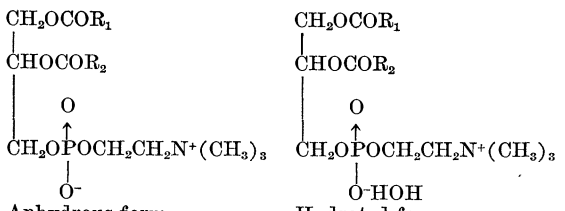
Communications

Depiction of the Lecithin Molecule

As a modification of the excellent suggestion made by David R. Howton [*Science* **119**, 420 (1954)], it would be well, in view of our present knowledge of acids and bases, to avoid depicting a hydrogen ion (proton) as existing, as such, in the presence of such a strong base as a hydroxyl ion. If the water of hydration is so important, it would be better if it were pictured in the manner indicated here. Note also the coordinate bond between the phosphorus and an oxygen atom.



Anhydrous form | Hydrated form

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2 April 1954.

A Comment on Scientific Writing

In *Science* for 23 April 1954 there were articles on the frequent wordy emptiness and awkward style in scientific writings. Most of the examples quoted and discussed, although poorly written, were nevertheless in correct English. However, the matter is more serious than that: in the mathematical field, at least, outright errors in grammar are not uncommon.

Recently the editors of a journal of a mathematical organization sent me for review a book that furnishes a rather bad example. The volume in question contains a fair proportion of really valuable new work. It was written by a group of distinguished scientists. The native language of the majority was German. The result is a chain of slang and stodgy teutonisms, scattered helter skelter among the commas. To qualify this statement I must add that one of the authors born abroad wrote in clear, precise, and correct English, whereas one of the young native Americans wrote miserably. Young scientists are trained by example, and I fear his case is typical. This aspect of the problem, nothing so refined as mere infelicity of expression, was not mentioned in the articles in *Science,* and for this reason the following paragraphs from my unpublished review may be of interest.

> Now to say no more than this about the style might allow misunderstanding. This particular kettle is only somewhat blacker than the pots in its environment. Not to the tolerance of Americans but to their carelessness must be attributed their willingness to read such maculation of their mother tongue. No German or French editor would dare to publish a comparable haggis of blunders and anglicisms. To the triumph of the jargon of comic strips and advertisements has been added the influx of foreign scientists, especially Germans. The splendid additions brought by these foreign scientists to our scientific life make it easy to see how some young Americans, already ill footed in their mother tongue and mistaking in their masters the certainty of knowledge for correct expression of it, have fallen into a ragged bastardy of language. At the same time there has been a very unfortunate pressure on foreign-born scientists to write in English. That their English is better than our German or French does not make their English correct or clear. That their English is only a little worse than their students' and colleagues', while reflecting little credit to these latter, does not license it. Every editor knows that most manuscripts received contain outright errors which must be corrected silently, while the problem of style is more or less hopeless. I mention all this here because this volume is the worst I have seen: each manuscript, apparently, is printed in its original purity, making the whole a defining example of *die schönste Lengevitch.*
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> Moreover, since most of this volume is written by persons whose native languages will not tolerate the mangling to which its free (but nevertheless not inexistent) grammar makes English liable, in this case there was a simple remedy. Had the editors encouraged some of the authors to write in German, some of the articles in this volume would have been expressed in a style commensurate with the value of their contents and the result would have come nearer to that clarity without which expository works fail of their purpose.

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"Big Business Takes Over Research"

In the issue of 9 July, page 74, J. B. Sumner pays tribute to the governmental and private institutions that "possess the financial backing, the equipment, the highly trained scientists and the technicians to follow up any new lead in science and to carry this lead rapidly to a successful conclusion." The remainder of the letter is a complaint that the university teacher cannot compete successfully with this setup and that this situation is "altogether undesirable."

The university teacher who carries on research as a side line to his teaching and utilizes untrained or partly trained fellows has as his most important function the training of his assistants in the methods of research. He is pointed not at the production of new *facts* so much as at the production of new *researchers.* The university professor must recognize that his first function is education, and no one should underrate that function—certainly not the professor himself. Without competent men, no amount of financial backing or equipment would produce anything.

On the other hand, the object of research itself is to discover new facts and concepts for the benefit of mankind. Big business has in recent years attacked the problems of pure science with the organizational precision that American business knows so well. The result of this business method in research has been a flood of immediately practical therapies that have rudely reversed the mortality figures in many diseases. In the ethical pharmaceutical field the pattern of research, of manufacture, and of distribution have reached an efficiency that has paid off in wide human benefits.

