one contemplates the long time which is involved, the many changes to which the crop is subjected during that time, varying its rate of growth from period to period, and its character, which the forester must be able to foresee. Finally, where finances are involved, market conditions must also be predicted: the forester must be a seer!

As in the factory, cost of output and sale value of product are compared, so in forestry the cost of producing wood and its eventual sale value need to be placed in relation. But, before a financial calculation can be made, we must be able to measure the product itself, and the methods that are employed to measure the volume of trees or parts of trees, of stands, forests, and of their increments from period to period are comprised under the name of forest mensuration.

It was quite natural that the first American professional text-book of forestry, worthy of the name, should occupy itself with this branch of the subject, which is to a large degree basic of all other branches. Dealing mainly with mathematical questions, it was possible to bodily transfer the European knowledge and practise, ready for our use.

The art of forest mensuration, as all other branches of forestry, has naturally been mainly developed in Germany, and as regards methods of procedure in the measurement, especially of standing timber and of increment, the author could add litttle to the contents of the latest German text-books. But in the matter of measuring felled timber, especially logs, the American method of employing the board-foot or some similar standard gave opportunity to add the matter contained in chapters II. to V. on log rules and scaling of logs, which would naturally not be found in European literature, the necessity for which we consider, however, a national misfortune.

It is unfortunate that we are doomed to remain in the backwoods as regards our units of measurement. If it is a pity that we have not yet adopted the metric system, it is almost a sin that we persist in continuing the use of the absurd log scales, and we regret that Professor Graves has not used the opportunity of inveighing more severely against this incubus.

There are not less than forty-five standards or units of measurement for logs employed in the United States, all varying in the board-foot contents they give for logs of the same cubical contents. It is a matter of experience that the results at the mill invariably belie the log scale. Professor Graves has treated this subject most fully and with an elaboration worthy of a better cause, admitting at the same time that 'the cubic foot will unquestionably be used more and more, as the value of timber increases and eventually replace the present rough unit, the board-foot.'

The other parts of the book are treated with similar clearness and elaboration, and the whole must be recognized as much a standard work—the first in the English language on the subject—as any of the best German text-books. Indeed, this book is in some respects an improvement by the addition of results of measurements in tables, which are usually not given in such text-books. The methods of estimating standing timber are also more elaborated than in European literature.

We welcome this contribution to professional forestry literature as distinctly an advance to our forestry movement.

B. E. FERNOW.

THE NUMBER OF KNOWN FERNS.

FEW persons not familiar with fern literature can begin to appreciate the scattered nature of the information that must be gleaned and sifted in the systematic study of the ferns of any region outside of temperate North America and Europe. The last summary of the ferns of the world was published a generation ago (1874) and proved a most useful work, notwithstanding two facts: (1) that its conservative authors, throwing geographic distribution to the winds, often included from two to twenty species under the single name of one of their so-called species of general distribution; and (2) that the use of the Kew method of citation for the author of the species made it practically impossible to trace a given species to its original descrip-

tion and so to its type-locality. 'Synopsis Filicum' served a useful purpose in its day, but the days of indiscriminate 'lumping' of species are over, and the really serious-minded who wish to attain accuracy in the scientific delimitation of species must have, even for the species known before 1874, a more accurate and available guide than this work. Besides this, the species that have been described in the last thirty-two years nearly equal those described before 1874.

It is, therefore, with the greatest delight that fern students of all lands will hail the completion of a publication whose earlier parts, already reviewed in this journal, have proved only a fair sample of what is, without question, the most useful single work on ferns that has ever been published.

'Index Filicum,' by Carl Christensen, now completed in a volume of eight hundred octavo pages is the work in question.[1] In this work each described species is entered not only under its original genus, but also under every successive generic name to which it has been referred in a century and a half of genus making, unmaking and remaking. For example the common male-fern of Europe is cited as *Polypodium filix-mas,* under which Linnæus first described it, and successively as *Dryopteris filix-mas, Polystichum filix-mas, Aspidium filix-mas, Nephrodium filix-mas* and *Lastrea filix-mas,* under which names it has successively appeared commencing with Adanson (1763), and under each of which it is known to-day in some part or other of Europe. Each reference gives a full citation with date, following almost exactly the American system for citation, and each entry has a cross reference to the generic name adopted in the work. Under the accepted one in the above case, *Dryopteris filix-mas,* the principal synonymy is given, together with the geographic distribution of the species. Genera and species are both included in one alphabetical series and selected forms of type readily distinguish accepted genera and species from synonyms, and these in turn from names of horticultural origin. Following this alphabetical index is a bibliography containing titles of all the works and papers in which genera and species of ferns have been defined, arranged alphabetically by authors, followed in turn by a systematic index of the bibliography by means of which one can quickly ascertain the extent of the literature bearing directly on the ferns of any continent, country or island, or on any genus or family of ferns.

