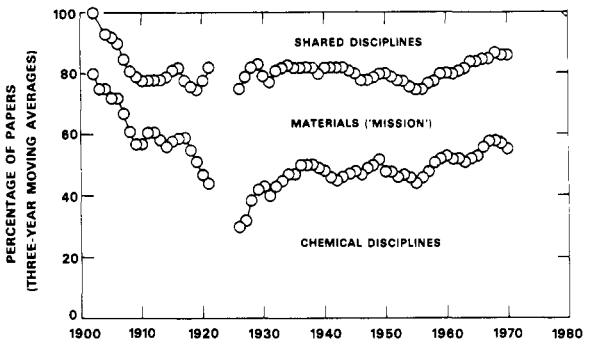

Figure 4. Distribution of papers among classes of divisions

in the chemical disciplines. Mushrooming regional meetings account for more than all others combined, and a further analysis of these is under way. Clearly, chemistry has grown long on papers, and longest on papers in the chemical disciplines, rather than in interdisciplinary areas or in mission research. The benefits of presentation before publishing would seem to be lessening for the researcher, just as it already has for the audience, judging from the diminishing numbers who now attend.

Levelling off of federal support of research will have pronounced effects upon presentation of papers at meetings. Nearly all curves bend downwards over the past two years. How far they drop will depend upon the opposing effects of efficiency and inflation on the conduct of graduate research. The figures will deserve close study, for upon a correct analysis will depend the soundness of Society policy for its second hundred years.

ACKNOWLEDGMENT

William L. Bulkley of the American Oil Company provided data on early AIChE meetings, and A. T. Winstead of the American Chemical Society filled some of the gaps in the data on national ACS meetings.

LITERATURE CITED

(1) Marschner, R. F., *J. Chem. Doc.* **3**, 42 (1963).

Assessing New Technology*

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Effective assessment of new technology requires an ability to foretell where that technology is leading and to analyze how it will impinge upon society and the over-all environment. Yet technological forecasting is an unproved discipline, while indicators of social change and standards or goals against which social progress can be measured are lacking for the most part. Technology assessment obviously must be broadly multidisciplinary. It seems no less certain that it will put new burdens on the handling of scientific information and create a demand for more information than is now generally available on the way technology interacts with society as a whole.

About eight years ago, in speaking to a gathering of distinguished scientists, President Kennedy commented: "Every time you scientists make a major invention, we politicians have to invent a new institution to cope with it." That pretty well sums up the idea behind technology assessment, a concept now increasingly in vogue.

Technology assessment, in theory at least, is an idea that seems easy to understand and difficult to fault. It is a reasoned response to the stress that a rapidly changing and expanding technology puts on our complex and increasingly industrialized, urbanized, and densely populated society. It is an attempt at making the process of coping with innovation and technological development more systematic and rational. It would do this by putting the machinery needed for the task into motion not after a new invention has been thrust upon an unsuspecting world but simultaneously with that event.

There are other ways to look at the technology assessment concept, as well: It can be viewed as a mixture of early warning signals and visions of opportunity; as a device for protecting man from his own technological creativity; as a formal mechanism for allocating scientific resources, setting technological priorities, and seeking more benign alternatives for technologies already in use; and as an attempt to control and direct emerging technologies so as to maximize the public benefits while minimizing public risks.

What could appear less controversial?

No wonder, then, that the idea has caught on or that it is winning over more and more people, especially on Capitol Hill and within some of the federal agencies, in the academic world, or from public interest groups, who are anxious to try to put it to practical work—and the sooner the better. They are convinced that if we don't try it, not only will many of our present problems become deeper but we will be faced with an expanding array of newly emerging problems which will only make those of today pale in comparison.

Just what would be the best way to implement technology assessment is not quite clear, of course. While we are swept up in the onrush of technological change, we don't

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really know yet how to foresee its effects on society. Nor, for that matter, do we really know how to evaluate those effects in any meaningful or objective manner. We might all agree that we must somehow learn to inhibit or reject uses of technology that are harmful or detrimental. But we are unable to identify those uses or measure their hazards in many cases before the fact. We find it difficult to sort out costs and benefits clearly so that we may encourage the good and hold back or modify the bad. Lacking standards of social progress and lacking established, widely accepted national priorities and goals, we tend to drift from crisis to crisis on a sea of change.

