*E*T*A*

MANKIND, ETHICS, TECHNOLOGY, AND THE ARTS

RECENT PUBLICATIONS

BIGGINS, DAVID R. "SCIENTIFIC KNOWLEDGE AND VALUES: IMPERATIVES IN ECOLOGY." ETHICS IN SCIENCE AND MEDICINE 6, NO. 1 (1979): 49-57.

The confrontation of knowledge and values evident in philosophical discussions of ecology demonstrates the inadequacy of the general model of knowledge upon which investigation is still based. The central current of Western epistemology sees the social role of science as the practical mastery and manipulation of nature for human survival. As a result, scientific knowledge concentrates on "formal and efficient causes" rather than considerations of "purpose or teleology." The values which can be interpreted from our understanding of nature are thus limited by emphases on certain aspects of nature and deemphasis of others. Biggins suggests a beginning toward the resolution of this problem in the writings of Habermas and Marcuse.

BOZEMEN, BARRY, AND ROSSINI, FREDERICK A. "TECHNOLOGY ASSESSMENT AND POLITICAL DECISION-MAKING." TECHNOLOGICAL FORECASTING AND SOCIAL CHANGE 15 (SEPTEMBER 1979): 25-35.

While largely an activity undertaken by the research community, technology assessment is requested, funded and controlled by bureaucratic agencies. Like other research, TA derives its legitimacy from logic and reason; in contrast, the source of legitimacy for bureaucratic agencies is political. The authors raise the question of how TA and bureaucratic decision making can accommodate one another without compromising their distinctive norms and values. To that end, Allison's three decision making models are discussed in the context of TA and bureaucratic processes. The "Rational Actor" model utilizes a technology assessment as the best possible information that determines the best possible decision. In the "Bureaucratic Politics" model, a technology assessment becomes a political weapon to be used or discarded according to the situation, while in the "Organizational Process" model, TA is a routine, intrinsic part of daily activities. Taken together, the models illuminate the persuasive power of information generated by research, the impact of values and interests on the end use of such information, and the incremental nature of bureaucratic action. All three models are thus required to depict the complex interaction between the political and scientific communities that characterizes technology assessment efforts.

BYRNE, EDWARD. "TECHNOLOGY AND HUMAN EXISTENCE." SOUTHWESTERN JOURNAL OF PHILOSOPHY 10 (NO. 1, 1979): 55-69.

By some anthropologists, the development of machines has been interpreted as part of the natural as well as cultural evolution of human beings. Following this view, "technophiles" have tended to depict the machine as an extension of the human nervous system, a prosthesis to overcome human physical limitations. Opponents to technology, Byrne observes, typically view it as a cultural, but not a natural force, essentially distinct from man, and perhaps even beyond man's control. Byrne contends that man and machine are not becoming one, arguing that the human being who neglects the cultivation of mind and body because a machine can do things better is not enhanced by that machine. Given the choice, he concludes, "people would rather do for themselves."

GAY, RUTH. "THE MACHINE IN THE LIBRARY." AMERICAN SCHOLAR 49 (WINTER 1979-80): 66-77.

Next year, the Library of Congress will close its catalog and "bring to an end a century-old system for the organization of knowledge." Gay knowledgeably describes the intricacies, quaintnesses, and social values that characterize the Library of Congress classification system. While admitting that the card catalog is a deteriorating "dinosaur," plagued by dog-eaten cards and inconsistencies, she is skeptical about the wisdom of libraries' eager abandonment of the catalog for the computer. There will be no more serendipitous discoveries for the card-shuffling scholar -- "only the right code word will release the treasure."

HUNTER, LOUIS C. A HISTORY OF INDUSTRIAL POWER IN THE UNITED STATES, 1780-1930. Vol. I. WATER POWER IN THE CENTURY OF THE STEAM ENGINE. Charlottesville: University Press of Virginia, 1979. xxiv, 606 p. Ill., tables, appendixes. Hard cover, $24.95.

