

some of the "passwords" which will take us across the "technical and arbitrary . . . frontiers that exist between the studies of heredity, development and infection."¹¹ That these frontiers are already being crossed by means of enzyme techniques is apparent from the work of Spiegelman and Lindegren^{11,12} who have shown that the melibiose-fermenting enzyme in yeast could be maintained and reproduced in the *absence* of the gene necessary for its *initial* synthesis. Thus we have an example of the autotynthesis which forms the basis of the competition between enzyme X and cancer protein in the enzyme-virus theory of cancer.

The novelty of the writer's theory of cancer does not lie in its use of the word virus. There was already a virus theory of cancer, just as there was an irritation theory, a genetic theory, a hormone theory and many others. However, the individual theories did not explain the facts which were used to support the alternate theories. The final theory must satisfy not only the biologist, but also the chemist and physicist; it must explain all the facts and in so doing will be not only a theory of cancer but a theory of life.² The keystone in the whole structure appears to be the identity or non-identity of the enzymes (*sic*) with the terms used by the other specialists. That is, each genetic factor not only produces a character in an ultimate time-space continuum that can be recognized visibly by the biologist, but it must also produce a chemical reaction that is recognizable here and now on a chemical basis. The need in this work is not for interpreters but for specialists who are at least "bilingual." In the latter case we naturally emphasize the importance of the language of the enzymologist.

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THE EFFECT OF OXALATES IN THE DIET

IN the March 16 issue of *SCIENCE* Roe E. Remington and Cecil L. Smith give superficial observations on feeding a commercial preparation (spintrate) and attempt, without basis, to throw new light on the effect of spinach in the diet. At the same time, they give a wrong impression of the established and published data of Fineke and Sherman which they cite¹ and of others² which they ignore, regarding the occurrence of oxalic acid and its effect on calcium utilization, by the following statement: "Since it has been reported that there is some substance, *presumably oxalic acid*,

(italics not theirs) which interferes with the utilization of calcium for bone formation. . . ."

The occurrence of oxalic acid and oxalates in spinach (and in other foods) is not on a "presumptive" basis, as any one who is versed in food chemistry well knows. That the oxalates in spinach have no effect on rat growth or bone formation, if the diet contains adequate calcium to stoichiometrically match the oxalate in addition to the normal calcium requirement, has been fully demonstrated, as Remington and Smith could have ascertained if they had familiarized themselves with the literature.

By not going to the trouble even to give the oxalate and calcium contents of their diet they have presented confusion, not enlightenment. If "spintrate" represents dehydrated spinach, it is likely that it has been blanched, since that is the usual practice in dehydrating vegetables. In that case the oxalates other than calcium oxalate, because of their solubility, are largely extracted, as are other water-soluble components, and the remaining calcium oxalate is practically inert. As an average figure the calcium oxalate in spinach constitutes only about one third of the oxalate content.

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"ANGRY" MOSQUITOES

A REPORT by Kahn, Celestin and Offenhauser recently published in *SCIENCE*¹ contains some very interesting and potentially significant observations regarding the sounds produced by mosquitoes. The data concerning species differences, sex differences and effects of interindividual stimulation are particularly instructive.

Inasmuch as the authors indicate their intention to continue their investigational program, and therefore presumably to publish more extensively, it may not be amiss to enter a plea for more careful and objective treatment of the psychological phenomena involved. In the article under consideration it is suggested that the calls of mosquitoes "may be in the nature of (a) mating calls, (b) calls warning of danger, (c) calls of anger and other sounds that are similarly functional."

Serious students of animal behavior have long been aware of the dangers of interpreting the reactions of a lower species in terms of psychological experiences characteristic of human beings. The facile process of imputing human motives and feelings to other forms and thus "explaining" observed behavior is rightly discouraged.² Such a procedure necessitates certain assumptions which are rarely made explicit, and are often unrecognized even by their author. To

¹ M. L. Fineke and H. C. Sherman, *Jour. Biol. Chem.*, 110: 421, 1935.

² B. W. Fairbanks and H. H. Mitchell, *Jour. Nutrition*, 16: 79, 1938; F. F. Tisdall and T. G. H. Drake, *Jour. Nutrition*, 16: 613, 1938; E. F. Kohman, *Jour. Nutrition*, 18: 233, 1939.