AN OLD IDEA, OR NEW?

Well, so much for the rationale—or the rhetoric, if you will—behind technology assessment.

Now there is much about the idea of assessment that may seem old hat, at least when it is interpreted in a broad context. After all, businessmen have long had to assess laboratory projects and the development and commercialization of new products and processes in one way or another. That is what research management, investment analysis, market research, commercial development, and long-range planning are all about.

The Federal Government, too, has been interested in the consequences of new technology for more than a century. A raft of agencies have been spawned in Washington with assessment of technology as at least a large part of their mission: the Food and Drug Administration, the Federal Communications Commission, the Federal Aviation Authority, The Atomic Energy Commission are but a few of the institutions that politicians have set up to cope with technology.

But until now, with rare exception, whatever assessments have been made have really only been half-assessments or less done on a trial-and-error, hit-or-miss, ad hoc basis. They have been retrospective rather than prospective. In business, at least, they have mostly been limited to such questions as: Is a new development technologically feasible? Will it be economically profitable? Such questions have been asked, moreover, only within a rather restricted framework.

Technology assessment, in the sense now coming into vogue, anyway, would go beyond all this. It would focus not just on the direct or primary effects which traditionally are the ones that have been subjected to intensive study because they are the objectives for which the innovation is directly aimed.

In addition, a technology assessment would scrutinize the interactions, side effects, by-products, spillovers, and trade-offs among several developing technologies or between a new technology and society at large and its environment. It is the emphasis on adding indirect or second- and higher-order effects and social impacts to the cost-benefit equation, really, that is novel—and important, as well. These second order effects, in the long run, may affect society more deeply than the intended primary effects. Yet if they are unwanted, the chances that they can be controlled or removed is much the greater if they are identified early on in the development process.

What it gets down to is that the profit motive and the traditional market mechanism that we have long relied upon no longer appear to be sufficient for the task of sorting out what technology should be put to use—and how. The first-order effects of damming a river, or launching an SST, or introducing a new detergent additive or pesticide, or building a highway may stand out clearly after the customary cost-benefit analysis. But technology assessment would try to get at what else might happen but be overlooked, whether it be beneficial or harmful.

It's a concept, though, that is still groping for scope and definition. And it is probably not surprising that since it does have an appealing sound of relevance about it, at a time when to be relevant is to be on the side of the angels, many people seem eager to appropriate the term for their own purposes, or to apply it as a way to add new luster to whatever they may have been already doing in the past.

Thus businessmen, if they have paid the idea any heed at all, which probably few have, may view it as merely a more sophisticated term for market research and long-range planning. The growing cult of futures researchers may see it as only an extension of technological forecasting or systems analysis. Environmentalists can envision it as a new way to apply leverage against polluters, whomever they may be. And social activists think they may have a new tool with which they can chip away at the establishment's power structure, while the antitechnology crusaders look on it as a weapon to combat big science. And it is difficult to escape the feeling that some people in government and the academic world think they may have uncovered a new means for bureacratic empire building or opened up a new channel for research grants. Obviously there is something in technology assessment for everyone.

Yet the term itself was coined about six years ago by the staff of the Subcommittee on Science, Research, and Development of the House of Representatives and was rather clearly defined by former Connecticut Congressman and subcommittee chairman Emilio Daddario, who provided much of the initial thrust behind the plans to set up a formal assessment body within the Government.

"Our goal," Mr. Daddario has stated, "is a capability for policy determination in applied science and technology which will be anticipatory and adaptive rather than reactionary and symptomatic." He envisioned an assessment mechanism that "would identify all impacts of a program; establish cause and effect relationships, where possible; determine alternative programs to achieve the same goal and point out the impacts; measure and compare sums of good and bad impacts; and present findings from the analysis. In the initial step, one would place the technology within the total social framework and identify all impacts in the natural, social, economic, legal, and political sectors. Direct effects would be separated from derivative effects."

