cation that stereopsis operates on a primitive level where Gestalt considerations do not enter.

That some of the more complex Gestalt factors—such as goodness of form, symmetry, and closure—are not a prerequisite for stereopsis does not mean that some more basic factors, particularly proximity and similarity can be omitted. Their importance in perception was first stressed by Gestalt psychologists, especially by Koffka and Wertheimer. Similarly, throughout this article I stress the notion of connectivity, into clusters, of adjacent dots of similar brightness. But there is a difference between my approach and that of the Gestalt psychologists. They developed these powerful notions to show that perception of form was a more involved process than had been previously believed, while I am using these same notions, restricted to random-dot patterns, to show that certain processes in stereopsis (and in visual discrimination of texture) are simpler than had been expected and amenable to rigorous analysis.

12. H. W. Dove, *Ber. Preuss. Akad. Wiss.* **1841**, 251 (1841); *Ann. Physik.* **110**, 494 (1860).
13. N. M. S. Langlands, *Trans. Opt. Soc. London* **28**, 45 (1926).
14. L. von Karpinska, *Z. Psychol. Physiol. Sinnesorg.* **57**, 1 (1910).
15. B. Julesz, *J. Opt. Soc. Am.* **53**, 994 (1963).
16. ———, *ibid.* **54**, 576 (1964).
17. These findings were for a picture size of 6 degrees of arc (image size, 100 × 100 picture elements; size of center squares 48 × 48 picture elements); disparity, 7 minutes of arc; stimulus brightness, 5 footlamberts (55 lumens/m^2).
18. P. M. Pritchard, *Quart. J. Exptl. Psychol.* **10**, 77 (1958).
19. The ambiguous stereo pairs, when presented by themselves for a brief period, were usually perceived in only one way. When a slight (10 percent) bias was introduced (to counteract the subject's natural bias), it proved to be excessive and reversed the perceived depth. If the preferred depth level were the first level given attention and the other depth levels were searched sequentially only afterward, then a 90-percent match at the preferred depth level would be more than adequate for stopping the search. That, instead, the 100-percent match is perceived at the unpreferred depth level is strong evidence for the parallel process. Recently Dodwell and Engel came to the same conclusion, utilizing Efron's technique of presenting alternate stereo images with various time delays [see P. C. Dodwell and G. R. Engel, *Nature* **198**, 39 (1963); R. Efron, *Brit. J. Ophthalmol.* **41**, 709 (1963)]
20. Recent neurophysiological findings revealed binocular neural units in the striate cortex of the cat. These units were activated by simultaneous stimulation of corresponding regions in the left and right retinas. Both summation and antagonism between receptor fields of the two eyes were demonstrated [see D. H. Hubel and T. N. Wiesel, *J. Physiol.* **160**, 106 (1962)].
21. H. von Helmholtz, *Physiological Optics*, J. P. C. Southall, Ed. (Dover, New York, rev. ed., 1962), vol. 3, p. 512 and plate IV.
22. For details on this region of patent stereopsis and on the problem of the horopter, see K. N. Ogle, in *The Eye*, H. Davson, Ed. (Academic Press, New York, 1962), vol. 4.
23. B. Julesz, "Special Issue on Sensory Information Processing," *IRE PGIT* [Professional Group on Information Theory] *Publ. IT-8* (1962), p. 84.
24. ———, in *Proceedings IFIP* [International Federation of Information Processing] *Congress 1862*, M. Popklewell, Ed. (North-Holland, Amsterdam, 1963), p. 439. This computer program takes the point-by-point differences between the left and right fields with all possible shifts prior to subtraction. This produces an ordered set of "analog depth planes" in which adjacent points of minimum value are connected into clusters. The search for these clusters of points with the same disparity immediately gives the cross sections (contour lines) of objects in a natural way.
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Problems of Drug Development

The government, the drug industry, the universities, and the medical profession: partners or enemies?

