able but also of the need for social stimulation. These joint undertakings do not always work, for attempted cooperation inevitably provides the opportunity for dissent; yet many of them work very well indeed. There are also the in-groups whose members succeed in common enterprise through correspondence, without being in the same place or able to become joint authors. These persons write papers, largely to one another, and they may develop so neologisitic a form of communication that outsiders cannot easily understand them or are unwilling to make the effort. So it is that the strengthening of communication within the in-group sets up barriers against outsiders, limiting the range of communication.

When the in-group begins corresponding by mimeograph, the desire for a wider social response seems to become almost irresistible. The author writes his paper and then mimeographs or dittoes or Xeroxes 100 copies and strews them abroad, sometimes just as they left the machine, sometimes with a general wistful request for comment or criticism, sometimes even with a "Dear-Dr.-Jones-Sincerely-yours" letter attached. It is hard for the older recipient, who has survived from the age of gracious epistolary manners, to know what to do with such a letter, personal and yet become standard operating procedure. He has been reduced to a statistic, and is no longer a person, for the author hoped for five replies out of 100, and the 95 were never expected to respond graciously to the implied R.S.V.P. Still, the method works. It provides casual communication, leaving journal publication for more carefully developed contributions. After all, this is also the method of ungracious nature, which scatters thousands of seeds for every one that eventually brings forth fruit.

There are some who see the present scene in American science as consisting of an enormous number of little in-groups, cooperators, and joint authors, each concentrating on some special enterprise, persistently "learning more and more about less and less," each group with its code of neologisms and laboratory slang—successful fanatics perceiving the larger world of their science somewhat dimly. Is this bad? It is the modern social version of the motivational predicament in science where egoism works against objectivity. The answer to the problem raised is surely that both these opposing tendencies need to be reinforced. Science as a whole requires cybernetic guidance. The fanatics of the in-groups get good work done. It has always been true that enthusiasm is the friend of action, even though it be also the enemy of wisdom. The dedicated individual, or the group small enough to feel its own selfhood, knows how eventually to penetrate the scientific frontier. Nevertheless, the effort toward generalization must go on at the same time if science is to continue to progress. Research must be published. The papers must be brought together and summarized—in annual reviews, then in books, after that in encyclopedias and handbooks—until the broadest principles are absorbed into the body of science and dealt out to sophomores in the textbooks. Depth and breadth are both worthy goals and in general are to be striven for by a division of labor among persons or through varied activity on the part of the same person. After a decade of intensive research, the fanatic stops to write his book. The incompatibility between the two activities is, at worst, only motivational. The complacent critic who merely views the scene had better do his wishing by hoping for both—for the social stimulus of the myopic in-group and the broader, more objective perspective that goes with erudition. Some scientists seem to manage to cultivate both of these conflicting values—alternately, more or less. In any case there is always posterity just around the corner, waiting to correct myopia.

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Intellectual Excitement: The "New" versus the "Classical"

One extremely important point is constantly overlooked or simply not emphasized in discussions of the "new" versus the "classical" in science, perhaps especially in biology [see E. Mayr, *Science* **141**, 765 (1963)]. This is the responsibility of proponents of classical fields to revivify their own fields so that the classical now burns with a competitively bright light in attracting newcomers and funds.

Before going further I would state my agreement with most criticisms of the "bandwagon tendency in American science." There are fads today in science. There are "Young Turks" whose arrogant enjoyment of their own field is matched only by their uncomplicated ignorance of other fields. There are fund directors who are overly zealous in associating the resources they control with "glamor fields."

But let us realize that glamor fields do not arise *de nove*; somewhere, imaginative hard work broke through. And Young Turks and fads typically gain their inspiration and enthusiasm from a genuinely exciting body of creative work. We cannot turn our backs on the advances which generate bandwagons; we cannot ask them to slow down, not in the slightest. It behooves other areas to catch up.

This returns us to the main point, the responsibilities of those who rightfully insist on the continuing significance of the classical fields. It is true that catching up—if that is the right phrase—will be tough in the face of rampant bandwagons tending to siphon off personnel and monies in their own support. But catching up is not impossible and is probably no more difficult than the initial efforts of those who labored to create the new field in the first place. In any case it is certain that simply "more financial and moral support for the classical areas" is not the answer. These two ingredients are important. However, the most important ingredient is intellectual excitement. This will not reappear in the classical areas through the use of intellectual feather dusters which simply reshift accumulated dust but which do not touch the form or content of underlying ideas. Perhaps intellectual sledgehammers are more the tool of choice to refurbish, remold, and rejuvenate hardened outlooks. Population genetics was the sledgehammer that remade taxonomy into the new systematics, as Mayr—a major architect in the remaking—well points out. Money and sympathy will not of themselves revivify invertebrate zoology (the specific example cited by Mayr as an understaffed field). The first necessity, as seen by one whose special interests are in the lower metazoans, is for invertebrate zoologists themselves to retool intellectually, if this should be necessary, and to rethink and recast their own field—to create their own breakthrough.

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