periences, and makes the members modes of itself. But while the child *learns* its members most animals appear to be instinctively aware of their somatic self in its parts and so to use them from the hour of birth. But only through the piecemeal learning of the somatic self does there come a full and strong sense of self. The man's hand is more really and fully his than is the crab's claw its claw. Self-conscious self-consciousness and all the high egoism comes of learning. However, the child learns itself in hand, foot, etc., by instinctive impulse, just as it learns to walk instinctively; but the learning, of course, implies attention, will, reason and feeling.

HIRAM M. STANLEY.

LAKE FOREST, ILL., June 16, 1898.

COLOR VISION.

IN regard to the points concerning which Professor Titchener considers that I have not correctly represented what he had to say on color theories in his letter in SCIENCE of June 17th it is so easy for the reader of SCIENCE to form his own opinion, if he is sufficiently interested in the subject to compare that letter with my reply to it, that there is no occasion, fortunately, to prolong the discussion. Since Professor Titchener has given so much attention to optics during the past year as he says he has done, he must plainly be much more familiar with the subject than most of the psychologists have time to be, and I have certainly hit it off very badly in accusing him of ignorance.

C. LADD FRANKLIN.

SCIENTIFIC LITERATURE.

Organographie der Pflanzen, in besondere der Archegoniaten und Samenpflanzen, I. Teil. K. GOEBEL. Jena, G. Fischer. 1898.

This first part of Dr. Goebel's Plant Organography has been awaited with impatience by many botanists who knew that such a work was in process of construction. Now, that the first half of the treatise is off the press, it can already be understood what an important and timely contribution to botanical literature is this latest work by certainly the foremost German plant morphologist, if not absolutely the foremost in the world. In reading through the attractive pages one is impressed, first of all, by the charming lucidity of the literary style, then by the freshness of the illustrative material, then by the perfect mastery of a wealth of detail and accessary or incidental matter, and finally by the philosophical and unpolemical tone of the whole. Professor Goebel has succeeded in bringing together from his own voluminous researches, and from the byways as well as the highways of botanical literature, a most interesting and suggestive volume. His general point of view is not at all new, for the foundation of organ-evolution is sought in adaptation rather than in the spirit of the recent *Entwickelungsmechanik*. Strong antagonism is manifested to the archaic 'ideal-philosophy' or 'nature philosophy' of Goethe and Herder, which one would think, from the somewhat unnecessary space given to its annihilation, must exist somewhere in the vicinity of Munich. The Goethean concept of the leaf, the stem, the flower, as in some mysterious sense types, or ideal plans, is generally so extinct that there seems scarcely justification for seriously girding at it. Goebel points out, truly enough, that there is no such thing as a *leaf* rudiment, but only bud-scale rudiments, sporophyll rudiments, cataphyll rudiments, foliage-leaf rudiments, etc. The leaf and the leaf rudiment are pure abstractions. But this does not seem to the reviewer so strong a position upon which to found a theory of metamorphosis as at first it did. It is true, Goebel's doctrine of pure metamorphosis is based upon just this conception of rudiments, and hence the position is important if one wishes to understand his work.

It would seem that one has quite as much right to insist that there are no bud-scale rudiments, but only willow bud-scale rudiments, poplar bud-scale rudiments, walnut bud-scale rudiments, cherry bud-scale rudiments, etc. Thus the bud-scale rudiment becomes, by the same process of reasoning, quite as vague an abstraction as does the leaf rudiment. As a practical proposition, Dr. Goebel's willingness to substitute analogy for homology in the foundations of botanical terminology cannot have much weight, for everywhere it is the phylogenetic test that is regarded as final, and analogies are rightly regarded as of secondary importance in

all taxonomic systems. But terminology must, in general, be of a sort that can be employed in systematic botany as well as in the departments of pure morphology or organography.

The attempt to construct an organography of plants upon adaptational or epigenetic lines must always be fraught with difficulties, some of which the author has not successfully avoided, but in general the work is most illuminating. A particularly useful chapter is that on symmetry, in which, it should be noted, there is included an independent paper by Dr. A. Weisse on the mechanical principle involved in leaf arrangement. The somewhat variant views of Schwendener and Vöchting are given due weight and discussed with much critical acumen. The part of this chapter dealing with the dorsiventral shoot is one of the few really satisfying chapters in botanical literature. Anisophylly, asymmetry and plagiotropy in general are given a most adequate and instructive treatment. Various species of *Selaginella* are reviewed, and the laws of leaf arrangement upon dorsiventral shoots are largely explained from plants of this one genus.

Of all five chapters, however, the third seems to the reviewer, upon the whole, the most original and valuable. Here Dr. Goebel incorporates his own results to a very considerable degree, and gives the first connected and philosophic account, in botanical literature, of seedlings. After his fashion in his earlier work upon plant development, he includes in the same breath discussion of gametophytic and sporophytic structures—a feature very repugnant to the reviewer—but, nevertheless, manages to leave no point untouched by a wealth of allusion and example, so that when the chapter is finished the reader feels that he never understood seedlings before. The spirit of the enquiry is altogether different from the drier and essentially formal tone of Sir John Lubbock's well-known book. It is philosophical, suggestive and inspiring.

Nothing particularly new or strikingly helpful is to be found in the closing chapters of the first part—those on malformations and on correlation—for the positions taken are quite exactly those of Sachs, and differ principally from Sachs, in treatment, by the examples chosen.

In general this work is one which will be everywhere regarded as well maintaining the transcendant reputation of its author.

Conway MacMillan.
University of Minnesota.

A Course in Experimental Psychology, Part I.: Sensation and Perception. By Professor Edmund C. Sanford. Boston, D. C. Heath & Co. 1898.

Professor Sanford has achieved a difficult task. A laboratory course may be most carefully planned beforehand, but upon trial it will be found quite inadequate in numberless ways; it is only after repeatedly using the course with successive classes, and most carefully correcting and improving it each time, that there is any reasonable security for the hope that the exercises will work smoothly. This series of elementary experiments is the successful result of many years of development in Professor Sanford's laboratory course at Clark University.

The earlier portion of the book (first published in 1894) covers the dermal senses, the kinæsthetic and static senses, taste, smell, hearing, the eye, light and color. The later portion (just issued) treats of visual perception. Some few of the exercises are rather physiological than psychological, but there is no objection to touching upon related problems; even books on physics are accustomed to discuss briefly the anatomy of the eye and the optical illusions. The experiments begin with qualitative ones of a most elementary character; *e.g.*, "Touch yourself in several places with the same object, and analyze out, as far as you can, the particular quality of the sensation by which you recognize the place touched. This quality of a sensation is known as its 'Local Sign.'" A few pages further the experiments become somewhat more elaborate; still further they require apparatus, and so on. In fact, they are carefully graded to increasing difficulty, without ever becoming too difficult for an elementary class. The suggestions in regard to apparatus are, in general, good, although some improvements might be made here; *e.g.*, it is doubtful if the joint-sense apparatus or the Ellis harmonium is worth the cost; if the large wooden pieces, such as tilt board and rotation table, are worth either the cost or the space, etc. The