Forest School of the University of California. Germany has the largest membership embracing eight institutions, Great Britain has six and other foreign countries from one to three memberships.

THE Department of Geology at the University of Illinois, through the courtesy of Dr. John B. Reeside, Jr., of the United States Geological Survey, has received a gift from the United States National Museum of a collection of Mesozoic plant and invertebrate fossils.

WE learn from *Nature* that the Pontifical Academy of Sciences (Nuovi Lincei) is offering a prize of 10,000 lire for a critical dissertation on the law of Mendel and the chromosome theory. Essays must be unpublished and may be written in English, French, German, Spanish, Italian, or Latin. They may be signed or written under a pseudonym, and must reach the Pontifical Academy of Sciences, The Vatican City, before October 30. The award will be announced at the first meeting of the academy in December.

DISCUSSION

BIOLOGICAL ABSTRACTS

BIOLOGICAL ABSTRACTS is intended to serve as a comprehensive abstracting journal of the entire literature of biological research of the world. The first number appeared in December, 1926, and the fifth volume is now in course of publication. Its subscription price is $15.00 per volume. It is the only publication in the world that pretends to cover the entire field of biology. Our German colleagues in order to obtain an equally comprehensive service would have to subscribe to ten abstract journals in theoretical biology at a cost of $382.50 per year, and to some at least of the journals in applied biology which collectively cost $305.00 a year additional. There would be, of course, an immense amount of duplication in such a collection of the admirable German abstracting journals. But the comparison will serve at least to indicate what an enormous undertaking it has been to organize a single journal which eliminates all duplication. If the performance of *Biological Abstracts* to date gives good promise of realization of its aim, there would be few to deny that it is a contribution to the service of biological research worthy of a high institutional rank.

It is not necessary to argue the case of the need of a reference system that will be something more than merely bibliographic before biologists of any one of the numerous persuasions. Whether those who grew up under the relatively simple conditions existing before the war are more convinced than those to whom the present intense worldwide activity and cooperation in scientific research seems of the order of nature is perhaps a matter of indifference, for neither the veterans nor the recruits are able without the aid of a comprehensive abstracting journal to view the entire biological front with its thousands of media of publication, whatever may be possible within a small field of investigation. And it is becoming increasingly important in genetics, in physiology, biochemistry and biophysics, in pathology and bacteriology, in ecology, in cytology and other disciplines within biology, to know not only what is being done by the zoologists, but also by the botanists, and not only in academic institutions and museums, but also in the medical schools, the institutes of agriculture, in the fisheries and oceanographic institutes, to name only some of the organizations in applied biology. Each piece of work has some taxonomic implication, so that the bad tradition that has separated systematists and workers in fields of more general biology should be broken down. If *Biological Abstracts* is really comprehensive, it is not only a great convenience, but it is a great unifying force in the life-sciences, and hence an agency of scientific progress.

It has been said that it is an impossible undertaking, but at present about 5,500 periodical publications out of a total of about 6,000 are being abstracted for their biological content. It will not require much extension to make the survey practically complete. Abstracts are furnished in part by authors, and to a great extent by some 3,000 collaborators scattered in all countries where biological research is in progress. Yet the resulting volumes, owing to special format and thin paper, are not unwieldy. The progress that has been made in these five years in completeness of references is guarantee of a fully satisfactory representation of the literature. The main criticism that can be made up to the present is the slowness in appearance of the index numbers, without which use of the volumes is rather painfully slow. But the recent appearance of the index number to the first volume is evidence that the difficulties connected with this essential part of the service have been overcome. It is to be hoped that the index numbers of the succeeding volumes will now be expedited. Already *Biological Abstracts* has a subscription list of over 3,000, which is greater than that of any other biological publication in America. It has been demonstrated not only that

the undertaking is possible but that it is very widely welcomed.

