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## Brave New Medicine

Presidential Address to the American Society for Clinical Investigation, San Diego, California, 2 May 1987

Thomas P. Stossel

Hematology/Oncology Unit, Massachusetts General Hospital, Harvard Medical School, Boston, Massachusetts 02114

It has been a privilege to serve as President of your Society. Being unqualified to produce the usual uplifting presidential advice, I present you with a fable.

It is the year 2007 and a curious anniversary: the centennial of a long defunct society. This fact has just been discovered by Cassandra Adunamis, a student about to graduate from Euphoria Medical School. Cassandra is waiting to learn about her first postgraduate employment, and, to take her mind off of the decision over which she has no further control, she is perusing a chapter entitled "Clinical Investigation" in Ralph Hythloday's classic textbook on the history of American medicine.

Cassandra has been a good student and therefore competitive for the job she hopes desperately to obtain—a junior associate position in the prestigious health firm of Lockjaw, Warburton, and Tytesphincter Medical Research and Providers, Incorporated, Subsidiary of Arf Dog Food, Automotive and Medical Enterprises, recently acquired by the Holding Company of Boesky, Mammon, Tokyo Bank, and Vesco International. Euphoria Med years ago adopted the pattern of its sister professional schools, Euphoria Business and Euphoria Law, in abandoning all service to teach only general fundamentals of medicine. In the employ of Lockjaw, therefore, Cassandra would obtain her first *clinical* training under the tutelage of the junior partners, also known as clinician-teachers. To be an associate at Lockjaw means hard work, but the pay is excellent, the patients strictly upper crust, the technology the absolute latest, and, if one has the mettle, an associateship leads to a lucrative partnership.

The alternatives are less attractive. Not so well-qualified students may end up as employees of a franchised HMO. Sears Roebuck Research, for example, specializes in drive-in lithotripsy for the simultaneous dissolution of urogenital and biliary stones and of sludge in the oil system of the consumer's automobile. The driver can easily reach out to malpractice suit vending machines should the need arise. The human genome was sequenced years ago, the culmination of an expensive project called "gene wars," and the entire population has been screened for susceptibility to many inherited diseases. For reasons Cassandra is learning in Hythloday's text, there has been little progress in understanding pathogenesis, so that the genetic knowledge is largely applied to mass-scale abortion, organ transplantation, technical tinkering, and the establishment of life and medical insurance premiums. Persons identified as at risk for atherosclerotic vascular disease, for example, and whose parents eschewed abortion come biannually to another national HMO, Burger King Research Cardiocenters,

which have aggressively promoted rapid outpatient "preventive" angiography and angioplasty. There is an impression that these procedures reduce the incidence of fatal myocardial infarctions and strokes, but there is also an uncomfortably high frequency of bizarre vascular events possibly caused by damage to the endothelium. Systematic epidemiological investigations are no longer performed, however, so that this idea remains anecdotal. Also nonexistent now is substantive evaluation of cardiovascular exercise programs, fatty acid analogue dietary supplementation, or other body lipid-modifying treatments that are aggressively sold at the cardiocenters. It is now also downright un-American for cancer patients not to seek what is marketed as experimental treatment at a "cancer research" HMO. No one is willing to be a control in the "research" protocols offered, and it is simply assumed that whatever is the latest is the greatest.

An unthinkable choice for Cassandra would be to join physicians who staff the squalid cut-rate hospitals owned by the insurance risk pool and Salvation Army consortium to service the poor or marginally insured. Only slightly better would be for Cassandra to remain at Euphoria in a teaching position. With little clinical experience and no research skills, faculty members have nothing to market as consultants, and the profession tends to view them as "those who teach because they can't do." As a member of the faculty, one can publish learned articles in the *Euphoria Medical Review*, although most of the news about medicine that gets read circulates widely with the throwaway *New England Journal of Fashion and Medical Publicity*.

"In 1909," reads Cassandra in Hythloday's text, "an organization called the American Society for Clinical Investigation (abbreviated ASCI) held its first meeting. The ASCI was chartered to provide an identity for scientifically oriented physicians, then a rare and beleaguered species. By mid century the Society's goals had been accomplished beyond belief. Many clinical investigators became as accomplished as the best of basic scientists and also provided leadership of clinical departments which in those days were affiliated with universities. The entire medical establishment recognized the importance of science and accepted the leadership of scientifically trained physicians with track records in research. The Federal Government lavishly subsidized them.

Any resentment by practicing clinicians of the clinical investigators' hegemony was muted, because practitioners were enjoying unprecedented prosperity. Clinical investigation had produced technology which, coupled with Federal subsidy for medical care of the elderly, remunerated the practitioner as never before. Affluence and a game of the emperor's new clothes kept the system intact. The mythical 'triple threat' with skills as clinician, investigator, and teacher reigned, because powerful chairpersons backed them. The focus was on the triple-threat's strengths in questioning, in criticism, in stimulation, and as a role model. Inevitable weaknesses in any one of the three 'threats' were overlooked. This promotion of

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the flawed triple threat is in accord with a sociological principle recognized by William Goode and called 'the protection of the inept' (1). In protecting the inept, society adaptively prevents weaknesses of individuals from being detrimental to the group, thereby protecting both the individuals and the group as a whole. This behavior does not violate society's merit aspirations but honors certain cherished values. A prime example of the success of this approach is the Japanese economy (2).

