of species, I cannot follow him at all. Size and weight—the traits that can be measured—are especially dependent on the environment and variable within the same species. Varieties of dogs may not intergrade at all in size and weight, or in the relative dimensions of the skeleton, but this does not lead us to call them separate species. The cephalic index is one of the most important differentials in man, but the fact that it may not intergrade does not turn races into species. The conditions are far more complex than Mr. Davenport assumes them to be. A certain quantitative amount of intergrading may mean entirely different things under different circumstances, and the various differentials of a species may intergrade to very different degrees. It does not follow that the chief differential is that quantitative characteristic intergrading the least. It may be the teeth or the reproductive system or whatever serves most conveniently as a basis of classification.

My excuse for writing on the definition of species is that I hold it to be a psychological problem. In pre-evolutionary days the naturalist undertook to discover species that had been created; now it is he who creates the species.* The problem is analogous to deciding how many colors there are in the spectrum; it may be held that there are three, or four, or seven, or two-hundred. There are, indeed, various criteria that may be used in the separation of species, of which the most important seem to be: (1) the phylogenetic history when known; (2) hereditary stability and variability; (3) the tendency to cross and the fertility of crosses, and (4) intergradation. The last named factor is not only quantitative, as in the cases given by Mr. Davenport, but also qualitative, and here the naturalist must try to use as his unit what the psychologist calls the 'just observable difference.' The degree of distinctness that shall constitute a species must, like the meaning of every word, depend on the best usage. As the usage of the best writers is compiled and given currency by dictionaries, so the usage of naturalists is compiled and given currency in a work such as *Das Thierreich*. The criterion given prominence by Messrs. Davenport and Blankinship should be carefully studied, but it is only one of many factors, and these must be distinguished and adjusted by the powers of observation and judgment of the naturalist. The definition of species is, as I have said, a psychological problem.

J. McKeen Cattell.

*I fear that I am here sailing under Dr. Merriam's heavy guns. He has written: "The function of the naturalist is neither to create nor destroy species, but to recognize, describe and learn about those which nature has established." (Science, N. S., V., 124.) Innumerable coyotes, differing more or less, live or have lived, and Dr. Merriam, not nature, has established eleven species. Some other naturalist has created the coyotes.

SCIENTIFIC LITERATURE.

Contribution towards a Monograph of the Laboulbeniaceæ. By Roland Thaxter. Memoirs of the American Academy of Arts and Science. 1896. Vol. XII., No. 3. Pp. 189–429. 26 plates.

This is the second important memoir by Dr. Thaxter on Entomogenous fungi, the first being a monograph of the Entomophthoreæ. The very large number of these plants which are being brought to light by the keen observation and untiring industry of the author of this memoir is a surprise to any one acquainted with the literature of the subject.

As Dr. Thaxter states in the introduction, his study of Entomogenous fungi was begun with the intention of embodying in a single monograph all species truly parasitic on insects. But the number of species of the Entomoythoreæ were sufficient for a monograph of considerable proportions, and now the hitherto insignificant family of Laboulbeniaceæ has, under his indfatigable researches, grown to an order of formidable proportions, while several other groups of insect fungi remain yet to be investigated.

While a few of the members of the genus *Laboulbenia* have been known for nearly one-half a century, our knowledge of the development, sexuality and formation of the spores has remained very imperfect. This, together with the difficulty of defining the position of the family in relation to other thallophytes, has probably had much to do with the almost universal absence of treatment of these forms from text-books of fungi.

The plants are remarkably peculiar in form and remarkably simple in structure, and probably represent degraded remnants of a more complex ancestry. The environment which they meet because of the peculiar habitat must have had a powerful influence in reducing them to their present rather stereotyped morphology. For while it has now been shown that there are considerable variations in species, and a goodly number of both species and genera are represented, one is struck by the constantly recurring facies running through many of the different genera.

The members of the family are attached to the legs or bodies of insects, usually those inhabiting damp or wet localities. An individual consists of a simple stalk for attachment, which bears a simple elongate perithecium as a lateral appendage, or is terminated by the same, while the antheridia may terminate the plant, or occur as a simple or tufted lateral growth. By studies of the development of a large number of species, and by the examination of a large series of forms, the limits of specific variation have been quite well determined, so that a fairly good basis has been established for the recognition of species and genera, and the systematic arrangement of the known forms can be presented with a good deal of confidence.

The discovery by Karsten, as early as 1869, of a trichogyne on the perethicium, and the fusion with it of bodies resembling the sperm cells of the Rhodophyceæ, indicating sexuality in these plants, has been fully confirmed by Dr. Thaxter's studies, and we need now only the knowledge of the actual nuclear fusions in the different steps of fertilization to show how the ascus originates as a result. The female organ shows a striking resemblance to the trichophoric apparatus in certain of these algæ, as suggested first by Karsten. These investigations serve to confirm this view, and the conclusion is drawn that this family of ascomycetes has originated from the Florideæ, and may possibly have been the point of origin of the ascomycetous fungi, Twenty-eight genera and one hundred and fifty-two species are described and illustrated; the larger majority of these are named by the author.

GEO. F. ATKINSON.

A Report on the Work and Expenditures of the Agricultural Experiment Stations for the Year Ended June 30, 1897. By A. C. TRUE. U. S. Department of Agriculture, Office of Experiment Stations, Bulletin 50. 1898. Pp. 97.

This valuable document should be perused by every friend of science in America. Dr. True, the Director of the Office of Experiment Stations, has not only followed the work of the stations from his office in Washington for many years, but has himself visited and critically investigated every one of them. Unlike many critics of station work, he has been slow in arriving at conclusions; erring, if at all, on the side of extreme caution rather than of haste. His natural bias of mind seems to be conservative, and added to this is his evident sense of the responsibility of his position; so that we may be sure his criticisms and suggestions for reform are only those which he has felt forced to make in the face of overwhelming evidence.

Yet we read these words (pp. 6–7): "In one respect the past year has been a period of unusual discouragement to those who have the best interests of the experiment stations at heart. From changes in the constitution of the governing boards, due to legislative action, changes in the Governors having power of appointment or removal of members of these boards, and other causes, the Directors of the stations in ten States and Territories have been changed since the last [annual] report was prepared. In several cases the Directors removed had had long and successful experience in the management of the stations and had made their work increasingly useful. In these and other cases the removal of the Director was accompanied by a further reorganization of the station staff. * * * The numerous changes in the station staffs recently made are calculated to shake faith in the wisdom of committing the stations so fully to the control of the local boards."

Taking the stations separately, we find:

Idaho.—"The station has fallen behind in its publications; its finances have been in an unsatisfactory condition, and its operations have been very largely of a superficial character."

Kansas.—"Out of fourteen persons constitut-