Biological science does not have back of it extensive, well-organized and highly paying commercial organizations dependent on the progress of the science and contributing to its development and support, such as exist in the case of chemistry, for instance. Although the applied aspects of biology in medicine, in agriculture and fisheries are of at least equal human significance they are not organized as commercial enterprises, and hence can not contribute directly to the support of *Biological Abstracts*, as can the commercially organized chemical industries to *Chemical Abstracts*. For a long time to come, then, *Biological Abstracts*, if it is to continue, must depend on the support of enlightened philanthropy. At present its earned income from subscriptions and other sources is sufficient to pay manufacturing costs only. This agrees with the original estimates drawn up before the project was under way. But the great items of cost, consisting of editorial, indexing, bibliographic, secretarial and clerical services, which make up from two thirds to three quarters of any adequate operating budget, must be specially provided. This constitutes an enormous "overhead" which exists whether the subscription list be large or small. It is estimated to amount to over $100,000 for 1931. This is obviously a situation in which every biologist can help, by his subscription. It is, however, not expected that even with the largest list of subscriptions practically possible, the overhead charges can be paid by the receipts of the journal.

The whole enterprise of biological research is, however, so vast and its human usefulness so inestimably great that such a sum seems to be only a small tax upon it; indeed, almost vanishingly small compared with the immense sums required for primary costs of the research and original publication. If the journal should acquire still more of an international character, the tax on American biologists and American philanthropy might be correspondingly reduced; but it seems to the writer that American biologists and philanthropists who have the advancement of science at heart should not withdraw their support until the future of this comprehensive abstracting service is adequately safeguarded.

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TWISTED TREES

I HAVE read with interest the notes in SCIENCE for February 13 and March 27 dealing with trees with twisted bark. My observations covering a large part of the province of Ontario, Canada, may be of interest in this connection. In this region I have often noted the twist of evergreens, especially of the cedar (*Thuja occidentalis*), white pine (*Pinus strobus*), Norway pine (*Pinus resinosa*) and Jack pine (*Pinus divaricata*). I have never noted it on a "hardwood" in the region. In the cedar the twist is very common, straight-grained trees being far less abundant than twisted-grained. Last summer I camped on an island in Lake Kahnipiminanikok, and my party amused itself one rainy day noting this twist on cedars, some one having discovered the predominance of right-handed twists. We counted (from my notes) 312 cedars on the island; of these 219 were twisted; of these 187 were right-handed twists. Later an Indian emphasized the need of straight-grained cedars in the hewing of paddles, and the difficulty of obtaining such grains in that vicinity. He also pointed out the fact that the twist is more common in large trees than in young ones, indicating that this character is acquired by some environmental factor. This twist is not alone in the bark, but in the wood as well. It is frequently so extreme as to be a spiral. Among the white and Norway pines the twist is far more common in trees exposed to severe weather conditions, especially to strong winds. Thus I noted that twisted trees occurred more commonly on exposed rocky cliffs and small, open islands, where they receive the full brunt of winter gales. A twisted tree in the heart of the forest is quite rare. But why do they twist so predominantly to the right?

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THE MECHANISM OF CROSSING-OVER

DR. SAX[1] has recently put forward a theory that crossing-over is due to the breaking of chiasmata in the course of terminalization. This theory is based on a suggestion of mine[2] that "crossing-over is occasioned by breaking of chiasmata." Moreover, Sax uses diagrams and terminology that are borrowed from my studies and therefore imply an interpretation in accordance with my findings.

I should like to point out therefore that I do not consider the original conjecture in any way supported by Sax's observations. I discarded the idea a year ago for reasons that are described in the accounts of studies conducted in this laboratory by Erlanson,[3] Philp and Huskins[4] and myself.[5,6,7,8,9] Briefly, the

[1] K. Sax, "Chromosome Structure and the Mechanism of Crossing-over," *J. Arnold Arboretum*, 11: 193–220, 1930.

[2] C. D. Darlington, "Meiosis in Polyploids, II. Aneuploid Hyacinths," *J. Genet.*, 21: 17–56 (see p. 52), 1929.

[3] E. W. Erlanson, "Chromosome Organisation in *Rosa*." *Cytologia*, 2 (in the press).

[4] J. Philp and C. L. Huskins, "The Cytology of *Matthiola incana* R. Br.," (especially in relation to the inheritance of double flowers), *J. Genet.*, 24 (in the press).