The remarkable fact about the joint rule of university and hospital at this time was that it made medicine unique among professions in having its cutting edge of service in the university, as compared with business, where the edge was in the market, or law, where it was in the market or the courtroom. Academic medicine was in the ivory tower and the real world at the same time. The accomplishments of clinical investigators, moreover, were substantive. Their ability, for example, in the early 1980s to identify the cause of the dreaded AIDS disease led immediately to the virtual elimination of one cause of its transmission, infected blood and blood products. This accomplishment reduced the incidence of the disease by several thousand cases per year, which represented a possible savings in medical care costs of many millions of dollars, not to mention a priceless reduction in anxiety for patients receiving blood. At face value, therefore, the identity of the clinical investigator was so well established by the 1980s that a low-budget society for clinical investigation seemed hardly necessary. One president of the Society, in fact, campaigned on the promise to abolish it.

Not that there was a lack of problems. Beginning in the 1960s, international adventures, inflation, economic stagnation, social activism in other spheres, anti-intellectualism (3), and a legitimate concern about subsidizing clinical subspecialization under the guise of research caused the Federal Government to finance the biomedical research community much less adequately than before. The academic establishment adroitly responded by lobbying for Federal monies, and the effort may have slowed a progressive decrease in the research that could be funded by Government agencies. Nevertheless, clinical investigators did not seem to be aware in the mid 1980s that they were relinquishing their sovereignty (4).

Evidence for the abdication of clinical investigators was apparent in their absence from influential planning bodies. In 1986, for example, not a single prominent *active* clinical investigator was represented on an important Medical Manpower Planning Board (5), on a Professional Liability Crisis Conference (6), or a steering committee of over 400 determining a 'health policy agenda for the American people' (7). In an article in an influential medical journal discussing attributes vital for future 'physician executives,' not one of the eight characteristics listed included research training or experience (8). This lateralizing of clinical investigators put them at risk of parricide by their former students. The growing inadequacy of funding for scholarship pushed university-based physicians into faculty practice plans to support departmental activities (9). Academicians then entered competition with non-academic practitioners who were already stressed as cost containment and rising malpractice premiums eroded their own sovereignty, independence, and income.

The demise of research as it was then constituted in clinical departments occurred because the environment for such research became inhospitable in the clinic and more favorable elsewhere. Industry, in particular, aggressively recruited the best investigators. This carrot might not have created a serious

brain drain from the university had not additional sticks beaten the clinical from investigation. Surprisingly, some of the very leaders of American medicine played a major role in this attack in several ways (10).

First, certain deans and department chairmen publicly bewailed the Trojan horse of Federal support which, once within the university walls, allegedly eroded loyalty of the faculty to the school and fueled unregulated expansion. Yet despite these concerns about institutional loyalties, these leaders spread their limited resources as thinly as possibly to maximize the exogenous supply and decreed that research should support itself. This pronouncement was especially paradoxical, because by the mid 1980s agency funding was flowing reliably only to the most fashionable, most immediately relevant, or most politically connected research. Only the rare clinical investigator might expect a lifetime of uninterrupted support from such sources. More likely, a young investigator's career was predictably a dance of death on the tightrope of the priority payline. Priority scores that would easily have been funded in earlier years now left the stench of death about even outstanding investigators, discouraging their students (11). There was one quasi-foundation with enough wealth to defray a significant part of the lost Federal support for excellent clinical investigation, but its managers, which included patriarchs of American medicine, turned its considerable resources to more basic, already well-funded and largely fashionable science and to other adventures. This left department chairmen no choice but to sacrifice departmental priorities to bicker with each other over the few projects and researchers acceptable to this powerful organization.

Second, the medical leaders pulled the invisible veil from the triple threat—so much for protection of the inept. Researchers, they said, were not necessarily the best clinicians; indeed, they were sometimes the worst. So there should be two platoons in the university: clinician-teachers and researchers. In football, after all, the two-platoon system had replaced the triple threat. Since it was admittedly difficult to be both in clinical medicine and in research, why not certify it as impossible, even though it was now acceptable for basic scientists simultaneously to be professors, researchers, and biotechnology entrepreneurs (12). Never mind that the two medical platoons, in contrast to football, were not necessarily playing for the same team.

Third, the medical leadership accused clinical investigators of excessive greed, which was contrasted with medical scholars of the previous generation who were supposed to be 'shabby genteel' (13). This argument was falsified by the conditions of the 80s. The cost of medical education rose long after the end of double digit inflation of the 70s, and most medical graduates had large debts. The accusation was also blind to a possibly unfortunate but real acceptance of economic inequality and a legitimization of affluence by all professions at that time. Status, class, and evidence of excellence were outwardly manifested by personal wealth. Among professionals, the trappings of corporate opulence signalled competence. In 1987, for example, in urging a near doubling of salaries for Federal judges, Supreme Court Chief Justice William Rehnquist stated that 'if salaries are not made comparable to the average level in private practice, fewer of the candidates will possess the first-rate talent which has always been a hallmark of the Federal bench' (14). To exclude the clinical investigator from the elite, who are entitled to subsistence commensurate with their dignity, was a powerful disincentive (15).