SOME SEARCHING QUESTIONS

Now this is a very large order indeed. A full-fledged technology assessment would have to seek answers for some very searching questions:

How will an innovation be used, not just today but in the future?

What will be the consequences of those uses, direct and indirect, for good or bad, on any part of society or the environment?

What responses or interactions or cross-impacts can be expected from other areas of science and technology?

How do the tonic effects balance out against the toxic effects?

Are the effects irreversible either in the short-run or the long run—or are we painting ourselves into a corner once we have introduced the new technology?

What are our options? Could the benefits of a new development be achieved at less cost or less risk by some alternative?

It is possible, of course, that the answers for many questions of this type are already in existence and remain only to be uncovered by a diligent search of the pertinent scientific and technical literature, reinforced perhaps by a limited amount of original, independent laboratory or field

research and testing. This might be the case, especially, when the assessment is restricted to a relatively narrow innovation or to a field that is relatively stable and well-documented. Until assessment really becomes more widely accepted and well grounded in experience, therefore, much of the work may actually center around a sort of glorified literature search that would carefully document data currently available and evaluate it as to relevancy, authenticity, acceptability, and like criteria. The intent would not be just to supply a greater amount of information to policy-makers, to be sure. Rather it would be to improve the quality, pertinence, and the completeness of the information on which they must base their decisions. Such a painstaking analysis of existing information sources would be adequate for spelling out incipient dangers and drawbacks posed by many new technological developments, particularly those which represent an incremental advance from preceding technology. Certainly much technological progress is of this nature.

MONITORING AND FORECASTING NEW TECHNOLOGY

Even a more wide-ranging technology assessment also must be geared to a comprehensive data bank of available current information, to be sure. For one thing, it is necessary to develop an alerting or monitoring system able to identify emerging technologies as early as possible and thus serve as a triggering device for instigating full-fledged technology assessments. In addition some sort of ongoing monitoring system will be needed to track the effects of developing technologies upon society.

But it is nevertheless clear that if technology assessment is to probe the future in order to fulfill many of the broader objectives that its proponents have in mind—if it is to act not just as a screening device for eliminating potential hazards but also as an early warning process and as a means for systematically investigating indirect consequences and alternatives and allocating limited technological resources with minimum waste—then the act of assessment demands more than just a documentation of existing information dealing with present technology. A study must be made of where emerging technological developments or long-range technological trends are likely to lead.

Hence the forecasting of technology is essential, both to uncover potential problems that otherwise would be unexpected or unforeseen and to disclose unappreciated or undercultivated opportunities or options. This is especially true in that assessment, if it is to be effective, should be triggered as early as possible, before a new technology has become well entrenched or developed a momentum of its own.

But can technological forecasting meet this challenge? Although also much in vogue, it too is a discipline—or better yet, an art form—still in its infancy, its formative years. Its antecedents lie in the books of the science-fiction writers and the speculations of science popularizers during the first half of the 20th century. But its development as a formal endeavor stems largely from the need, following World War II, for organizing and planning huge military and aerospace research programs. It has come into its own only within the past decade.

Some very interesting techniques (not to mention some quite obscure jargon) have been developed in forecasting technological change in an organized manner. Delphi studies, cross-impact analysis, relevance trees, scenario writing, envelope curves are only a few. But by and large these techniques produce results that must still be accepted with a considerable degree of faith, for their reliability remains largely untested. One can cite examples of uncanny predictions made in the past by people like Jules Verne and H. G. Wells and others, but the over-all record for foretelling technological change is quite spotty.

In 1936, for example, a well-known American educator and engineer estimated that the ultimate speed of airplanes "might well approach 500 miles per hour." In 1939, an admiral of the U.S. Navy declared that "as far as sinking a ship with a bomb is concerned, you just can't do it." In 1945, Vannevar Bush stated, in speaking of the intercontinental ballistic missile, "In my opinion, such a thing is impossible for many years." Also in 1945, Admiral William Leahy said of the atom bomb: "That is the biggest fool thing we have ever done. The bomb will never go off, and I speak as an expert in explosives." Then there was the Astronomer Royal who said, in 1956, "Space travel is utter bilge."

