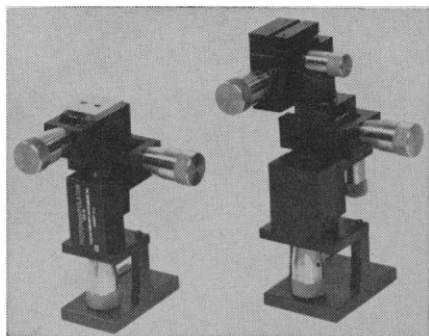
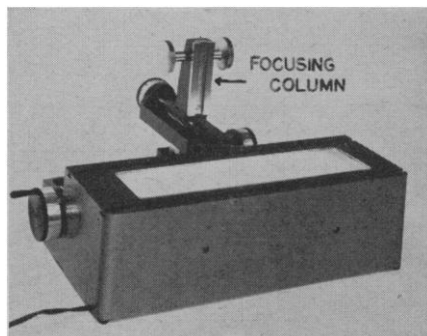


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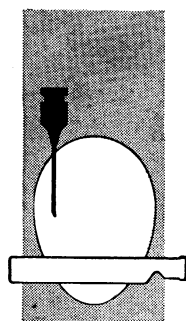
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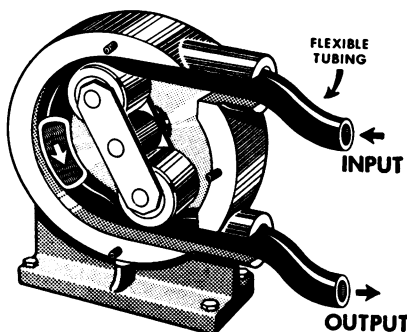
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sentence from Seaborg is: "Today, about 12 percent of the federal funds for research and development are used to support basic research fields." The statement from the later issue is: "large-scale action programs have seldom been accompanied or preceded by pilot studies which evaluated the several alternative actions that appeared equally attractive."

In the physical sciences and in engineering, Seaborg notes, Americans spend some \$8 in the "theory-to-practice sequence" for each \$1 spent on theory, in contrast to the disregard of this aspect of effort in the behavioral sciences, as noted in the third sentence quoted. No, or few, test facilities or proving grounds in the behavioral sciences can be cited as counterparts of the tens or even hundreds supported in the physical and engineering sciences. Who is to say that if a comparable effort were made, comparable results would not be achieved?

It is a commonly accepted view that the behavioral sciences are not as far advanced as the natural sciences. The conclusion is sometimes drawn that this is the sole or a major cause of the less firm understanding, in practice, of behavioral than of physical phenomena. The "mathematical model" of this argument might run as follows: given curves f and g , where a point A of f is not on g and a point B of g is not on f , then f and g can have no point in common.

It should be clear that neither the conclusion nor the line of argument is espoused in any of the articles cited. Indeed, it appears that they justify, rather, the conclusion that in the "theory-to-practice sequence," as elsewhere, "you get what you pay for."

CLIFFORD J. MALONEY

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Frederick, Maryland

Genesis of Cancer

Despite its title, "Heritage of acquired characters," the recent article by Frank L. Horsfall, Jr. [*Science* 136, 472 (1962)], is devoted largely to the relationship between viruses and cancer. I have no professional concern with that subject and no fault to find with factual aspects of the article. The title, the introduction, and some further remarks have, however, misleading implications for a field with which I am concerned—evolutionary theory.

The author states that, "the theme does not carry the implication of refutation or support of any theory of inheritance, certainly not of Lamarckian concepts . . ." but he belies this by adding that if knowledge of the genesis of cancer should not correspond "with Mendelian and Darwinian teachings . . . it may be well to reassess our views." The disclaimer of concern with theories of inheritance further rings false because the whole article is based on the theory of inheritance by DNA coding. The title of the article and the mention of Lamarck and Darwin certainly suggest pertinence to the old controversy as to whether the evolutionary adaptation of organisms is caused by the inheritance of acquired characters or by natural selection. Later, Horsfall argues that the result of introducing foreign DNA into a cell is an acquired character and that, "The evidence that it is in fact heritable appears conclusive." Regardless of Horsfall's intended conclusions, his way of expressing them invites citation as "proof" of the Neo-Lamarckian inheritance of acquired characters.