¹ M. C. Kahn, W. Celestin and W. Offenhauser, *SCIENCE*, 101: 335, 1945.

² T. C. Schneirla, *Jour. Comp. Psychol.*, 34: 79, 1942.

designate a particular sound produced by a mosquito as a "call of anger" is to imply a parallelism between the psychological processes of the insect and those of a man who is angry. Whether or not the inference is intentional is immaterial. The psychologically naive reader will unconsciously assimilate it as part and parcel of the presentation and accord it weight equal to that given the objective data with which it is associated.

The objections to anthropomorphic interpretations of animal behavior are several. (1) As noted above, they involve the implicit, but infrequently stated assumption of close similarity between psychological processes in widely separated species. (2) They substitute a process of naming for one of analysis. Thus the labelling of an act as an expression of anger, of fear or of mother love is sometimes regarded as sufficient explanation of the overt response. In actuality no explanation whatsoever has been advanced. (3) Curiously enough anthropomorphic interpretation is most often applied to forms of behavior which are at best only dimly understood in man himself. A great deal of hard work has been and is being done in an attempt to elucidate the stimuli, the mediating mechanisms and the overt expressions involved in human emotions; but the most ardent student of the subject would be quick to admit that we are a long way from a satisfactory understanding of the functions involved. This being the case, one is clearly ill advised to attempt to interpret the reactions of other animals in terms of human emotions.

It is to be earnestly hoped that the investigation of sounds produced by mosquitoes will be pushed ahead, and the resultant findings will be published. We may be certain that the physical characteristics of the calls recorded will be expressed in recognized quantitative terms such as cycles per second, etc. This note is to ask that the behavioral features of the phenomena be accorded equally objective treatment.

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PRESSURE DUE TO MOUNTING SCIENTIFIC KNOWLEDGE

THE number of fields of science have increased to such an extent that it has become impossible for any one man to become conversant with all of them. Some of the sciences have so developed that it has become difficult, if at all possible, to master a single one of them in its entirety.

As the frontiers of a scientific field expand and recede from the regions covered by experience, the scientific explorer is forced to spend more and more years in getting to the frontier. Unless some radical measures are taken, this situation will soon become so aggravated as to put a brake on the progress of

science and force the scientist to become a specialist in an ever narrowing field.

Evidently the remedial measures should aim at securing time-saving means of acquiring knowledge and more efficient use of those means. To this end I suggest, first, making English the international second language for science; second, making English completely phonetic; and third, streamlining and otherwise improving our educational procedures.

In a recent communication, Professor Duane Roller¹ called attention to the need of an international second language for science; he referred to the advantages of English; and suggested that Basic English be used in our scientific periodicals in order to make English the international second language.

No one questions the need for an international second language. Many recognize the advantages of English over other languages, natural or artificial, especially from the point of view of practicability. But few would concede either that Basic English is adapted to the needs of science or that its use in our periodicals could make English an international second language.

Basic English is designed to convey simple ideas. It is not adapted to the expression of the relatively complex ideas of science. Furthermore, the advantage of Basic English is due to its limited vocabulary. This would be largely cancelled by the addition of the extensive technical vocabulary of science.

It is true that simplicity of expression is helpful to all readers, native as well as foreign. But that alone is not sufficient to make English an international language. However simple scientific English is made, a Frenchman will still have to learn Russian if he wants to read scientific papers published in Russian.

English could become the international second language for science if every important research paper written by the scientists of the world were published in English. This could be done if sufficient funds were made available to the scientific societies of the English-speaking countries to enable them to translate and to publish every important research paper submitted by scientists of other countries.

The amount of money required for putting such a plan into effect would be great indeed; but the benefits derived would be even greater—English-speaking scientists would be relieved of the burden of having to learn foreign languages; other scientists would have to learn only one foreign language. Even from a purely financial point of view, the execution of this plan might prove to be a good investment, for the simple reason that the foreign trade of the English-speaking countries would be given a great impetus.

English spelling is not only a stumbling block to

¹ Duane Roller, *SCIENCE*, 101: 299, 1945.