Louis Lasagna

The past few years have been marked by acrimonious discussions about the problems of drug development. While some would like to believe that Congressional hearings such as those of the Blatnik and Kefauver committees stirred up previously calm waters, it is clear that the storm winds had been gathering force for a considerable period of time and that the explosive passion evident in the reaction to these events was not engendered *de novo*. That problems exist is clear; what is less evident is the willingness of the interested parties to define these problems with clarity and to solve them.

I should like to analyze the interactions of physicians, the medical schools, government, and business first by listing some *sources* of discontent, since an attack on primary causes seems preferable to a preoccupation with secondary manifestations. Then I shall suggest some approaches which might ameliorate the present state of affairs, in the optimistic belief that progress is possible and that Heraclitus was right. ("Everything comes about by way of strife and necessity.")

There are almost daily complaints about some aspect of drug usage in our society. The academicians are constantly berating industry for its motivations and promotional excesses. When not so engaged, they are lambasting Congress for inadequate support of clinical pharmacology or for adding to the headaches of researchers by passing "patient consent" laws. The personnel of the Food and Drug Administration (FDA) are rarely allowed to rest quietly in their foxholes: on one day they are bombed for pusillanimity, on the next for high-handedness. (If a specific issue is lacking, it is considered good form to brand them as generally inept.)

The drug industry, in its turn, is bitter about the unreasonableness and extravagance of the professional attacks. The pharmaceutical folk are understandably annoyed when their substantial scientific contributions are ignored, or when they are asked for funds to support research or scientific societies by the same academicians who have berated them. Government is constantly a threat to the industry, the nature of the danger ranging from possible patent restrictions to "arbitrariness" or "ignorance" on the part of specific FDA staffers determined to prevent a drug's being marketed or to snatch a profitable pharmaceutical off the market.

The government, for its part, must

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be confused by scientists who won't "stand still" ideologically. Just when a senator or representative thinks he has done a creditable job in following up on the suggestion of some distinguished scientists, they turn on him for going too far. The FDA is perpetually spending time justifying to the press, Congress, the drug industry, or the medical profession some action it took 2 years ago, or didn't take last week.

Rapport Lacking

There is, then, no paucity of strong sentiment about the handling of drug matters. What is lacking is rapport between the various forces responsible for the health of the public. The protagonists seem to function like those figures on monumental European clockworks: each one appears briefly at the sound of bells or chimes, exposes one side temporarily to the public, and then disappears from view, separated for eternity from the other figures of the clock. There is much soliloquy, but little dialogue.

The search for new drugs has been criticized as a sort of blind man's buff, a groping for precious jewels hidden in a vast desert. And so it is, in part. The science of pharmacology is not sufficiently precise or profound to permit the rational design of wondrous new agents. Pharmaceutical research has of necessity, therefore, to spend a good part of its effort in "screening" and in testing chemicals related to older drugs found—usually by luck—to be effective. This kind of search, which includes testing of soils for antibiotics, scouring the world for effective folk remedies, and synthesizing congeners, is not without rationale, and occasionally it yields a fine new product. It is nonetheless expensive and inefficient. Usually, for example, the testing of congeners fails to provide a dramatic breakthrough, and the result is a "me-too" drug which it is hard to justify putting into man at all, let alone on the market.

From the drug house's viewpoint, on the other hand, it may be simply a matter of capitalizing on someone else's serendipity so as to assure a satisfactory sales volume and thus satisfy stockholders and support the entire organization, including the research staff. As one drug house physician put it to me: "With our firm's fine reputation and large detail force, we can put out a thiazide diuretic that is no better or worse than any of those already available from other firms and capture 15 percent of a huge market. Why shouldn't we?" In such a situation there may be a serious conflict between good business decisions and the needs of the physician and his patient. (It is true, to be sure, that a "me-too" drug may still turn out to be uniquely useful for *some* patients, and the existence of competing products may occasionally have a salubrious effect on drug prices. Such a matter is rarely black-and-white.)

There is another aspect of new drug development which gives rise to conflicts: the pressure of time. Time is a precious commodity for us all, and it is especially precious in a market characterized by rapid obsolescence and fierce competition. If a drug house is working in a field known to be tilled by other firms, there will of necessity be pressures to market at the earliest opportunity. There are considerable market advantages in being the "first firm in the territory," and even if there is no worry about the emergence of similar drugs from other firms, someone else may be working on a completely different kind of drug which may soon toll the commercial death knell for the earlier product.