Under these assaults clinical investigation quickly shattered. In 1988 the periodical sponsored by the ASCI, *The Journal of Clinical Investigation*, was included in a massive conflict of interest lawsuit between investigators. The effort to protect the anonymity of reviewers in the protracted legal proceedings soon exhausted the *Journal's* assets (16). *The Journal* declared bankruptcy, and soon thereafter the ASCI was disbanded. In 1989 the Soviets responded to an American nuclear defense plan known as 'Star Wars' with their own initiative called 'The Evil Empire Strikes Back,' leading the United States to retaliate with an even more lavish program, deepening an already huge Federal deficit. This caused spending for other programs, including the appropriations for medical care and research, to be curtailed.

A relatively affluent and politically powerful elderly population strove to preserve its wealth and supported conservatism in welfare policies. No serious movement toward a national health service took place, despite wishful thinking of some health pundits. Also contrary to predictions, more and not less of the GNP was spent on health. Despite the fact that the national matriculation rate was falling, the upper middle class strove for status by trying to plant its offspring in a small number of elite and expensive colleges. Following the same pattern, they paid ever more out of pocket for what was perceived as upscale medical care. The poor stretched their meager resources for medical services as well. A glut of doctors threatened to cut the income of most physicians (17) and led to explosively expanded advertising and marketing of clinical services by physicians and health corporations. Court decisions permitted increasingly liberal use of puffery in the advertisements (18). The predictable further deterioration of physicians' professional image by such advertising led to a revival of health populism and folklore. The distinction between peer-reviewed and so-called throwaway commercial medical periodicals became increasingly blurred. The science paparazzi, the science writers for newspapers and science magazines, could make or break investigators' careers. The erosion of discrimination by both professionals and the public about what truly constituted research, combined with the increase in health advertising, made it convenient to say that research was being done when it was not true.

Unregulated competing technologies emerged too fast to permit scientific comparisons (19), and any desire to do so was terminated by the landmark legal case *Medigimmick, Inc., v. Mayo Clinic*, in which Supreme Court Chief Justice Genghis Redneck's majority opinion made official the inexorably developing notion (20) that it was defamatory and in restraint of trade to publish results in a scientific journal showing that one product was superior to another unless the alleged inferior product was clearly dangerous.

Medical education changed also. Medical schools obtained instant financial relief by ceasing to support research, and kept only enough faculty for classroom teaching. Basic research was done only in science departments or in industries: the medical university had regressed to a one-dimensionality of earlier times (21)."

Let us return to Cassandra, who now pondered the annihilation of clinical investigation and felt a sense of loss. She wondered if this catastrophic evolution had been unavoidable. The concluding remarks of Hythloday's chapter, with which I close this fable, addressed her question.

"It is difficult for us [continued Hythloday] to imagine the splendid careers of this extinct species, the clinical investigator,

and its potential for contributing to humankind. Few have had this many challenges: to confront directly the physical and emotional aspects of people in repair and disrepair: as individuals, as families, and as social groups; to attack the frontiers of fundamental biology or to bring to order seemingly disparate phenomena in clinical experience; to impart their skills and knowledge to eager apprentices; and to shape the practical interworkings of these diverse activities within clinical departments. Sovereignty, however, does not derive from pleasure in the presence of a profession, but from the public perception that the profession contributes sufficiently to justify conferral of that sovereignty. Immersed in the joys of their work, clinical investigators failed to preserve themselves. Their responses to dilemmas facing medicine in general tended to be highminded but ineffectual. There were evangelical calls to 'return to earlier professional values,' meaning more emphasis on high quality of care and less on personal profit. From a practical standpoint, however, the more open commercialism of medicine was impossible to reverse with anything less than another monastic revival or puritan revolution (22). What might clinical investigators have done differently? (Hythloday suggested the following.)

Had the collective consciousness been focussed on their waning sovereignty, clinical investigators might have defended the triple threat from dismemberment by the medical gerontocracy. Indeed it should have been expanded to a 'quadruple threat'; adding political awareness to patient care, teaching, and research, the traditional trinity of academic medicine, thus transforming the three-legged stool into a stabler four-legged chair (23). To exercise more influence clinical investigators needed, first, to overcome their subspecialty factionalization and to pool resources. One area of consolidation could have been the many specialty and disease-oriented organizations in which clinical investigators were then prominent. In addition to fundraising for their narrow parochial interests, these agencies could have encouraged the public to provide the popular demand necessary for more *general* Federal research support (24).

[Hythloday's second suggestion:] The two-platoon notion, which separated good basic research from the bedside and which isolated clinical investigators from their base of power, the public in general and patients in particular should have been rejected. The already difficult job descriptions of clinical investigators could obviously not encompass an extensive personal involvement in primary care or a heavy responsibility for the prosperity of the faculty practice plan. But continuing leadership of clinical departments was indispensable. Only by restoring the importance of research in the clinical setting would *clinical* studies of high quality be performed (25). To this end clinical investigators had to have more influence on a confused and amorphous university hospital governance (26) and stand up to the businessmen and business physicians who intimidated others with the acronymic and shallow jargon of health bureaucracy and health business. University investigators needed to tighten, not loosen, their grip on service, so as to remain central to the 'practical' purposes of health care and to derive support from the charity of grateful patients. Quality, unfortunately, does not necessarily sell itself. To justify this leadership role, therefore, clinical investigators needed to market, tastefully but aggressively, if necessary with the help of professionals in advertising, their special value—both in the United States and abroad.