The apparently conclusive evidence to which Horsfall refers is that additions to the heredity of a cell may be made by the introduction of viral DNA. This is one of the most exciting recent discoveries in biology, but it has nothing whatever to do with the theory of the inheritance of acquired characters, as that expression has always hitherto been used. Put in somewhat more modern terms than usual, that theory claims that individual and purely somatic modifications, or somations, acquired within the reaction range of an inherited genetic code can alter that code (in the gametes, if the individual is sexual and multicellular) by encoding the somation itself. There is no evidence that this ever happens. The incorporation of foreign bits of precoded DNA does not constitute such evidence, and indeed has no bearing on the question. One is tempted to say that this is an example, not of the heritability of acquired characters, but of the acquisition of heritable characters. But that might still be a somewhat misleading statement.

Further, Horsfall's argument that the results of the introduction of new DNA into a cell are acquired characters would logically lead to labeling the results of fertilization of an egg by a sperm as "acquired characters." As Horsfall says in another connection "new information has been acquired too fast for new language to keep abreast of it." The

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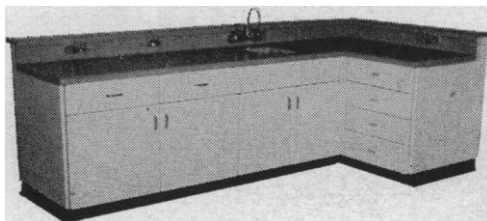
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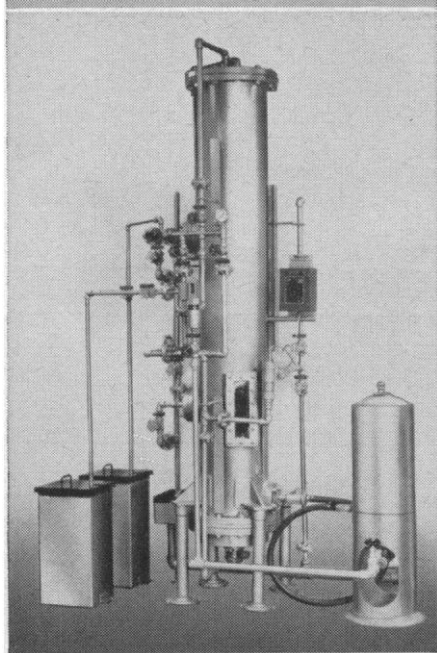
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situation is not improved by misapplication of old language, such as the term "acquired characters."

I trust that both Horsfall and his readers will take this not as a contradiction but as a clarification of his intended meaning.

GEORGE GAYLORD SIMPSON
*Museum of Comparative Zoology,
Harvard University,
Cambridge, Massachusetts*

Comprehension and Understanding

Webster's Third New International Dictionary gives two rather different definitions for the word *understanding*: "1: the act of grasping mentally . . . (a clear [understanding] of the reasons for his failure)"; and "4a: a friendly or harmonious relationship (working for better [understanding] between nations). . . ." One of the factors that confuses discussion of our relations with Russia is a tendency to mix up these two distinct meanings of the word. Melvin H. Marx's letter [*Science* 136, 190 (1962)] rather neatly illustrates this confusion. Marx states that the "fundamental disease . . . [is] the almost total ignorance of the problems and intentions of the 'other side' evident on each side." He feels it should be treated "by improving the reciprocal understanding and appreciation of strengths, as well as weaknesses, of the American and Russian societies." It is very clear that study and educative efforts will improve the understanding, in the sense of the comprehension that the two peoples have of the "other side's" system. It is not at all clear that this will lead to a friendly or harmonious relationship.

Khrushchev has said that he hopes to bury us. It is surely possible that he doesn't really mean it, but it is also possible that he does. If Khrushchev does wish to impose his system upon us, then a better understanding of that fact would surely not lead to "resolving the underlying tensions by improving the reciprocal understanding. . . ." The possibility that further comprehension of the Soviet system might lead to even more strained relations between ourselves and the Soviets, or perhaps leave the present situation unchanged, is simply ignored by Marx. The reciprocal possibility, that the Russian value system is such that their esteem for us will not increase as they know more about us, is also ignored.

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