Who, on the other hand, foresaw how the development of the transistor would spur widespread use of computers or influence the economic development of several Far Eastern countries? Who foresaw the impact of DDT on birdlife? Who, at the turn of the century, could have envisioned that the automobile would become the major source of urban air pollution or how it would affect so dramatically the way in which Americans spend their spare time, where they live, the location of retailing activities, or the puberty and fertility rites of American youth? In this connection, a quotation from a turn-of-the-century issue of *Scientific American* is pertinent: "The improvement in city conditions by the general adoption of the motor car can hardly be overestimated. Streets clean, dustless, and odorless, with light rubber-tired vehicles moving swiftly and noiselessly over their smooth expanse, would eliminate a greater part of the nervousness, distraction, and strain of modern metropolitan life." There's a clear-sighted vision of the future!

SOCIAL CHANGE AND NATIONAL GOALS

If technological forecasting is an uncertain link in the technology assessment process, means for evaluating the manner in which technology interacts with and impacts upon society are an even greater lack. What is needed is some meaningful measure of social change and some index by which to gage social well-being—a gross national happiness index, as it were. Yet no good and comprehensive set of social indexes or indicators exist today by which we can measure the quality of life in a way similar to our use of economic indexes and indicators to measure economic growth.

And even if we could measure social change, we have no real standards by which we can judge our progress or set our course. Until we have formulated national goals and priorities that can be well defined and widely agreed upon, we will be incapable for the most part of assessing technology in a definitive way and in terms of what society should do about it.

The goal-setting process may be particularly frustrating in a democracy. Who is to do it? Political parties? Bureaucrats? Pressure groups? Some undefined elite?

And we can really assume today such a rather Machiavellian role and arrogantly impose our ambitions, values, and desires on generations still unborn? How would goals that might have been formulated in the days of Queen Victoria meet the needs and problems we face in the present?

On the other hand, if we don't somehow fashion objectives to which we can aspire in this world of accelerating technological change, are we not only bequeathing continued crisis and conflict to our children—condeming them to a future world that is nothing more than an extrapolation from the past and present, with all their inadequacies? In a world that is increasingly crowded and technologically

complex, in fact, present shortcomings are only likely to be magnified severalfold and present problems become more irreversible and intolerable. Once we have attained new technological capabilities, do we really have any choice but to make choices, even though we can perceive only dimly—if at all—all the eventual consequences of those choices? There is, after all, no putting the genie back in the bottle.

Which brings us around to technology assessment again, and the task of making the genie our servant rather than our master. If it must be done, who indeed is to do it—and how—and where?

PRESENT STATUS OF TECHNOLOGY ASSESSMENT

Let's take a brief look at what is going on now.

Two bills have been introduced in Congress to set up agencies specifically charged with technology assessment. One of these, identical with a proposal introduced by former Congressman Daddario last year, would establish an Office of Technology Assessment as an arm of Congress to conduct technology assessments with assistance from the General Accounting Office, the Congressional Research Service, and the National Science Foundation. This proposal has already been approved by the House Committee on Science and Astronautics. Identical legislation has been introduced in the Senate, although no action has been taken on that side of the Capitol so far.

A second bill, introduced by Senators Magnuson and Hart, would establish an independent Technology Assessment Commission. Just how this commission would function is still not very clear, but it would be an agency separate from all present branches of government. Some people have viewed it as a fourth branch of government, but one with a rather nebulous constituency and clout. No hearings have been held on this bill yet. In any event, the likelihood of passage of any legislation this year—or even next—seems rather dim. While no strong opposition to technology assessment has surfaced in Congress, there is no apparent sense of urgency behind passage of pending legislation either.

Nevertheless, interest on Capitol Hill has sparked activity in other government agencies. The Office of Science and Technology, for example, has sponsored five pilot studies in technology assessment at Mitre Corp., completed this summer and aimed at demonstrating the feasibility of assessment methods. The National Science Foundation, through its RANN program, has funded to the tune of about $2.5 million, about three dozen grants with a technology assessment slant. Among technologies being studied under NSF grants are off-shore oil drilling, nuclear control, solid waste management, and the Big Sky recreational development. The first assessment to be completed deals with the effects of seeding clouds to increase snow fall, and hence runoff, in the upper Colorado River basin.