Louis C. Hunter, long known for his excellent study, Steamboats on the Western Rivers (1949), has with the publication of this volume switched from the study of mobile power to that of stationary power as used for industrial applications in mills, mines, and factories. Waterpower in the Century of the Steam Engine is the first of a projected three volume study of the history of power which was such a central feature in the process of industrialization. The author's primary attention is directed to power generation but he is also concerned with distribution and application. Thus, with water power the essential supporting facilities --the millwork, dams, and raceways-- receive extensive consideration. From 18th century rural grist mill to the development of the hydraulic turbine, Hunter discusses design, construction and operation through excellent diagrams, illustrations and text. Numerous tables help to flesh out the economic framework within which his technological analysis rests. The effect of this volume should be to reestablish attention to the importance of water power for American industrialization during the 19th century. Publication of volumes 2 and 3 on steam power and the "transmission revolution" and the spread of electrical power respectively should round out the evolving story of industrial power. A well-done, comprehensive study in the history of technology and economics.

IVASHEVA, VALENTINA. ON THE THRESHOLD OF THE TWENTY-FIRST CENTURY; THE TECHNOLOGICAL REVOLUTION AND LITERATURE. MOSCOW: PROGRESS PUBLISHERS, 1978. 211 P.

A communist view of the influence of the scientific and technological revolutions on Western literature begins by attempting to explain the increased popularity of the documentary, science fiction, and the inclination to "philosophize" in literature. Ivasheva then turns to the literary use of the theme of time and space as conceptualized by Einstein. Discussion of the influence, physiology, and "psycho-physiology" on writers leads to a treatment of the growing place in Western literature, of themes centered on personality disorders. The final chapter discusses the alterations in the artistic portrayal of the human personality as a result of increasing knowledge of psychic processes.

KELLY, PATRICK, AND KRANZBERG, MELVIN, EDS. TECHNOLOGICAL INNOVATION: A CRITICAL REVIEW OF CURRENT KNOWLEDGE. SAN FRANCISCO: SAN FRANCISCO PRESS, 1978. XVIII, 390 P. BIBLIOG. $27.50.

This state-of-the-art study was compiled under a National Science Foundation grant to further understanding of R and D. Part 1 covers "The Ecology of Innovation," while Part 2 covers "Aspects of Technological Innovation." Among the contributors are Kranzberg, Frederick Rossini, Nathan Rosenberg, Paul Strassman, James Bright, Thomas Parke Hughes, and Simon Kuznets. There is a lengthy bibliography which, although not annotated, contains a wealth of material.

MEIKLE, JEFFREY L. TWENTIETH CENTURY LIMITED: INDUSTRIAL DESIGN IN AMERICA, 1925-1939. PHILADELPHIA: TEMPLE UNIVERSITY PRESS, 1979. XV, 249 P. ILL. BIBLIOG. $17.50.

Meikle focuses on the emergence of the industrial design profession during the Depression era. Designers hoped to create a coherent environment for the "machine age" and reverse the economic downswing. Although no theory was recognized as supreme, streamlining was the most important component; it gave visual impetus to the desire for "frictionless" technological progress. "In the American tradition of practical eclecticism they [industrial designers] took whatever seemed modern and transformed it for commercial use . . . . In addition to serving an economic function, the style . . . both expressed and stimulated an optimistic, often utopian mood shared by ordinary people concerned with nothing more than purchasing the latest refrigerator." Although streamlining and the larger vision of a harmonious machine age failed to survive World War II intact, industrial design continues to influence business as a sales technique. 149 photographs contribute to the usefulness of this history.

PICKETT, WILLIAM BEATTY, ED. TECHNOLOGY AT THE TURNING POINT. SAN FRANCISCO: SAN FRANCISCO PRESS, 1977. IV, 75 P. $6.25.

Six papers presented at the Rose-Hulman Bicentennial Conference on American Technology -- Past, Present, and Future are included in this brief volume. Authors and titles are: Thomas P. Hughes, "Edison's Method;" Ruth Cowan, "Women and Technology in American Life;" Melvin Kranzberg, "Technology the Liberator;" Paul Horwitz, "Public Fiends and Private Technology;" Joseph Weizenbaum," Computers and Hope;" and Victor Ferkiss, "The Future of American Technology." The "turning point" generally reflected in all papers is the changing perception which no longer regards technology with unbounded optimism, but rather recognizes its threat to life and liberty at the same time it benefits humankind.