What was this value? Clinical investigators, like clinical

practitioners, possessed the precious license to examine, comfort, and sometimes heal human beings. They also owned a marketable notion, research. The researcher's magic of tomorrow went beyond the practitioner's magic of today. The marketing might of research was abundantly evident in the use of the term by medical providers who did not research at all. Because of the prevalent anti-intellectualism and latent fear of science in society (3), it was probably also necessary for investigators to convince the public that they could be just as caring as non-researchers (27).

Another attribute that arguably gave clinical investigators a special handle on high quality in service was their acceptance of rigorous peer review. Students of medical sociology (4, 28) documented how medical practitioners resisted serious peer review and relied primarily on etiquette, informal marketplace forces, and token certification procedures to set standards. Investigators, on the other hand, were dependent upon refereed grants and publications for funding and promotion. This evaluation system, although far from perfect, fostered the habit of mutual oversight, rendering most investigators comfortable with a critical approach and unlikely to resort to anecdotal evidence or authority to assert their opinions. Training in the rigors of research made most of them aware of the inscrutability of nature, the danger of forcing clinical observations into pigeonholes defined by textbooks or by comfortable prejudices, and the peril in glossing over the vast reservoir of ignorance which *they* could best perceive behind the complacent mirage of high technology and contemporary ideas of physiology. They knew or should have known better the difference between substance and promotional hype (29).

The value of such self criticism should have been explained to key business leaders, emphasizing that research could help them attain what they wanted—health care of good quality at a reasonable cost—by limiting expensive but marginally effective or unproven technology, that is, by reducing the reservoir of ignorance. Whereas new medical technology tended to drive up costs, it was possible to document that research *concerning* technology could diminish *utilization* of expensive techniques, thereby saving money (30). In institutions where such research was taking place, physicians' acceptance of technological restraint would probably have been better and met with less objection than where cost containment was the sole motivation for technology limitation and where it was imposed by bureaucratic fiat.

[Hythloday's third point:] Clinical investigators *as a group* should have protected the university's rights to the fruits of discovery and forced business to invest more in the university's traditional balance between practical studies and the search for knowledge for knowledge's sake—the kind of study necessary to reduce the reservoir of ignorance (20, 31). Universities could have been more aggressive about patenting and especially about regulating the entrepreneurial activities of faculty who became involved in commercial enterprises. The entire university community, after all, conferred its prestige on the investigator and his industrial liaison, and also assumed the risk should the activity fail or become an embarrassment. The university could have attempted to benefit monetarily from all varieties of technology transfer into the community, including medical treatment regimens and surgical procedures (32).

Finally [according to Hythloday], had clinical investigators regained their sovereignty through unification and exercise of power, they clearly needed to be more cognizant of the feelings of nonacademic physicians, a sad lack in the bonanza years of

clinical investigation. Clinical investigators should have suspended their snobbery and political prejudices and interacted with the American Medical Association, the major organization of practitioners. Academicians might then have been able to convince practitioners that leadership by and support of researchers was not necessarily against the long-range interests of clinicians. Only if physicians were perceived as scientifically well-trained individuals, part of a profession that had a strong ongoing research commitment, would their prestige and status remain high. The AMA might even have mobilized practitioners in a grass roots advocacy for research, such advocacy being the key to political success in America (33). Clinical investigators might then have involved practitioners more in the excitement of acquiring new knowledge, thus forging the partnership between town and gown that was long sought by the founders of modern American medicine (34).

The ASCI [concluded Hythloday] in the 1980s should have reaffirmed its original mission—for clinical investigators to join and assert their identity and value. In the 1980s nearly everyone thought that the clinical investigator was a permanent institution. Today, as in 1907, it hardly exists."

Thus ended Hythloday's chapter. Cassandra went to the mailbox and picked up the envelope that she knew was her invitation to join Lockjaw Warburton. She was relieved, but somehow lacked the elation that she might otherwise have felt.

So ends this presidential fable. Whether or not this caricature of the present becomes reality is up to you. Even if the future is much less dire, Hythloday's five recommendations: (i) Preserve the *clinical* base of clinical investigation; (ii) Transcend subspecialty parochialism; (iii) Market the special values of clinical investigation; (iv) Assure that a fair portion of the monetary value of knowledge returns to the university; and (v) Reach out to the practitioner appear to be good policy. I thank you for your attention.