The summary of entries includes 819 generic names and 22,680 specific names, which shows (1) the magnitude of the work, since these names are all entered at least twice, and (2) the extent of the synonymy, since the number of accepted genera is 149 and the number of accepted species is 5,940. To show the growth of our knowledge during a generation, we give in the following table a list of a few of the genera whose limits are alike in all the works cited, with the number of species in each as recognized in 1874 in *Synopsis Filicum,* as estimated by Diels and others in *Die natürlichen Pflanzenfamilien* in 1898, and as actually listed by Christensen in *Index Filicum* to the end of 1905.

Genus.	Species Recognized in Synopsis Filicum in 1874.	Species Estimated in Die Natürlichen Pflanzenfamilien, 1898.	Species Listed by Christensen, 1905.
Trichomanes,	91	80	228
Hymenophyllum,	80	74	231
Cyathea,	80	100 +	182
Hemitelia,	30	44	59
Alsophila,	90	112	185
Woodsia,	14	15	25
Cystopteris,	5	5	13
Adiantum,	80	80	184
Vittaria,	13	10–20	46
Gleichenia,	27	25	79
Marattia,	8	12	28
Ophioglossum,	10	30	43
Botrychium,	6	16	34

In sixty preliminary pages issued with the last part (12) of the work, Christensen gives a concise systematic enumeration of the gen-

[1] *Carl Christensen:* Index Filicum; sive enumeratio omnium generum specierumque Filicum et Hydropteridum ab anno 1753 ad finem anni 1905 descriptorum; adjectis synonymis principalibus, area geographica, etc. 8vo, pp. lx, 744. Hafniae, 1905–1906, apud H. Hagerup.

era adopted in the index, with synonyms and sectional divisions. This follows in the main the treatment in *Die natürlichen Pflanzenfamilien,* departing from it where recent monographic work seems to render it necessary, and changing generic names where priority requires. In this connection, it will be a rude shock to some of our conservative fern students to see the names *Dryopteris, Dennstædtia, Phanerophlebia, Phyllitis, Pteridium, Matteuccia, Cyclophorus* and *Ceropteris* accepted in place of names long cherished, but progress is inevitable and these names will stand because they are *right.*

To those people who still name ferns as new which are 'not described in *Synopsis Filicum,*' to whom it makes no difference whether the type locality of the name given to a West Indian fern is New Zealand, Mauritius or Jamaica, or to whom the mere priority of publication is of no concern, Mr. Christensen's book will be only a thorn in the flesh. To those whose ambition is to place fern delimitation and our knowledge of fern distribution on a stable and scientific foundation for accurate study, his work will be worth its weight in gold as a time saver, and a datum line for departure into new fields. Conceived in the same spirit as *Index Kewensis* for flowering plants, Mr. Christensen's work will far outrank it in accuracy, completeness and rational point of view.

The novice might well ask: Are the ferns all described in these 5,940 accepted species? Unhesitatingly we would say, No! Not all these names will stand, for there has been much avoidable and some unavoidable redescription in the absence of such an index as we now have before us. On the other hand, countries supposed to have been exhaustively studied are yielding frequent novelties. A single capital illustration is fresh from the antipodes. The island of Java has been classic ground for fern study since the time of Blume (1828). Raciborski has recently (1898) given us a fresh manual of the ferns of the vicinity of Buitenzorg. This last work includes only a single terrestrial *Ophioglossum.* An American morphologist visits Buitenzorg specially in quest of material bearing on this primitive type and what does he find? No less than four well-marked terrestrial species of *Ophioglossum* snatched from under the eyes of the slower European botanists who have exploited rather than exhausted the fern flora of the old world.

LUCIEN M. UNDERWOOD.
COLUMBIA UNIVERSITY,
November 10, 1906.

SCIENTIFIC JOURNALS AND ARTICLES.

The Botanical Gazette for November contains the following papers: 'The Ovule and Female Gametophyte of Dioon,' by C. J. Chamberlain. This genus is endemic in Mexico and it is probable that plants often reach the age of more than 1,000 years. The structures studied were the ovulate strobilus, the megasporophyll, the integument, the vascular system of the ovule, the megaspore membrane, the archegonium and the egg, the general conclusions being reached that Dioon resembles Cycas more than does any other living genus. 'Temperature and Toxic Action,' by Charles Brooks, the purpose of the experiments recorded being to determine what might be the modifying effect of temperature on the toxic properties of certain chemicals as shown by the effect of these substances on germination and growth in certain fungi. 'The Embryogeny of some Cuban Nymphæaceæ,' by Mel. T. Cook, giving an account of the development of the embryo sac, the endosperm and the embryo.

SOCIETIES AND ACADEMIES.

THE SOCIETY FOR EXPERIMENTAL BIOLOGY AND MEDICINE.

THE eighteenth meeting of the Society for Experimental Biology and Medicine was held at the Cornell Medical School, in New York City, on Wednesday evening, October 17. The president, Simon Flexner, was in the chair.

Members present.—Atkinson, Auer, Beebe, Buxton, Crile,[1] Dunham, Elser, Emerson, Ewing, Field, Flexner, Flournoy, Foster, Gibson, Gies, Hatcher, Lee, Levene, Levin, Loeb (L.),[1] Lusk, Mandel (A. R.), Meltzer, Meyer,

[1] Non-resident.