different systems proposed for the labyrinthodonts, forming a very convenient compilation for the student. The rest of the book is devoted to descriptions of the different families of the Stegocephali. The author concludes that the paleontological material is still too meagre to venture on a genealogical table, but promises to offer a comparative discussion at the end of the whole work.

The first part of the second volume contains the Dendrerpetondidae, Diplovertebridae, Archaegosauridae, Chauliodontia (Miall), and Melosauridae. In the beginning we find the remarkable note, that it is difficult to accept Cope's division into Rachitomi and Embolomeri, based on the characters of the vertebrae, because both kinds of vertebrae (rachitomous and embolomerous) can be found in the same animal. The embolomerous form seems to be developed in the caudal, the rachitomous form in the thoracic, region.

The question whether the hypocentrum or the pleurocentra constitutes the base of the vertebra is decided by Fritsch in the following way: A normal vertebra with *one* centrum never can be formed from a rachitomous vertebra, but only an embolomerous vertebra with two disks. The rachitomous form prepares the embolomerous, and it is not surprising that both forms exist in the same animal.

The following parts will contain the fishes and arthropods, and in the final part the general conclusions will be given.

Finally, it should be mentioned that galvanoplastic copies of thirty-five Stegocephali have been prepared by the author, which cannot be distinguished from the originals. They are obtainable at the low price of fifty dollars from the author, 35 Brenntegasse, Prague.

PRACTICAL BOTANY.

TEACHERS who carry their classes beyond the elements of analytical botany find the number of adjuncts at their disposal increasing rapidly, so far, at least, as histology is concerned. Beside general text-books of all grades, and the treatises, large and small, on the methods of microscopical work, explicit directions for the study of common representative plants are now published in several languages.

So far as a short course is concerned, the demand for laboratory directions is already well met by the botanical portion of Huxley and Martin's 'Biology,' which any capable teacher can bring to date by a few lectures, and supplement by synopses of work for a few additional plants, like Spirogyra, Aspergillus, and Penicillium; and it is doubtful if many courses offered in America are comprehensive enough to warrant carrying this part of the work further. Yet to students who have time for additional work in this direction, without the knowledge requisite for carrying it on independently, this little book of Mr. Bower's, which owes its origin to the same causes that produced Huxley and Martin, will prove exceedingly useful. If it cannot be said to equal Strasburger's 'Botanisches practicum,' it has the merit of being in English, and bears evidence of careful workmanship on every page, while it is sensibly bound for laboratory use.

A course of practical instruction in botany. By F. O. BOWER, M.A., F.L.S., and SYDNEY H. VINES, M.A., D.Sc., F.L.S. Part i. Phanerogamae-Pteridophyta. London, *Macmillan & Co.*, 1885. 11+226 p. 16°.

NOTES AND NEWS.

THE vessel Alert, sent to visit the stations established last summer in and *en route* to Hudson Bay, has been obliged to return by reason of the prevalence of pack-ice, the exhaustion of their coal, and certain damages sustained. She will start again; but those interested in the commercial route *via* Hudson Bay to Manitoba are much disappointed; and the return is generally regarded as evidence that such a route would be even more precarious and uncertain than its opponents have claimed.

— Dr. Elkin, in charge of the heliometer of the Yale-college observatory, has been engaged for nearly a year and a half past in measuring the group of the Pleiades, his original plan being to measure with this instrument the same stars which Bessel measured with the Königsberg heliometer about fifty years ago. Dr. Elkin has taken advantage of all the improvements in the instrument and the methods of using it which have been developed in the last half-century; and, in addition to the successful carrying-out of his carefully elaborated plan of triangulation, he has also been able to extend his work to a large number of stars which Bessel did not measure. The position-angle and distance of the Bessel stars from the large star Alcyone are included in the work. The results of this very valuable work cannot be fully discussed, and prepared for publication, until the positions of certain stars of reference have been obtained from the work of other observatories where they are now being determined. Dr. Elkin has also obtained measures of the distances of a number of craters on the moon from neighboring stars, on thirty-six nights, near the times of first and last quarter. The positions of these craters on the moon itself have been determined; also series of measures made of the diameters of Venus, of the outer ring of Saturn, and of the satellite Titan

referred to its primary. A registering micrometer has been devised, and, in the form constructed by the Repsolds, has proved a complete success, greatly increasing the amount of work which the observer can accomplish. Dr. Elkin proposes to devote the heliometer for a year and a half to come to investigations in stellar parallax. The plan of research mapped out and already commenced will, it is hoped, if carried to completion, furnish a reliable value of the relative parallax of stars of the first and eighth magnitude.

— The fourteenth meeting of the French association will take place, says *Nature*, on Aug. 12, at Grenoble. Verneuil, member of the Academy of medicine, will be president. The public lectures will be, 'On the new gallery of paleontology of the Paris museum,' by Cotteau, ex-chairman of the Geological society of France; and by Rochard, general inspector of the marine, on 'The victualling of France.' A large number of medical questions will be dealt with in the several sections of the congress. The Ferran cholera experiments are sure to be discussed at full length. Numerous excursions will take place in the Alps, under competent guidance, as far as Chambery.