This is not to say that the result is invariably inadequate documentation, or excessive and premature claims for safety and efficacy, but it would be unrealistic not to admit that pressures are exerted in these directions by the ticking of the clock.

A paradox also emerges from the very pace of industrial activity. I believe that the drug industry generates certain anxieties in physicians in direct proportion to the rate at which it introduces new drugs on the market. Such anxieties do not require that these drugs be worthless or "me-too" products; indeed I suspect that the greatest unrest would derive from the marketing of large numbers of unique and excellent drugs!

Let me explain. The incorporation of new drugs, like new tests or new surgical treatments, into one's medical bag of tricks creates serious trouble for today's busy practitioner. The doctor's life was simplest when he needed only to concern himself with a small number of proven remedies. Such slogans as "It isn't the anesthetic that's important; it's the man who uses it" and "Learn to use one digitalis preparation well, rather than many poorly" are in part sound principle, but in part also a reflection of the turmoil created by the need to master a large pharmacopeia. It is on such anxieties and frustrations that the success of *Consumer Reports*-type periodicals like *The Medical Letter* and how-to-do-it books like *Drugs of Choice* or *Current Therapy* is built. No doctor is capable of expert judgment on all drugs, and he must increasingly seek quick, authoritative, "unbiased" advice regarding new agents. Such expert and reliable advice is obviously desirable, provided the physician does not accept ex cathedra statements as Eternal and Infallible Truth.

The productivity of the drug industry also compounds the difficulties in another area. There are thousands of chemists and pharmacologists and technicians busily at work trying to come up with new drugs. The budgets supporting such research are astronomical. The success of these research programs demands the elaboration of a certain number of useful products. To put even a small number of drugs on the market requires that a much larger number be evaluated in man. Unfortunately, but a handful of investigators in the country are trained to evaluate drugs in man, and the number of industrial products requiring accurate and careful study is extremely large.

If the supply of first-rate investigators is short in general, it becomes shorter with respect to drugs that do not look intellectually exciting. As a result the help of second-rate investigators (who may be first-rate physicians) is solicited. The resultant level of drug investigation is thus suboptimal and serves to promote erroneous decisions in regard to marketing, and to accumulate poor data, inadequate to support advertising claims for new drugs.

Whereas drug advertising is better than it was, some of it continues to be lacking in taste, intelligence, or truth. The inadequacies in clinical pharmacology already mentioned and the frenetic pace of industrial activity contribute to the problems. The marketing of drugs that are not world-beaters or that are "me-too" products automatically makes for trouble, since the existence of such drugs presents the advertising man with the necessity to choose between distortion and not selling. No one can sell a chemical by saying "Peppo is not really very good for depression and fatigue, but

it's pretty safe" or "Salo is not much better or worse than any of the eight other related diuretics that you've been using for years."

When the decision is made to market a drug, there can be no wishy-washy approach to its promotion. Either the firm believes in the drug's potential, or it will not try to sell it. But when a drug is first put on sale—no matter what the amount of experience to date has been—there will be uncertainties about its true capacity for good and harm. It takes years for a drug to settle into its proper niche (and some never do). A common pattern of evolution is for therapeutic and safety claims to be tempered with the passage of time. If a new drug turns out to be a superb agent, then everyone is better off if the advertising campaign is wildly successful. If the new drug turns out to be a dud, or unpredictably toxic, the public is best served if the ads miss the mark.

While a drug firm does not wish to make profits at the price of harming people, it is not unreasonable to believe that a firm would not feel badly about sales of a drug to patients who didn't need the drug at all or who didn't respond as well to the drug as they might have to some other agent. Most drug ads do not really qualify as "educational," but as "persuaders." There is thus a certain conflict between the goals of advertising and the goals of the physician and his patient, and no amount of wishful thinking can alter this fact.