The National Environmental Policy Act of 1969 also has been spurring federal assessment activities. The law requires that all federal agencies assess the impact of technological programs for which they are responsible on the environment.

Despite all the talk and some evidence of activity, multidisciplinary, full-impact technology assessments are hard to find anywhere, either within government or outside. What evidence is available suggests that except for traditional cost-benefit investment and economic studies, technology assessment is still receiving more lip service than implementation. And where they have been undertaken, assessments have centered on pollution control or other environmental matters, land use, and the like. The quality and the effort going into such assessments varies tremendously. Many have been superficial, based out-of-hand on available engineering data, and apparently intended as much to promote as to even-handedly appraise a given program.

It must be stressed that while an evaluation of the role of technology in the degradation of the environment is a very important part of any over-all assessment, it is all too easy but wrong to view technology assessment as just another means for controlling pollution. Certainly there is a strong overlap between assessment and environmental protection. But they are by no means identical. Technology assessment demands a more comprehensive approach. If it were to concentrate on environmental problems alone, many by-products of innovation which could be even more hazardous or undesirable would be overlooked.

PROBLEMS OF BIAS AND CREDIBILITY

What it boils down to is that no present organization may be really capable of doing the job. Government agencies, private industry, professional societies, the universities, the nonprofit institutions, and think tanks all have inherent limitations—some as a result of the way in which they are organized, others because of limitations of perspective. Wherever you look, there are questions of bias, self-interest, conflict of purpose, competitive pressures, limited objectives, inadequate incentives, narrow or tunnel vision, and insufficient power.

Can the Atomic Energy Commission, to name one, in view of its vested interest in promoting the use of nuclear energy, really be expected to weigh in an adequate fashion both the economic benefits and the environmental hazards to be found in building nuclear power plants? A recent court decision provides interesting insight into that question. Or can the Federal Aviation Authority, with its mission of improving aviation, objectively judge the economic and social impact of an SST? Federal regulatory agencies all too often have tended to be captured by the very groups they were set up to control.

Can the assessment of the ecological effects of a new pesticide be made in an impartial manner by manufacturers of agricultural chemicals? Or the allocation of national resources for research and development be left to any group of scientists and engineers?

These are not just questions of callousness or dishonesty. Everyone working on a project inherently is biased toward moving that project forward. They may view their own interests, their own little component of the over-all system in a totally neutral, balanced, impartial fashion. But they may still fail to see how it fits into the big picture.

Then there is the question of credibility. No matter how even-handed an assessment, it is likely to be suspect if the assessor is presumed, rightly or wrongly, by the public at large to have a self-serving interest in the outcome. Most organizations, whether in private industry or the government, have been set up to promote rather than regulate a given technology.

On the other hand, technology assessment is not a job for dilettantes or do-gooders. It demands expertise and intellectual discipline rather than the superficiality which has been the hallmark of most social interest groups. Where are the experts to come from? It seems unlikely, certainly, that any single body within the Government could muster unto itself a staff with talent ranging across the full spectrum of scientific and sociological disciplines that a solidly grounded assessment would seem to require. Because assessment is clearly a broadly interdisciplinary function, it is likely to remain an ad hoc function as well. Much of the expertise obviously resides within private industry, although how it can be brought to focus without raising damning questions of conflict of interest is still unclear.

Of course, the task of assessment might seem to fall logically to the universities, with their pool of presumably disinterested scholars. Few, if any, universities today, however, are really organized or have the managerial capabilities to do the job. The interdisciplinary, mission-oriented applied research that is intrinsic to technology assessment is quite foreign to the universities' traditional structure built along relatively rigid disciplinary lines.

There is another question of the "who" type. How many engineers and scientists capable of working on assessments are at the same time interested in such assignments, especially considering how thankless they are likely to be. The task of critical evaluation, with all its negative aspects, is likely to seem less creative and less intellectually stimulating than the laboratory research and process design that most scientists and engineers have been traditionally trained to do.