— An abstract of the second report of Albert Williams, jun., on the mineral resources of the United States for the years 1883 and 1884, has been issued in advance of the report itself. From the abstract we condense the following table, giving the value of the

Substance.	VALUE.			
	1880.	1882.	1883.	1884.
Coal . . .	$94,567,608	$146,632,581	$159,494,855	$143,768,578
Pig-iron . .	89,315,569	106,336,429	91,910,200	73,761,624
Silver . . .	41,110,957	46,800,000	46,200,000	48,800,000
Gold . . .	33,379,663	32,500,000	30,000,000	30,800,000
Petroleum .	24,600,638	23,704,698	25,740,252	20,476,294
Building-stone . .	18,356,055	21,000,000	20,000,000	19,000,000
Lime . . .	–	21,700,000	19,200,000	18,500,000
Copper . .	8,886,295	16,038,091	18,064,807	17,789,687
Lead . . .	2,102,948	12,624,550	12,322,719	10,537,042
Salt. . . .	4,829,566	4,340,140	4,211,042	4,197,734
Cement . .	–	3,672,750	4,293,500	3,720,000
Zinc . . .	2,079,737	3,646,620	3,311,106	3,422,707
Mineral waters . . .	–	–	1,139,483	1,665,490
Natural gas .	–	215,000	475,000	1,460,000
Minor mineral products . . .	3,387,444	15,995,830	15,841,664	15,205,464
	$322,616,480	$455,216,689	$452,204,628	$413,104,620

mineral products of the United States for 1882, 1883, and 1884 respectively; and to these we have prefixed the values obtained by the U. S. census for 1880, so far as known. No condensed table of quantities could be made, owing to the variability of the units of weight and measure employed. The great difference observable between the estimates for 1880 and those of later years is probably due rather to the methods employed for obtaining the mineral statistics, than to any such rapid increase in the value of the products as the figures would indicate. The amount of copper produced has steadily increased from 91,646,232 pounds in 1882, to 117,151,795 pounds in 1883, and 145,221,934 pounds in 1884; but the value of the product is less in the last year than in 1883. The value of the mineral waters produced in 1884 is over one and a half millions of dollars, nearly 69 million gallons being sold; while the amount of natural gas produced has been subject to a rapid increase, particularly during the years of the tariff agitation. The quantity of quicksilver produced has steadily diminished, while that of coal has increased. In the list of minor mineral products we have for 1884 such items as 2,000 tons of slate ground as a pigment, 35,000 tons of iron pyrites, 10,900 tons of felspar, 281,100 pounds of bromine, 10,000 tons of manganese ore, 147,410 pounds of mica, 431,779 tons of South-Carolina phosphate rock, 3,401,930 tons of limestone used as an iron flux, 875,000 tons of New-Jersey marls, 25,000 tons of heavy spar (barytes), 7,000,000 pounds of borax, and 1,800 troy ounces of aluminum. The general diminution in the total value of the mineral products of $3,012,061 from 1882 to 1883, and of $39,100,008 from 1883 to 1884, is due, as a whole, more to a decrease in price than to a decrease in the quantity produced.

— The Botanical club of the American association will hold its meetings during the week of the association, the hours and place to be announced on the daily programme, and not on Tuesday the 25th, as erroneously stated in the circular of the permanent secretary, and elsewhere. The first meeting will probably be on Thursday morning, Aug. 27, at nine o'clock. The club invites short and informal communications on any botanical subject of interest. This will obviate the necessity of presenting any but the most important and well-digested botanical papers before the biological section. Any person interested in botany who is also a member of the association may become a member of the club simply by registering.

— The chemical wonder of the London inventions exhibition is said to be the manufacture of oxygen by the process of Brin frères. They have made what is really an artificial mineral lung of anhydrous oxide of barium; and with this, by an ingenious process, they simply take up the oxygen from the atmospheric air. First, the air is drawn, by means of a partial vacuum, through a vessel of quicklime, which absorbs all the carbonic acid and moisture, and reduces it to a mixture of oxygen and nitrogen. These gases are then drawn into the retorts, heated at 500°, and the artificial lung absorbs the oxygen, while the nitrogen is drawn off to a gasometer for conversion into ammonia, etc. The Brins have, for the first time, made the artificial lung indestructible. The use of baryta for the purpose is not unknown; but hitherto the baryta has been perishable, and has required renewal every four and twenty hours, at great expense. They make it virtually indestructible and unchangeable. In this way they claim to have effected an absolute revolution in chemistry: for with a lung for the machine, and the atmospheric air for the material, they can make just as much oxygen as they like; and its uses, present and prospective, are almost innu-

merable and incalculable. For ventilation, aerating water without carbonic acid, for increasing the heat of blast-furnaces and the light of lamps, its uses are self-evident. The nitrogen, which was at first looked upon as wasted, has, by a process due to the same inventors, been turned into ammoniacal salts for manure. Most of the uses of these products were known. What is claimed is the almost fabulous reduction in the cost of production. The chemical text-books, according to Messrs. Brin, are at fault as to the possibilities of baryta. They all teach that it is destructible; and the Brins maintain, that, as they know how to treat it, it is indestructible. Oxygen in large quantities means a revolution in half the processes of chemical industries.