Obviously drug houses must make money. No one but a fool would want them out of business. Yet many drugs do seem expensive to many people, and there is no evidence in the yearly earnings reports of individual firms that the industry is perched on the brink of financial disaster. It is furthermore difficult to convince the consumer that he should use trade brands rather than generic products if considerable savings can be had by using generic products of apparently equal quality.

The problem is not a simple one. The small house that capitalizes on other people's discoveries is, in a sense, parasitic. A society with nothing but such firms would be in a sad fix. Patents have been infringed upon in other countries, and manufacturing secrets are occasionally stolen. The aims of these small houses are less humanitarian than profit-minded. (A British firm which has made a killing by selling cut-rate antibiotics has now put out, in a Kafkaesque move, a branded tetracycline which costs twice as much as its *own* unbranded tetracycline.)

On the other hand, much of the attack by the ethical houses on generic drugs has been below the belt. Many such drugs are perfectly satisfactory products, and not the sort of hopelessly inferior junk pictured in campaigns against them. An occasional preparation, to be sure, is sufficiently off the mark to interfere with medical care, but the same can be said of the products of large firms. It would seem important, rather, for techniques and standards to be developed which insure that no substandard drugs are sold by anyone.

The untoward effects of drugs constitute another source of discontent. Many physicians are convinced that there is too much prescribing of drugs (by *other* physicians, of course). The incidence of toxicity is probably directly related to the number of drugs a patient takes. While admitting the physician's complicity, critical academicians point the accusing finger at the firms "overpromoting" these drugs.

In addition, there is often friction between the physicians reporting new and serious side effects and the manufacturers involved. A common pattern of action is the following: A drug has been on the market for some time, apparently doing its job well with a minimum of trouble. Suddenly, the drug is alleged to cause serious toxicity or even death. The cases are reported. The firm examines the cases critically and points out that it is less than certain that the agent in question was the only cause. As the reports accumulate, there is a clear-cut difference of opinion: several responsible clinicians become convinced that mischief from the drug is occurring with some frequency; the firm is convinced that most or all of the reported cases can be explained away. Retrospective analyses by the firm are begun, and they often "show" that the drug not only doesn't *cause* cataracts, jaundice, or strokes, but actually *prevents* these troubles, since there are fewer *reported* instances of trouble in patients taking the drug, than are shown in the public health figures available for the general population. Eventually, however, it is demonstrated that the toxicity is produceable at will in animals, or that it occurs conclusively in man, and the drug is taken off the market.

The FDA staff, meanwhile, can't win in such a situation. If they don't whisk the drug off the market at the first report, they are considered slothful, or gutless, by some doctors. If they do, they are accused of bureaucratic, impetuous, and dictatorial action by the manufacturers. If they take the drug off the market after due deliberation, they may be attacked by both the manufacturer and some physicians who have gotten to like the drug.

FDA Tightrope

It is too little appreciated that the FDA has a fantastically difficult tightrope to walk, and that public health decisions can't be made separately for this physician or that, this patient or that, but that (as FDA Commissioner Larrick has pointed out) "the government must make a judgment as to the hazards likely to be encountered when the drug is employed by physicians of varying skills . . . in patients with a multitude of disease processes, . . . and in patients incorrectly diagnosed or inadequately tested. . . ." Lord Lytton stated it well a century ago: "We cannot apply to courses of political action . . . methods . . . applicable to . . . research; the object . . . [is] to bring about good of a particular multitude of human beings whose condition is extremely composite and whose interests are rarely identical."

The very existence of the FDA is a thorny irritant to some. An agency which can delay or block the marketing of a drug, cause warnings to be put on labels or to be sent out to doctors, or remove a profitable and useful drug from the market, will of necessity be resented by the drug industry and, on occasions, by members of the medical profession. The policeman is welcome when you're being attacked or robbed, but not when he's giving you a speeding ticket.

In addition, the FDA has made enemies in the past by the ineptitude of some of its procedures: by long delays in answering the simplest of queries, by peremptorily demanding voluminous data from firms within a short period of time and then postponing action on such data for many months, by assigning untalented and inexperienced scientists or physicians to discuss matters with drug house experts who felt "insulted" at the quality of their interrogators and their questions.