## Acknowledgments

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1. Goode, W. J. 1967. The protection of the inept. *Am. Soc. Rev.* 32:5–19.
2. Minabe, S. 1986. Japanese competitiveness and Japanese management. *Science (Wash. DC)*. 233:301–304.
3. One of the ironies of scientific and technological education is that it has produced some of the most virulent adversaries of its own foundations (e.g., Cavanaugh, M. A. 1985. Scientific creationism and rationality. *Nature (Lond.)*. 315:185–189. Marks, S. J. 1986. Investigating the paranormal. *Nature (Lond.)*. 320:119–124). In dealing with its patrons, the research community skirted the two cultures, generally emphasizing its practical rather than its humanistic value. For this reason, clinical investigators, like the military, were more effective than "pure" scientists in negotiating subsidy for research, although all types of research benefitted from these negotiations. Research lobbyists did attempt to demonstrate the power of basic and nondirected investigation, but the limits of their success was evident in the allocation of most Federal and nearly all voluntary agency research funds according to categories of disease or of particular technologies. The negative side of this practical approach was that the Government and voluntary

agencies tended to remain as purchasers of products, the difference between science and technology remained blurred in public perception, and the need to conjure practical benefits for all kinds of research created the danger of disaffection, should such benefits not arise. The first evidence of trouble for what had been uninterrupted growth of clinical investigation since the Second World War may not have been a limitation of funds but the decision of the Johnson administration in the mid 1960s that it was time for the so-called "Great Society" to focus its subsidy more on the application of basic biomedical research advances to health problems than on the advancement of research *per se*. When funding did become limited, the debate over the relative values of "basic" and "applied" research sharpened. One of the liabilities of the cost containment efforts in the 1980s was that the limitation of tests and procedures for diagnosis and management spilled over to education and research. Cost containment made a convenient excuse for the anti-intellectual to squelch the desire of curious physicians to look deeper into anomalous findings.

4. Starr, P. 1982. *The Social Transformation of American Medicine*. Basic Books, Inc. Publishers, New York. Starr convincingly documented how professional expression depended upon professional sovereignty which, although influenced by transient historical events, ultimately derives from public perception. The practitioners of clinical medicine had achieved an amazing sovereignty by the middle of the twentieth century. They then lost it rapidly as their posture and pious invocations of the sanctity of the doctor-patient relationship appeared unconvincing and self-serving to the general populace, and they could not market their claims of quality service in the face of a demand for lower costs. Although medical leaders seemed to have absorbed the facts presented by Starr, few appeared to have understood his unifying political principles. To the extent that there was concern about the role of the clinical investigator in the 1980s, it focussed more on whether the clinical investigator was being supplanted by the basic scientist than on the issue of political abdication, which permitted the clinical investigator's importance to be demeaned (Gill, G. M. 1984. The end of the physician scientist? *Am. Scholar*. 53:353-368. Glickman, R. M. 1985. The future of the physician scientist. *J. Clin. Invest.* 76:1293-1296).

5. Levy, G. S. 1986. Organizing to begin physician manpower planning. *N. Engl. J. Med.* 315:1244-1346.

6. Iglehart, J. K. 1986. Special report. The professional liability crisis. The 1986 Duke private sector conference. *N. Engl. J. Med.* 315:1105-1109.

7. Boyle, J. F. 1987. Health policy agenda for the American people. *JAMA (J. Am. Med. Assoc.)*. 257:1199-1210.

8. Hillman, A. L., D. B. Nash, W. L. Kissick, and S. P. Martin. 1986. Managing the medical-industrial complex. *N. Engl. J. Med.* 315:511-513.

9. MacCleod, G. K., and M. R. Schwarz. 1986. Faculty practice plans. Profile and critique. *JAMA (J. Am. Med. Assoc.)*. 256:58-62. MacLeod, G. K., H. E. Rockette, and M. R. Schwarz. 1987. An attitudinal assessment of faculty practice plans. *JAMA (J. Am. Med. Assoc.)*. 257:1072-1075.

10. Beeson, P. B. 1986. One hundred years of American internal medicine. A view from the inside. *Ann. Intern. Med.* 105:436-444. Ebert, R. H. 1986. Medical education at the peak of the era of experimental medicine. *Daedalus (Boston)*. 115:55-81. Petersdorf, R. G. 1986. Medical schools and research: is the tail wagging the dog? *Daedalus (Boston)*. 115:99-118. It is important to point out that these and other individuals also made valiant efforts to support biomedical research and to address the political currents of the time in an effort to promote scholarship in medicine.

11. The average priority scores given to grant proposals by merit review study sections, such scores being what determined which approved proposals would be funded, changed little between 1962 and 1983: the median score was the mid 200s (100 being the highest possible score) (Garrison, H. H., and P. W. Brown. 1986. The Career Achievements of NIH Postdoctoral Trainees and Fellows. NIH Program Evaluation Report. National Academy Press, Washington, DC). This median value was generally fundable through the early 1970s but

was well below the payline by the mid 1980s (e.g., Levy, J. A. 1984. Peer review: the continual need for reassessment. *Cancer Invest.* 2:311-320. Atkinson, R. C., and W. A. Blanpied. 1985. Peer review and the public interest. *Issues Sci. Technol.* 2:9-10. Culliton, B. 1984. Fine tuning peer review. *Science (Wash. DC)*. 226:1401). In the early 1980s there was much concern about a declining number of physicians entering careers in clinical investigation (e.g., Wyngaarden, J. B. 1979. The clinical investigator as an endangered species. *N. Engl. J. Med.* 310:1254-1259). In response to this concern the NIH established training programs with better stipends and a longer duration of support than were provided by existing training grants, and also gave special consideration to grant proposals from young investigators emerging from training. Because of the general fiscal constraints, however, the number of such awards was limited, and an increasing number of young investigators found their proposals "approved but not funded." It should be emphasized that basic scientists as well as clinical investigators were in this dilemma.