— Before the Amherst-college science association (see *Science*, v. iii. p. 340), the following addresses have been given, and papers read, during the past year: German university life, by G. G. Pond, M.A.; Origin of the vertebrate type, by Prof. J. M. Tyler; The chemistry of photography, by H. B. Ames; Artificial diamonds, by E. H. Smith; Chemistry and its relations, by Prof. E. P. Harris; Post-routes during the siege of Paris, by W. I. Fletcher, M.A.; Atomic weights, by W. H. Hallock; Relation of literature to science, by President J. H. Seelye; Torpedoes, by J. W. Morris; Relation of the mind to the body, by I. H. Upton; Storms, by A. F. Stone; Geology of regions about the Rhine, by Prof. B. K. Emerson; Marriage, by Dr. E. Hitchcock; Labrador, by W. A. Stearns; Astronomical photography, by Prof. David P. Todd; Nebular hypothesis, by Prof. B. K. Emerson; Migration of birds, by F. T. Jencks; Relations of animal to human psychology, by Prof. J. M. Tyler; Geology of South Africa, by B. N. Bridgman; How to choose a physician, by Dr. H. H. Seelye.

— The geological survey of Pennsylvania has now collected the various maps of the Panther-Creek and other coal-basins of that state, to form part i. of its 'grand atlas' of the anthracite coal-fields. It contains twenty-six sheets relating to the eastern end of the western, middle, and southern fields in four counties of the eastern part of the state. They have been published before by instalments, and noticed by us at different times; but their collection into a single atlas marks a welcome stage of that part of the work, under the superintendence of Mr. Ashburner.

— Rear-admiral English, who was recently in the Kongo country, has made a report to the Navy department in regard to the advisability of establishing a commercial station at the mouth of the Kongo River, or of securing a limited district for a depot and 'factorial establishment' for American citizens in that region. He says that the investigations made by Commander Bridgman and U. S. commercial agent Tisdell show that all the available land has been acquired for the nation by the trading-house employees, and is held at extravagant prices. Under these circumstances, Admiral English deemed it unnecessary to take any further action, and was of opinion that to establish a proposed coaling-depot at the Kongo would be unwise and unnecessary. Admiral English quotes from a letter from Tisdell, in which he says, "The reputed wealth of the Kongo valley has been greatly exaggerated, and it will be an undesirable and unprofitable country for an American to make his home or to embark in any business enterprise. Between Vivi and Stanley Pool I saw on all sides misery, want, sickness, and death, particularly among the employees of the International association. The country does not and can not produce food for the white man to live upon, and barely produces enough for the natives." This opinion is confirmed by Commander Bridgman of the Kearsarge, who says that it would be unwise for the government to do any thing to encourage Americans to go to that region. Commander Bridgman has no faith in the future of the Kongo predicted for it by interested parties.

— At the meeting of the Gas institute held in Manchester, Eng., in June, Mr. William Gadd read a paper on the effects of heating air upon combustion. For a considerable period, on purely theoretical grounds, Mr. Gadd had strongly doubted the value of heated air at ordinary pressure as a means of intensifying or causing more perfect combustion. Recent investigations strengthened his doubts to an enormous extent. An observation made by Professor Dixon, in connection with some experiments on a certain regenerator-burner, in which he found that a small quantity of air let in at the bottom or lower part of the lamp much increased the intensity, produced a strong impression on his mind, and confirmed the views he had formed. He therefore resolved to devise some simple experiment which would determine the point. He employed many methods which showed, all of them, in some degree the expected result, and strengthened the belief in the discovery which theory pointed out. He was at last enabled to formulate a method to make the conclusions unmistakable and plain. He found a peculiar phenomenon of flame, which he termed 'a balanced flame of imperfect combustion.' In this he recognized the means for what he conceived to be complete demonstration of that which he had long suspected; namely, that, so far from the heating of air in passages at constant or ordinary pressure increasing combustion, it actually retarded or rendered combustion more imperfect. Mr. Gadd described his experiment, and produced before the meeting the 'balanced flame' he spoke of. His conclusions were strongly contested by several speakers.

— The slight epidemic of small-pox in Berne last winter has hastened the passing of the new vaccination act there, which differs slightly from the previous one. Vaccination is not to be invariably compulsory, a physician's recommendation being sufficient if dispensed with. As a rule, animal lymph, not human, must be used, and the consent of the parents is requisite. The state will provide the doctors with lymph, the doctors undertaking to vaccinate gratis. Any doctor can be prosecuted for injury caused by careless vaccination.