At times the lack of insight into the attitudes of investigators has been

amazing. One highly placed FDA staff member once stated: "It is difficult to understand why any conscientious and experienced clinical investigator would object to supplying detailed reports of his work." Such a statement is explainable only by the numbing tolerance to paperwork that is developed by those whose every working day is occupied with the weary filing of forms in quadruplicate.

Some of the discomfort and pained surprise experienced by industry, government, and segments of the medical profession arises from a fundamental lack of appreciation of the guiding principles of the academic scientist. One hears complaints from the drug industry, for example, about "lack of moderation," "ingratitude," "faulty perspective," and "partiality." (As to the latter, one might recall Charles P. Curtis's remark that "impartiality is nothing more than a vacancy of mind. In its purest state, it is either ignorance or idiocy.")

It might help if the industry remembered that a university scientist can get highly incensed over one bad ad, no matter how many other, unobjectionable ads he encounters and accepts as a matter of course. He can take a drug house grant or fellowship with one hand, while the other hand is busily clubbing the drug house about a shoddy product. He is concerned with what he considers principle and with the eradication of what he perceives to be error. He often looks upon himself as the keeper of the flame. It is unwise to expect him to be a compromiser or a diplomat, as his colleagues, dean, or university president know all too well.

The academician, then, is likely to be a scientific boat-rocker. It is desperately important that these qualities be nurtured. As Bronowski has put it, "No society is strong which does not acknowledge the protesting man." Or, if you prefer an economist: "Always, therefore, if we are to retain an internal social vitality there must be men and women who are prepared to express their discontent, vent their feelings, and exercise their moral responsibilities in whatever way they consider best. The health of our society can be assessed by the tolerance that is accorded to such people" (V. L. Allen).

The recent struggle over the banning of some antibiotic mixtures is a case in point. An extraordinarily distinguished and experienced panel of scientists recommended to the FDA that oral "cold remedies" which combined antibiotics with analgesics, antihistamines, decongestants, and caffeine be removed from the market.

The uproar that followed was intense, but predictable. The drug industry resented the move because it would have eliminated a lucrative market. Many physicians objected because they thought the mixtures useful.

Most academic scientists, on the other hand, regard the preparations as irrational and of little value. Furthermore, it is almost certain that the "experts" do not subscribe to the AMA's democratic notion that "only the medical profession, after widespread usage, can determine the true effectiveness of a drug." Scientific truth is not arrived at by majority vote. There is too much evidence that the medical profession, like the rest of us, can be misled by "practical experience" to encourage the testing of truth by referendum. Our "experience" tells us that the earth is flat, and that we are not spinning around in space, but neither of these happens to be true.

Some Discontents

It would seem highly desirable to define our discontents and to discuss them. What is the nature and extent of academic dissatisfaction with industry and government, and *vice versa*? What are the problems of the physician in regard to drugs? Are these problems different for the profession at large than for the 27,000 subscribers to *The Medical Letter*? (There is little doubt in my own mind that these subscribers are highly atypical). What are the sources of discontent within the drug houses themselves? What attracts some scientists to industry and discourages others? Why do pharmaceutical employees move from firm to firm or leave industry altogether? (One medical department left almost *in toto* recently when a new administrator arrived who told his staff that they should "encourage positive reports" from investigators). What special insights into the problems of industry can be gained from scientists who serve as consultants to drug firms? What faults do the employees of one firm see in other firms? What advantages over their own?

What would a dispassionate analysis tell us today of the impact of the Kefauver–Harris legislation of 1962? Have drug prices been altered? Is the small drug house better or worse off than before? Are drug ads better? Has quality control improved? Are patients better protected? Is the investigator better off, or worse? Is the FDA meeting its new responsibilities?