Ideally, what is needed, it would appear, is an infusion of the spirit of technology assessment into the total fabric of how we as a nation do business, so that it becomes both a way of thinking and a way of life. Perhaps the most that can be expected of any federal legislation to set up an institutionalized assessment mechanism as an arm of government is that it will provide a means to coordinate the assessments made by present agencies, tying them all together.

ROLES FOR INDUSTRY AND GOVERNMENT

Certainly industry needs a technology stance of its own if only for self-preservation so that it may respond to pressures either from within the government or from private interest groups. It must arm itself against outside attacks and the stress of shifting constraints. Maybe what it needs is a counter commercial development staff or long-range debunking group within the over-all corporate structure. Such a group would have to be able and willing to assess business objectives and priorities not merely in the customary terms of short-range profits and sales growth such as Wall Street spotlights but in terms of social responsibility and consequences as well. Clearly, this will be no easy function to fill. It will demand the asking of embarassing questions and throwing up of road-blocks before pet projects. The role of corporate Cassandra is hardly one by which to win friends in the executive suite. But it's a task that industry may soon find that it cannot afford, either from an economic or a public relations standpoint, not to do. Otherwise, it may find itself being clobbered one of these fine days by outside pressures.

In the final analysis, of course, the proof of technology assessment will come only when it leads institutions—whether they be Congress, the executive agencies, the research institutes, or private enterprise—to act in a way that is different from what they might otherwise have done, especially if in doing so the assessment comes into conflict with traditional freedoms or political realities or vested interests. It is not difficult to imagine the hue and cry that will go up if the assessment mechanism treads painfully on the toes of powerful and well entrenched segments of the economy or with influential pressure groups. Washington, in particular, seems to be carpeted with wall-to-wall toes.

This type of head-on confrontation could mean disaster unless there is a strong body of political support to protect the assessors themselves. Without such support, without a constituency that is hardly in evidence now, any assessment is likely to be little more than an academic exercise leading to frustration and futility.

Certainly, there will be eager critics waiting in the wings for the assessors to stumble. Many people in industry, for example, view the idea of an institutionalized federal mechanism for technology assessment as little more than another attempt at bureaucratic empire building designed to interfere with and stifle industrial research and business enterprise. They fear technological assessment is just a synonym for technological arrestment. "We have more federal regulatory agencies than we need as it is," is a common complaint.

There seems to be little question, nevertheless, that much of the responsibility for making assessments and putting them to use in controlling technological progress must rest on the shoulders of government. The function of government, after all, is to set ground rules and establish the priorities within which business—or any private group—may operate.

Businessmen's fears are not unreasonable. By adding new uncertainties to the research and development equation that is already strewn with risks and ambiguities, assessment could well discourage private investment and undercut innovation. By adding new costs and delays in an increasingly competitive world, assessment could well weaken our ability to meet challenges from overseas. It certainly will not be easy to force businessmen to account for all the indirect consequences and spillovers that they long have been accustomed to ignore or pass on to the public at large.

ASSESSING THE ASSESSMENT PROCESS

And before we become too enthralled with the idea of assessing the full impact of indirect effects of technology, we would do well to take a close look at the possible first- and second-order effects of the assessment process itself on the fragile and poorly understood process of innovation.

It would be unfortunate, too, if any attempt to assess technology were to be used merely as an excuse for a broad assault on science and engineering in general. Yet many advocates of the idea, especially in the academic world, seem to take the benefits of technology for granted for the most part while spotlighting its faults and miscarriages. They tend to stress, in vivid if not extravagant terms, what is wrong with science in a manner likely to put off many people in the scientific and industrial world.

But if we remain unequipped to sort out good uses of technology from bad, all science and engineering may suffer as a result. Should a growing impatience with the failures of technology turn the public against science, the social costs will be very heavy indeed. Many remedies for past failures, in fact, will only be found in the future through the introduction of still newer and more sophisticated and more powerful technology.