12. Kenney, M. 1986. *Biotechnology. The University-Industrial Complex*. Yale University Press, New Haven, CT. 5:90-105.

13. In support of the argument was cited a starting salary for an assistant professorship in a department of medicine in 1958 in the northeastern USA of \$8,500 (Petersdorf, R. G., see note 10). Comparative consumer price indices translate this amount to approximately \$34,000 in 1986 (Paul Samuelson, Department of Economics, Massachusetts Institute of Technology, personal communication). The mean base salary for an assistant professor of medicine in the northeastern USA in 1986 was \$62,500 (Smith, W. C., Jr. January, 1987. Report on Medical School Faculty Salaries, 1986-87. Division of Operational Studies, Association of American Medical Colleges, Washington, DC), indicating that there had been significant improvement in compensation at this faculty level. Incidentally, \$62,500 was the minimum salary for rookie professional baseball players (*Sports Illustrated*. April 20, 1987. p. 55). Looked at another way, IRS data on the income of practicing physicians reveals an average of \$17,000 in 1958 as compared with \$105,000 in 1986 (Rashi Fein, Harvard Medical School, personal communication). The increase in academic salaries between 1958 and 1986 is more nearly equivalent to the corresponding increase in the income of practicing physicians.

14. *Boston Globe*. January 1, 1987. p. 3. For a justification of the legitimization of affluence from an attorney's perspective, see Eubank, T. 1986. Attitudes toward wealth. *The Probate Lawyer*. 12:1-92. The social and economic forces contributing to economic inequalities in the USA are discussed by Thurow, L. 1987. A surge in inequality. *Sci. Am.* 256:30-37.

15. It is unclear what motivated medical leaders to attack the remuneration of clinical investigators. One possible answer is that major inequities characterized the payscale of clinicians at that time. Physicians and surgeons performing procedures were paid much more than those delivering more cognitive services, and the assault may have been an overreaction to inflated incomes of a minority of academicians in procedure-performing specialties. The demoralizing effect of inequities in faculty compensation in the university in general has been described (Hansen, W. L. 1986. Changes in faculty salaries. *In American Professors. A National Resource Imperiled*. Oxford University Press, Oxford. 80-112). Physician-teachers were unlikely to receive much sympathy from lower-paid academics in faculties of arts and sciences.

The leaders of medicine also challenged the expectation of academic tenure in medicine. Although the notion of lifetime tenure was a subject for reasonable discussion (e.g., Silber, J. R. 1974. Tenure in context. *In The Tenure Debate*. B. L. Smith, editor. Jossey-Bass Inc., Publishers, London. 34-53), to gainsay it categorically sent a powerful psychological message to young faculty comparing their positions with practicing physicians who, with active practices and a good disability insurance policy, might have a better guarantee of income than that afforded by classical academic tenure arrangements.

16. Newspapers and wide-circulation technical periodicals could afford the legal expenses associated with court actions that intruded into scientific communication in the latter years of the century (e.g.,

1972. End of dentist's libel action. *Br. Med. J.* 2:372-373), but low-circulation technical journals that were the vehicles for dissemination of most science could not.

17. Fuchs, V. R. 1986. *The Health Economy*. Harvard University Press, Cambridge, MA.

18. Gray, J. 1986. The selling of medicine. *Medical Economics*. 63:180-194.

19. Petitti, D. B. 1986. Competing technologies. Implications for the costs and complexity of medical care. *N. Engl. J. Med.* 315:1480-1483. Goodman, C. S. 1985. The scope of US medical technology assessment. In *Assessing Medical Technologies*. National Academy Press, Washington, DC. 32-69.

20. Rose, M., and R. F. Leibensluft. 1986. Antitrust implications of medical technology assessment. *N. Engl. J. Med.* 314:1490-1493.

21. Kerr, C. 1963. *The Uses of the University*. Harvard University Press, Cambridge, MA. Kerr presented a much more optimistic and less defeatist picture of the impact of the Federal Government in the university than was pictured by the doyens of American medicine 25 years later. He recognized the irreversibility of Federal intrusion into academe, if the university was to thrive, although the task of academic leaders was to maintain checks and balances. The economic picture was admittedly brighter when Kerr wrote, and he accepted uncritically the claim (pp. 82-83) that more physicians should be trained, a call that was heeded and later deemed unwise when it subsequently led to a physician surplus.

22. As virtuous as these preachings sounded at face value, it has been argued that the stated piety of medicine was not consonant with reality since the time of Hippocrates (note 4; Chapman, C. B. 1979. On the definition and teaching of the medical ethic. *N. Engl. J. Med.* 301:630-634. Edelstein, L. 1977. The professional ethic of the Greek physician. In *Legacies in Ethics and Medicine*. C. R. Burns, editor. NY Science History Publications. 76-104). Profit had been a part of medicine for millenia, yet the intrusion of "for profit" ventures into clinical medicine sparked violent debate (e.g., Herzlinger, R. E., and W. S. Krasker. 1987. Who profits from nonprofits? *Harvard Bus. Rev.* Jan/Feb. 93-106; commentary in *The New York Times*, Business Section, April 4, 1987; and Relman, A. S. 1987. Practicing medicine in the new business climate. *N. Engl. J. Med.* 316:1150-1152). Fee-for-service research treatment also began to thrive in the 1980s (Ezzel, C. 1987. US experimental drug rule change may help biotechnology. *Nature (Lond.)*. 326:536. Lind, S. E. 1986. Fee-for-service research. *N. Engl. J. Med.* 314:312-315). Rather than continue to market traditions that may never have been what they seemed, it was more to the point to educate the public about standards and quality so that these would be sought whether the system was profit or nonprofit.