Many of these problems are of fundamental importance. To discuss them intelligently, however, we need facts and not opinions. Some group that is beyond criticism—perhaps the National Academy of Sciences—would earn the gratitude of all reasonable men by supplying the public with reliable information. Such data will not come from the narrow approach of any individual academic, the Pharmaceutical Manufacturer's Association, the AMA, or the FDA. The utterances of these persons or groups are too often loaded with self interest to provide proper perspective. In addition, their pronouncements are often either issued for purposes of attack or in defense against someone else's attack on them.

In addition to the collection of data, there must be freer communication. We need more frank discussion between people in industry, government, and universities, and less solipsistic grumbling and intratribal character assassination. I am certain that many of our problems have arisen from ignorance of the other man's problems and point of view.

The quality of pharmaceutical research should be improved. This suggestion is made less in criticism of the drug industry than of non-industrial scientists. Improvement requires the collaboration of both groups. To begin with, more academicians should rid themselves of the notion that they cannot contribute to the development of new drugs. The history of therapeutic advances is in good measure a tribute to non-industrial efforts. An anaylsis of new drugs in 1963 by a pharmaceutical consultant indicated that 43 percent of significant new medicines came from non-profit organizations. (Foreign researchers working outside of industry outproduced their American counterparts by better than 2 to 1.)

The great value of such collaboration comes from the fact that these two kinds of talents complement each other so well. There are resources in the non-industrial world not available to industry, and *vice versa*. Why not pool talents more often?

A second important development would be closer collaboration between the laboratory worker and the clinical

investigator, and also between governmental "policemen" on the one hand and industry and the universities on the other. Rarely do the laboratory people responsible for suggesting a new drug for clinical trial actually see the problems involved in its evaluation. Rarely does an FDA official see the "bench" experience of either the industrial scientist or university researcher. The reverse of these statements is equally true.

A third approach that could improve drug development is a cooperative attempt to sharpen the requirements for the study of new drugs. Ideally, no drug should ever be offered to an investigator for study until its sponsor has justified its trial by explaining why the drug is expected to have the clinical effects it claims, and why such a drug would be wanted if it turned out to have these effects. What unmet need would it fulfill? In what way might the drug fill a gap in the doctor's drug arsenal? If sponsors of new drugs faced up to these problems and investigators adhered to the principles implied, there would be a minimum of "me-too-ism" and unjustifiable patient risk.

Clinical Pharmacology Improved

Clinical pharmacology can be dramatically improved by the expenditure of a relatively small amount of money. Although a few individual far-sighted firms have generously supported, on a no-strings-attached basis, the formation of clinical pharmacology divisions in specific schools or hospitals, the volume of such support has been pitifully small. The National Institutes of Health (NIH) have supported a few training programs in this area. The Pharmaceutical Manufacturers Association (PMA) at one time granted a few fellowships in clinical pharmacology. But the total effort is far from adequate.

Nor is the problem entirely one of financing. The favorable atmosphere needed for the development of programs in clinical pharmacology and clinical toxicology does not exist in the majority of medical centers. Professors of pharmacology and of clinical departments have not all seen the light. In many instances there is ignorance of what such a unit can contribute. Even today, when the creation of committees for passing on new drug research in the clinic is encouraged by the new FDA regulations, and when local committees for reporting toxicity may soon be required for hospital accreditation, there is still apathy in many quarters.

There is needed, therefore, an appreciation of this new discipline. If private sources cannot support in full the operations of clinical pharmacology units—and I for one am pessimistic about such support—federal funds will be required. If the medical schools and university hospitals do not come to the NIH for support, the NIH should seek to encourage applications in the field. The seeds must be planted now. Each medical school should have a clinical pharmacology group by 1970. Without a more formal concern for research on, and teaching of, therapeutic and toxic effects of drugs, medical education will suffer. In turn, the sick suffer and are deprived of the medical care which they deserve.

Congress has demonstrated in the past its wisdom in stimulating scientists to move in desired directions. Earmarking funds for scientific support has its dangers, but there are times when the greater danger is to leave the ennui of universities and scientists undisturbed. I believe that if the problems are properly appreciated by both Congress and the schools there will be no problem in agreeing on methods.

