For the convenience of readers who do not have our original article at hand, we point out that the respiratory center was not characterized as "merely" a computer, and it was not "relegated to the chore of computation." It was described as analogous to a computer; we assumed that readers would share our respect for computations done by the central nervous system. Neither was the mixed venous chemoreceptor mechanism "supposed to be located in the pulmonary artery." The glomus pulmonale (which is in the pulmonary artery) was described to show that the anatomic structure necessary for the concept exists; whether or not it is a chemoreceptor, we do not know. The equations and numbers in our article were derived by operations of arithmetic and elementary algebra, not from "extensive mathematical gymnastics." Nor were they intended to "pinpoint" the site of any action. The most extensively discussed equation (Equation 5) was used, primarily, to summarize much of our concept quantitatively—much as the second paragraph of the "Summary" does with words.

Finally, we are aware of the consequences of iconoclasm and those that often attend discussion of bits of indirect evidence which, when taken together, trend to support an unproved hypothesis. Since existing theory of respiratory regulation seems to have reached an impasse, a new approach, however challenging it may be, seemed, and continues to seem, appropriate.

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Academic Biology in Europe

William V. Consolazio's article on the "Dilemma of academic biology in Europe" [*Science* **133**, 1892 (1961)] painted a picture in the biological field which is in sharp contrast to what I had observed in Europe in the field of chemistry. I had the opportunity of working for a year in a European laboratory and was able to visit a number of university as well as industrial establishments. Most of the laboratories were conducting a vigorous program of fundamental research and on a larger

scale than is usual in the United States. The equipment was up to U.S. standards, but the working facilities, in terms of space and assistants, were superior to what is found in most laboratories in our country. I believe that our effort is greater in applied research. I concur with Consolazio in his observations concerning the organization of the Research Institutes and the stifling effect it has on the younger members.

It may be that the difference in the status of academic biology and chemistry in Europe merely reflects what people there believe is most important. Certainly we can see similar situations around us in the United States. Europe and America have a great deal to learn from each other, not only in the field of chemistry but in many other areas as well.

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I was fortunate enough to be able to spend 2 years at one of the excellent biological laboratories of the United States with the aid of a National Science Foundation fellowship. I am most grateful for that opportunity and, therefore, feel obliged to say a few words on the recent article "Dilemma of academic biology in Europe." As Consolazio says, he is able to report only first approximations in his survey of the organization and the needs of European biology, and I find that, although I agree with some of his main points, I have quite a different impression of several others, especially as far as Germany goes.

I certainly agree with Consolazio that, at least as far as German academic biology is concerned, these reforms are needed: The training of students, who are to become the biologists of the future, needs to be broadened in several fields, for example in biochemistry and genetics. The capability of the universities could be greatly improved by adding professorships and departments. Also, it would be an improvement to have the responsibilities and privileges in each department shared by several members instead of having them borne entirely by one director, as they are now. But in spite of these deficiencies, I would say, in disagreement with the author, that adherence to tradition has not been the major cause of the decline in biological science in Europe. My view is that the two world wars are by far the most important cause. They, especially World War II, interrupted both research and academic teaching, and caused the economic ruin of Europe. This, and in some countries the loss of outstanding scientists and interruption of correspondence with the outside world, had two main results: the loss of scientific offspring, and the lack of facilities for research. After the last war, if first-rate scientists had been available and if the economic situation had allowed these people to have the facilities they needed, then there would be no reason to believe that European universities would not have changed, built new laboratories, created more chairs, and so on. As economic conditions improve, I believe this will become evident for all of Europe.

Fortunately, in Germany, with the much appreciated aid of members of the Western nations, especially the United States, much of the economic stress has been overcome and a modest, but increasing, proportion of our taxes is now being spent on improving the biological laboratories of the universities. The laboratory I returned

to from my stay in the United States is exceedingly well equipped, and the library facilities also are good enough to keep anyone from intellectual starvation. In addition, my colleagues and I do not have any difficulties to complain of in supporting our families.

For a more country-wide example, the Wissenschaftsrat (committee for nation-wide coordination of research and higher learning) has made many recommendations, including the proposal to create 35 new professorships of genetics in universities, in their natural science departments and agricultural and medical schools. Several German states have already acted upon these recommendations. Unfortunately, the shortage of qualified scientists and teachers, due to the causes stated above, will not be overcome for some time. The help of the United States in training young German biologists has been and will be of great benefit in overcoming this deficiency. Already many of these United States–trained biologists have returned and seriously discuss the improvements in German biology that seem to be needed—improvements that incorporate both new developments and the best of traditional forms. As economic and scientific conditions improve in Europe, I feel that the problem of young scientists leaving their home countries for the United States and Canada, for example, will disappear.

Consolazio believes that language differences are a serious barrier to a flourishing biological development in Europe. I feel that this is overly pessimistic. Europeans, in contrast to Americans, are more or less forced to be familiar with more than one language. Although this does not lead to easy communication among all European biologists, there is hope that the present trend towards more intercommunication will become even greater. For example, for the past few years the universities of Poitier (France) and Marburg (Germany) have had a successful and regular interchange of their faculty members of all departments. This type of exchange between still independent universities has the advantage of broad communication and yet of retaining a variety of ideas and approaches to problems. I would even consider cultural differences between European peoples an asset, which furthers a multifaceted progress, and which one should by no means try to make too homogeneous by overemphasizing internationaliza-

tion in science. Such trends toward uniformity should even be considered in the otherwise valuable creation of strategically placed international institutes of advanced studies.

Summing up, then, I would say that neither barriers of any kind inside of Europe nor the organization of her universities is the primary factor that has caused European biology to lag behind, but rather the effects of the sad 20th-century history on this continent. As to the means for recovery, I am much more optimistic than Consolazio that with continuing economic improvement the deficiencies can be overcome by the reshaping of university organization that at the same time will keep the best of traditional forms.

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With respect to Perry's comments, my article limits itself to academic biology. I tried to make it clear that not everything was black. Even though I was generalizing, I nevertheless qualified my generalizations. In this instance, if I may quote from the article in discussion, I believe I can make my point clear: "There are pockets of scientific activity of very high quality in most of the other countries of Western Europe . . ."

With respect to Becker's points of issue, I have two comments to make. I am aware of plans not only in Germany but in other parts of Europe to right the existing situation, but more is needed than plans. In the second instance, I said nothing about language as a barrier to communication and to developments in science. I was talking about nationalism, and more specifically about citizenship as a qualification to hold appointments in the universities.

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Mushroom Structure

You have committed a mistake in the explanation of the picture on the cover of the 26 May issue [*Science* **133** (1961)]. Your statement reads ". . . crowded knife blade gills of white support the umbrella-shaped pileus and bear spores. . . ." The gills in *Lepiota* are free from the stipe and grow downward from the context of the pileus. The *pileus* is the supporting structure