And above all, it would be a great mistake to put too much stress on the risks and negative aspects of technology assessment. If it is done with reason, if it is even-handed and balanced, there is no reason why assessment should not promote the use of unappreciated and unemployed technology so that on balance it will enhance our well-being and reduce the long-term cost of innovation. It should help to stem the waste that results from poorly planned, unproductive, and unfeasible programs of research and development. At the same time, it should spur the development of beneficial technologies that might otherwise be overlooked because they seem to fall too far outside of the market place economy to warrant exploitation. Such technologies need the advocacy that well designed technology assessment could generate. Thus technology assessment can be viewed as a rectifying as well as a regulating process—one that throws the relationships between technology and the environment into clearer perspective, that adds a

new social and economic dimension to technological planning, and that puts a stamp of relevance on innovation.

Technological choices have to be made, in any event, one way or another. The question is: Will such choices continue to be made willy-nilly, haphazardly, cavalierly, and in a slipshod, profit-centered, disorganized manner? Or can policies and priorities somehow be set in a more rational, deliberate way and based on broader and better points of view? Can we learn to identify and weigh the trade-offs in the decisions we must make, and recognize how a decision made today may irrevocably affect the decisions we may want to make tomorrow?

What the advocates of technology assessment are seeking are hard-headed, practical methods to do just these things. Few of them would claim that they know how to do it now, at least in depth. We have some pilot studies, but little more.

I have said little about how technology assessment might impinge upon the handling of chemical literature. I leave this to the reader's imagination and intellect. But I do suspect that technology assessment will place some novel demands on the type of information that must go into the development of new chemical products and processes.

The Untapped Resource—Unpublished Manuscripts*

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The organization of a centralized, cumulative collection of unpublished manuscripts is described, whereby research directors, administrators, and laboratory scientists can be periodically alerted to progress and discovery within their respective fields. Classification and publication information is presented on 394 unpublished manuscripts maintained in the Baxter Laboratories, Inc. Unpublished Manuscript File from December, 1960 through March, 1965. Of the 302 manuscripts accepted for publication, 51% were published within 4 months and 90% within 16 months of receipt into the file. Clinical papers—written in English, treating clinical sciences (mainly internal medicine), and eventually published in clinical journals—dominated the collection.

In an era of scientific advances ranging from lunar exploration to organ transplantation, it is insufficient for the progressive scientist merely to keep abreast of the literature in his field; he must keep ahead of it. Research organizations have a responsibility to know what subjects need investigation, to be aware of and evaluate research trends, and to inform and advise those who must determine the course of research efforts.[1] Delays in present publication procedures or the unsuitability of data for publication seriously retard such research planning.

Frequently, through contact with his contemporaries at scientific conferences, the modern scientist is informed of innovations prior to their publication. A system whereby scientists could be periodically altered to progress and discovery within their respective fields would serve as the epitome of vigilance. This service can be accomplished by means of a cumulative collection of unpublished manuscripts.

Centralization of the collection ensures rapid access of the manuscript to research directors, administrators, and laboratory scientists; and positive control, thus preventing abuse of the confidential status of any manuscript in the file.

In accord with the traditional spirit of scientists, most investigators are generous in the prepublication disclosure of the results of their research work. Consequently, the acquisition and collection of manuscripts submitted for or prior to publication present no major obstacle to the establishment of an unpublished manuscript file.

ESTABLISHMENT OF THE FILE

Baxter Laboratories, Inc., Morton Grove, Ill., instituted a storage system for unpublished manuscripts in 1960. Sources of these manuscripts include internal generation—i.e., authorship by company personnel; outside consultants; outside investigators—i.e., basic scientists or clinicians investigating either potential or established products; preprints distributed at scientific conferences; editors transmitting galley proofs citing Baxter products; committee membership in scientific and professional societies and quasi-governmental councils; ghost writers; and other industrial firms.

DESCRIPTION OF THE PROCESSING PROCEDURES

Upon acquisition, an unpublished manuscript is labeled, classified, duplicated, and filed under suitable security regulations. In labeling a manuscript, the following identification criteria are indicated: full name of author(s); institutional connection; security classification—i.e., a description of the confidential nature of the material and limitations on its distribution; pertinent circumstances related to the acquisition; and author's plans for publication, if known. Classification of a manuscript places it in one of the following major categories: clinical paper, basic science paper, applied science paper, abstract, review, or lecture. After being properly labeled and classified, an unpublished manuscript is duplicated and filed.

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