Funds are needed to start departments or divisions of clinical pharmacology, to support a nucleus of permanent or semipermanent physicians and pharmacologists in such groups, to pay for the salaries of a technical staff, and to defray research costs. Because of the unique quality of such units and the manpower shortage in the field, a certain amount of money will have to be awarded on the basis of future potential rather than demonstrated performance. Applications that are sketchy and vague may have to be approved in order to launch programs. Young clinical pharmacologists moving to new institutions will need support despite less than ideal circumstances. In short, gambles will need to be taken.

For some years now the FDA has been under recurrent scrutiny. Some recommendations of past investigating committees have been heeded in the Drug Industry Act of 1962. Other suggestions have not been followed. It is difficult to know how to proceed now. The Bureau of Medicine has a new director, and his comments to date have been reassuring. Perhaps he should be given time to set his shop in order without sniping from critics. After a reasonable period of time, it would be helpful if a new non-HEW committee were to inquire from the director and his staff what their needs were, and what further reorganization is required. To outsiders, there still seems a lack of close liaison within the FDA. It is still thought by some that there is not adequate collaboration between the FDA pharmacologists and its medical people, for example.

In the meantime, it is to be hoped that the FDA will call increasingly on the academic community for help, for sharing in decisions and in responsibility. There is a large untapped reservoir of friendly academic talent. For example, I suspect that in regard to problems of drug advertising and toxicity reporting, the FDA would find strong allies in the medical school faculties.

Most academicians with whom I speak believe firmly in the principle espoused by the government that indications and contraindications for a drug should be presented in fair balance in advertising, and our medical students agree. In regard to the reporting of drug toxicity, most of my colleagues would back the request that "*any* deaths associated with the use of a drug, whether or not it is attributable to the drug," be reported to the FDA. Many of us have had experiences which suggest that it is unwise to require the reporting only of cases where the firm involved considers that "there was adequate reason to believe that use of the drug may have contributed to the cause of death." I have no objection to an opinion to this effect from the firm, but reported deaths should not be buried in a firm's files because someone there doesn't agree with the suggestion by a physician that the drug *may* have been implicated.

Another example of talent which could be used by the FDA resides in the pharmacy departments of drug houses and in schools of pharmacy. There is now a growing body of knowledge indicating that too little attention has been paid in the past to the physicochemical aspects of pharmaceutical formulation. Obviously old-fashioned ideas about "disintegration-time" are no longer adequate, and USP and FDA specifications for drugs may re-

quire considerable revision. In this, as in other matters, there is much to be gained in the long run by all of us if the FDA operates at the highest possible level of intellectual and technical competence.

The PMA would do the drug industry a great service if it could diminish the number of objectionable ads run by its member firms. Much valuable information along these lines is already available, if member firms were willing to share at least a fraction of their hard-earned knowledge with each other. At the very least, it would help if continuing attempts were made to scrutinize drug ads to find those that irritate the physician-consumer. It would be educational to have these criticized ads made available to all firms, plus rebuttal commentaries by the ad men responsible. In the other direction, why not give awards for *excellence* in drug ads? It is done already for other kinds of advertising—why not for medical ads?

It should also be remembered that one firm's or agency's objectionable ads are likely to reflect—unfairly—on all firms and agencies.

It is tragic that education in pharmacology is declining at a time when it is most needed. In an era of therapeutic explosiveness, one finds medical schools wondering whether pharmacology should exist as a separate discipline. The formal teaching of therapeutics to students is either considered an impossibility or explained away by the statement that "it is taken care of by each individual clinical department." The education of physicians in practice is left pretty much to the drug houses, the medical journals (including *The Medical Letter*), and a few medical meetings each year. How many medical schools are doing a good job of keeping the doctors in their communities up-to-date on drug therapy?

We must face the fact that the practice of medicine is getting more, not less, difficult because of the many powerful drugs put into our hands. There is an urgency to the situation which is not being heeded. Meanwhile the ill suffer daily from errors of omission and commission.

Our society's handling of the problems created by the pharmacological revolution of the last quarter century leaves much to be desired. Equitable solutions are not likely to be evolved without the full cooperation of the medical profession, the medical schools, the drug industry, and the government.