23. Goode (note 1) pointed out the structural peculiarity of the academic profession that downgraded the value of administrative work and of politics in comparison to scholarship, an attitude that tended to encourage or at least increase the risk of mediocrity in academic governance. The high vacancy rate of ostensibly prestigious chairmanships of medicine departments in the 1980s was consistent with this formulation (Papper, S. 1985. *Thirty-five Years in the Tower*. Little, Brown and Co, Boston/Toronto).

24. Some might argue that the disease- or organ-oriented agencies marketed research to an extraordinary degree, and that researchers, assisted by these agencies and by their own institutional public relations, obtained abundant free advertising in the lay press, which hawked science news on a seemingly interested public. The public relations of the agencies and the news reporters, however, tended to emphasize the simplistic elements of research, with particular weight on "breakthroughs" or frightening revelations, without attempting to apprise the public of the gradualism or even the process of real science. The agenda of the agency managers was primarily fundraising for the narrow interests of their programs, and most of the funds raised were not necessarily for research. It is not clear that there ever was a call to statesmanship for rising above parochial interests to encourage those in the public with an interest in a particular disease to lobby for general funds. A stronger public lobby might have helped biomedical investigators in general to escape from the ritual that came to characterize the

appropriation of funds for biomedical research. Congress generally increased the allocations above the low levels requested by the Administration, but, without a public uprising, would only go so far. Clinical investigators became habitually relieved to obtain appropriations better than the worst case but insufficient to further the enterprise adequately. For research to move ahead with a momentum that would lead to the discoveries that would benefit society or that would bring basic science to the bedside, it is necessary to fund a certain amount of not-so-fashionable science.

The fragmentation of medicine into subspecialties was also an impediment to effective communication among clinical investigators and a distraction from recognizing some of the problems outlined in this chapter (Stossel, T. P. 1987. The present and future of the 'clinical' meetings. *Clin. Res.* 35:173-176). Clinical investigators also lost training leverage, because specialty training in medicine was perceived by medical economists as a cause of excess spending. Limitation of training subsidies across the board (The Commonwealth Fund. 1985. Reports of the task force on academic health centers. Prescription for Change. The Winchell Co., Philadelphia) and exhortation of institutions to be virtuous and curtail training of specialists were predictably ineffective when subspecialty programs meant prestige and cheap labor for the institution and a source of status and control of information and delegation of tasks for the individual practitioner, not to mention a basis of wealth when specialization meant access to remunerative procedures. Had elite clinical investigators been empowered by the government or by the specialty boards as gatekeepers to accredit institutions permitted to train specialists and taken advantage of the willingness of authorities to exempt training for academic rather than service careers, the desired trimming might have taken place without penalizing clinical research. By limiting subspecialty training to a few institutions with certifiable academic training records, this approach might have concentrated the power of specialization in the research university and united specialty training with scholarship. See also, Nathan, D. G. 1987. Funding subspecialty training for clinical investigators. *N. Engl. J. Med.* 316:1020-1022.

25. In 1966 an ASCI president astutely worried that a devotion to reductionism for its own sake might decrease the perceived legitimacy of clinical investigation as a scientific discipline relevant to medicine (Seldin, D. W. 1966. Some reflections on the role of basic research and service in clinical departments. *J. Clin. Invest.* 45:976-979). In the latter half of the twentieth century clinical investigation was not as identifiably "clinical" as in earlier times, and the research at the cutting edge was usually indistinguishable from basic science. One of the early tasks of the ASCI was to establish legitimacy, and this was accomplished by restricting membership to a scientific elite. Insofar as the best university science was reductionist, the research showcased by the ASCI tended toward the basic. This may have conveyed the unfortunate message that all other research was unworthy. Bedside-oriented clinical research that was innovative or of real import tended to be slow and became more difficult and more expensive. Appropriate but nevertheless burdensome attention to the ethics of human experimentation required vast amounts of paperwork. The increasingly competitive climate of clinical practice did not mesh well with participation in unremunerated time-consuming research protocols. With the prospect of a grant renewal in as little as two years, it was safer to accrue animals or cultured cells into a study than reluctant or scarcely available patients.

26. Lewis, I. J., and C. G. Sheps. 1983. *The Sick Citadel. The American Academic Medical Center and the Public Interest*. Oelgeschlager, Gunn, & Hain Inc., Publishers, Cambridge, MA.

27. Presumably this anti-science mentality provoked the recommendation to physicians by a director of provider relations at a large HMO "to resist word, action or policy that defines you as a physician-scientist rather than a physician-humanist. . . ." (Magee, M. C. 1987. Pursuing an ethic of advocacy. *Mass. Med. March/April*. 12-13).