ROBERTSON, JAMES. THE SANE ALTERNATIVE; A CHOICE OF FUTURES. ST. PAUL, MINN.: RIVER BASIN PUBLISHING COMPANY, 1978. 152 P. $4.95.

The "sane alternative" Robertson advocates is a decentralized equilibrium economy based on the individual, unstructured economic activities of households and communities. The SHE future (sane, human, ecological) is compared with four less desirable futures: business as usual; disaster; totalitarian conservationist (TC); and hyper-expansionist (HE). The attainment of a SHE future requires not only the transformation of economic institutions, but also a shift from a societal paradigm based on academic knowledge, bureaucratic government, and professionalism to one based on intuition, community politics, and personal relationships. A directory of groups and individuals supplements the book, and there are study questions at the end of each chapter.

SHEPARD, JON M.; KIM, DOUG. I.; HOUGLAND, JAMES R., JR. "EFFECTS OF TECHNOLOGY ON INDUSTRIALIZED AND INDUSTRIALIZING SOCIETIES." SOCIOLOGY OF WORK AND OCCUPATIONS 6 (NOVEMBER 1979): 457-81.

American studies have suggested that in the course of technological development, worker alienation peaks during the mass production stage, but then declines with the advent of automated systems. Results of a comparative survey of American and Korean workers in the oil refining and auto industries provides new evidence for the idea that the stages of industrialization create similar structural and cultural changes wherever they occur. However, Korean workers appear, on the whole, to be less satisfied and more alienated than their American counterparts. The authors suggest that, perhaps as part of the industrializing process, nations develop appropriate adaptive mechanisms.

SJOBERG, LENNART. "STRENGTH OF BELIEF AND RISK." POLICY SCIENCES 11 (AUGUST 1979): 39-57.

Subjective probability, the subject of this paper, is defined here as "the strength of belief that a certain person holds in the occurrence of an event." A consideration of subjective probability is important to the study of risk for two reasons: experts incorporate subjective judgements in empirical risk assessments; and society responds to technology in accordance with subjective perceptions of risk. Sjoberg reviews the research on subjective probability, encompassing psychological versus statistical uncertainty, the interaction of beliefs and values, and problems of measurement.

°°°Christine Roysdon
Lehigh University Libraries

°°°Judith Mistichelli
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SHOT SYLLABUS EXCHANGE

Additions to the history of technology syllabus exchange (see Issues #11, pp. 11-13; #12, p. 16; and #13, p. 11) include the following courses and brief descriptions:

Prof. Lee Smalley
Industrial Teacher, Education Department
University of Wisconsin-Stout, Menomonie, WI 54751

Impacts of Technology

A two-credit graduate course taking a historical, contemporary, and futuristic look at some of the economic, sociological, psychological, and political implications of industry and technology.

Profs. Merritt Roe Smith
and David F. Noble
Program in Science, Technology and Society
Room 20B-222, M.I.T., Cambridge, Mass. 02139

History of Technology in America: 1776-1876

A one-semester course that examines specific engineering achievements from the Revolutionary Era to the Philadelphia Centennial Exhibition. Particular emphasis is placed on technology as an expression of American culture.

OPEN FORUM

Science, Technology, and Human Values Seminars

The National Endowment for the Humanities has announced that its program of Summer Seminars for College Teachers will offer 120 eight-week seminars during the summer of 1980. Twelve college teachers will be selected to attend each seminar, and participants will receive a stipend of $2,500 to cover travel expenses to and from the seminar location, books and other research expenses, and living expenses. The purpose of the program is to provide opportunities for faculty at undergraduate and two-year colleges to work with distinguished scholars in their fields at institutions with library collections suitable for advanced research. The 1980 Summer Seminars for College Teachers brochure, which lists seminar topics, directors, dates, and locations will be available locally from department chairpersons or from the Division of Fellowships, National Endowment for the Humanities, 806 15th Street, NW, Washington, D.C. 20506 after January 1, 1980. College teachers interested in applying to a seminar should write directly to the director (addresses are listed in the brochure) for detailed information and for application materials. The deadline for submitting applications to directors will be April 1, 1980. Four seminars are particularly related to Science, Technology, and Human Values:

Director/Location	Topic	Director/Location	Topic
Asger Aaboe Dept. of History of Science Box 2145 Yale Station New Haven, Connecticut 06520	*Exact Sciences in Antiquity and the Middle Ages*	E. Fred Carlisle Dept. of English Michigan State University East Lansing, Michigan 48824	*The Functions of Discourse in Science and Literature*
Stephen G. Brush Dept. of History University of Maryland College Park, Maryland 20742	*The Second Scientific Revolution*	Dudley Shapere Dept. of Philosophy University of Maryland College Park, Maryland 20742	*The Interpretation of Scientific Change*

The 1980 Business History Conference

will be held March 6, 7, 8 at Lehigh University. Numerous papers on the technological aspects of business growth and development are included under the following session headings:

- *The Iron and Steel Industry: Aspects of Industrial Organization in the Eighteenth and Nineteenth Centuries.*
- *Businessmen as Innovators: Ideology and Organization.*
- *The Rise of Big Business: Aspects of Reform and Reorganization.*
- *Investment and Building Strategies: Canals and Railroads.*
- *Labor, Technology, and Finance in the Early Years of Industrialization.*
- *The Iron and Steel Industry: Labor and Community Relations.*

For further information on specific paper titles and their authors or on times and registration for the conference write to: Bruce R. Dalgaard, Director, Center for Economic Education, Drown Hall #35, Lehigh University, Bethlehem, PA 18015 or call 215-861-3401.

INTERFACE 80

The Department of History and English of Southern Technical Institute in conjunction with the Humanities and Technology Association is sponsoring the fourth annual national conference on the humanities and technology in Marietta, Georgia, October 23-24, 1980.

Papers and presentations in the growing discipline of technology and culture studies which examines the integration of humanistic concerns and technological growth are invited. To focus fully on this interaction, submissions could deal with the following areas:

--History and philosophy of science, technology and architecture
--Public policy and understanding of science and technology
--Curriculum design for the humanities and technology
--Roles and effects of technology in science fiction, American culture studies, and popular culture
--Responses of literature, aesthetics, and the arts to technology

The deadline for submission is May 1, 1980.

Abstracts and/or papers should be addressed to: Dr. Roberta D. Gates or Dr. Amos St. Germain, Department of English and History, Southern Technical Institute, Marietta, Georgia 30060 (404-424-7203 or 424-7202).

A Workshop On Ethics And Public Policy

for teachers, scholars, and practitioners interested in the field of ethics and public policy will be held in Chestertown, Maryland on the campus of Washington College, June 22-28, 1980. The workshop will be sponsored by the University of Maryland's Center for Philosophy and Public Policy, in collaboration with the Institute of Society, Ethics and the Life Sciences.

Workshop participants will be exposed to readings, examples and discussion of two areas where normative concerns and public policy join: (1) moral problems confronted by public officials; and (2) analysis of policy tools available for decision-making.

The first half of the program will concentrate on two areas where professionals must exercise moral judgment in the course of their employment: truth-telling and reverse discrimination. The second portion will turn to decision-making tools and frameworks policy-makers often rely on when faced with decisions. These tools -- such as cost/benefit analysis and welfare economics -- are seldom ethically neutral. The workshop will examine these tools from normative perspectives.

The format will include speakers from government agencies with relevant program responsibility and faculty members with experience in ethics and public policy. Readings will be distributed in advance, and there will be extended small-group discussions. The sessions will be designed to be especially useful to persons of both academic and policy-making institutions.

For further information and application forms please contact: Peter G. Brown, Director, Center for Philosophy and Public Policy, University of Maryland, College Park, Maryland 20742 -- phone: (301) 454-4103.

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