Not the smallest part of this pattern is the widespread distribution of information on new medical products, practically a continuing postgraduate course for all physicians. Here big business has taken the very wise stand that a reputation for honesty and reliability has tangible value, and the professions have been quick to recognize the importance of this flow of service data.

From the point of view of the patient—the average citizen—I hope that your correspondent will reevaluate his estimate of the situation.

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15 July 1954.

Interaction between Casein and β-Lactoglobulin on Heating

Electrophoretic evidence has been obtained which indicates that casein and β-lactoglobulin, the major protein constituents of milk, combine under the influence of heat, forming a stable complex (*1*). When a 1 percent protein mixture composed of 0.75 percent casein and 0.25 percent β-lactoglobulin in 0.1 ionic strength phosphate buffer of *p*H 6.86 was heated at 85°C for 30 min, and electrophoresis was carried out in the same buffer, the β-lactoglobulin migrated with the α-casein. Three well-separated electroproretic peaks (α- and β-casein and β-lactoglobulin) were obtained for the unheated mixture at this *p*H. A solution of 0.25 percent β-lactoglobulin in the *p*H 6.86 buffer, heated in the same manner, yielded two electrophoretic peaks. The more rapidly migrating peak had a mobility slightly lower than that of the α-casein peak in the unheated mixture but about the same as that of the proposed complex of β-lactoglobulin and α-casein in the heated mixture.

If β-lactoglobulin and α-casein had not actually formed a stable complex, it should be possible to resolve the two components by performing the electrophoresis at a different *p*H. In an attempt to so resolve the denatured β-lactoglobulin and α-casein components, electrophoresis of mixtures prepared and heated in the same manner was carried out in *p*H 2.45 glycine-HCl buffer of ionic strength 0.1. No component was present in the electrophoretic pattern of the heated mixture obtained at *p*H 2.45 that had the mobility of heat-denatured β-lactoglobulin. (Heat-denatured β-lactoglobulin showed a single peak at this *p*H.) The proposed complex, identified on the basis of the area of its electrophoretic peak, migrated with a mobility appreciably lower than that of heated or unheated β-lactoglobulin or unheated α-casein. The area of the complex peak at *p*H 2.45 was not as great as the area of this peak at *p*H 6.86, but it was quite evident from the dissimilarities between the ascending and descending patterns that interactions of an ionic nature occurred at *p*H 2.45 in the heated mixture. The ionic interactions introduced considerable uncertainty into the identification of the components other than the large peak that was assumed to be the complex between α-casein and β-lactoglobulin.

The evidence, although not conclusive, is supported by similar observations made by Jennings (*2*) and Krejci (*3*) that casein formed a complex with a horse serum immune globulin under the influence of heat.

Heat-induced interactions between proteins may be of considerable significance with respect to protein stability problems in food processing.

Work is in progress to confirm the existence of α-casein-β-lactoglobulin complexes in heated synthetic mixtures and in heated and dried milk.

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References and Notes

1. This paper reports research undertaken in cooperation with the Quartermaster Food and Container Institute for the Armed Forces and has been assigned number 490 in the series of papers approved for publication. The views and conclusions are those of the authors; they are not to be construed as necessarily reflecting the views or endorsement of the Department of Defense.
2. R. K. Jennings and L. D. Smith, *J. Immunol.* **45**, 105 (1942).
3. L. E. Krejci, R. K. Jennings, and L. D. Smith, *J. Immunol.* **45**, 111 (1942).

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Antibiotic-like Substance and Cellulose Digestion Stimulator Found in Fermented Feeds and in Rumen Fluid*

Factors that stimulate *in vitro* cellulose digestion by rumen microorganisms have been found in fresh rumen fluid and its extracts (*1–3*). Cow manure and common feedstuffs have also been shown to contain similar factors (*4*). However, previous workers have not reported an antibiotic-like factor in these materials.

A factor, or factors, that stimulates the growth and cellulolytic activity of rumen microorganisms and inhibits the growth of microorganisms previously isolated as undesirable contaminants from the digestive tracts of ruminants has been obtained in crude form. Active extracts were prepared from four bovine ingesta, one ovine ingesta and two fermented feeds.