28. Colombotos, J., and C. Kirchner. 1986. *Physicians and Social Change*. Oxford University Press, New York. Freidson, E. 1975. *Doctoring Together: A Study of Professional Social Control*. University of Chicago Press, Chicago. Eddy, D. M. 1982. Probabilistic reasoning in

clinical medicine: problems and opportunities. *In* *Judgement Under Uncertainty: Heuristics and Biases*. D. Kahneman, P. Slovik, and A. Tversky, editors. Oxford University Press, Oxford. 249–267. There was clearly a spectrum of behavior among physicians, as with all people, and a significant proportion of them undoubtedly struggled selflessly to uphold high professional standards and dedication to patient's welfare (e.g., Good, M. J. D. 1985. Discourses on physician competence. *In* *Physicians of Western Medicine*, D. A. Hahn and A. D. Gaines, editors. D. Reidel Publishing Co., Dordrecht, Netherlands. 247–267. Berrien, R. 1987. What future for primary care private practice? *N. Engl. J. Med.* 316:334–337).

29. The marketing value of peer reviews was evident in Congress' willingness to exempt physicians from litigation if they exposed malpractice by colleagues, provided that they accepted peer review of their own practices (Health Care Quality Improvement Act of 1986 [PL 99-660]).

Clinical investigators admittedly had a difficult challenge in that their marginal value required more than a superficial explanation to be understood. In marketing more vigorously, however, clinical investigators need perhaps not to have underestimated the intelligence of the public. Persons with the ability to follow a complex play from scrimmage or the convoluted plot of a soap opera might have been given the benefit of the doubt in being expected to comprehend the inadequacies of halfway technology, the exploitation, for example, by nutrition entrepreneurs, of merely suggestive research results, and the importance of peer review and first-hand experience in research as qualifications for leadership in medicine.

30. e.g., Zibrak, J. D., P. Rossetti, and E. Wood. 1986. Effect of reductions of respiratory therapy on patient outcome. *N. Engl. J. Med.* 315:292–295. By failing to heed the warning that insurers would establish their own, uninformed, and shortsighted principles for reimbursement of patient care (Wittes, R. E. 1987. Paying for patient care in treatment research—who is responsible? *Cancer Treat. Rep.* 71:107–111), clinical investigators lost the opportunity to obtain funding for patient care research and the insurers (and the public) ended up paying more in the long run, initially for marginally effective “proven” therapies and later for whatever could be marketed to the public.

31. The impact of faculty entrepreneurial activities in biotechnology on the university is discussed in Grobstein, C. 1985. Biotechnology and open university science. *Science, Technology & Human Values.* 10:55–63. Kenney, M. C. *op cit.* Davis, B. D. 1986. *Storm over Biology*. Prometheus Books, Buffalo, NY. 316–324.

32. Patenting by universities was not without problems which in-

cluded expense, effects of the university's public image, and ethical issues (Weiner, C. Patenting and academic research: historical case studies. 1987. *Science, Technology & Human Values.* 12:50–62). Some costs of patenting could have been defrayed in part by an overhead tax levied on industries involved with university scholars. Industry, especially the highly profitable drug industry (Standard & Poor's Corp. 1983. Industry surveys, health care: current analysis. 151:H1–H5), contributed only a tiny fraction of its revenues to unrestricted university funds and had license to exploit specific lucrative aspects of the university for its own ends (Kenney, M. C. *op cit.* p. 37). Investigators were shortsighted when for a consulting fee they went directly to business and thereby forwent royalty benefits, either for themselves or for their university (although arguably some benefited from stock options). Trade secret protection, which would have been less expensive and time consuming than widespread patenting, was at odds with researchers' penchant for publication, since the law required that secrets be kept truly secret in order to be protected (Reece, L. H. 1986. Trade secret misappropriation: a review and analysis of Massachusetts law. *Mass. Law Rev.* 71:171–188). Industrial science never published as much as university science, and with biology becoming more industrial, the pressure to preserve open publication diminished. It is also conceivable that the law might have accommodated publication priority without patents as a right to commercial control in order to balance society's desire for open science with the scientists' need for self sustenance through industrial applications. By the 1980s the university was so deep in commercial ventures that concerns about public image that were important in earlier years were no longer very relevant.

The call for more regulation of entrepreneurialism in the university is not inconsistent with the advocacy of better income for investigators earlier in this chapter. It would have been hard at the time to conceive of biomedicine ever closely resembling capitalist commerce, driven by wealth and in which success was almost entirely gauged by acquisition of wealth. Whereas relative poverty might have pushed recruits out of clinical investigation, it is not certain that a lack of personal entrepreneurial opportunities would have also had that effect.

33. The power of a popular uprising is exemplified by the incident in which a prominent newspaper columnist, Ann Landers, promoted a letter-writing campaign in 1971 that resuscitated the National Cancer Act then floundering in Congress (Rettig, R. A. 1977. *Cancer Crusade. The Story of the National Cancer Act of 1971*. Princeton University Press, Princeton. 175–176).

34. Cushing, H. 1925. *The Life of Sir William Osler*. The Clarendon Press, Oxford. 1:345.