ests in the Lewis and Clarke reserve, the glaciated valley, the numerous mountain chains, the unknown animal and vegetable life, suggest numerous topics for the thoughtful student.

There is no reason why eastern friends should not make the laboratory a rendezvous during the summer. One can recreate to the fullest and yet have a definite object in view. It is impossible to visit the mountains and see them without some one of experience to help the visitor around. Vacation is gone before the wanderer 'hits the trail' he is seeking. His inexperience leads him to undertake things he can not do. Montana can not be seen from the car window. One must push out of the canyons. He is unwise who enters the pathless forests alone. They are too vast, the hills are on too large a scale, and the difficulties are too great to be entered hastily.

From the laboratory the collector may easily reach alpine heights, where grand scenery is spread before him. He may gather material for future study, undertake serious study indoors, more serious and more difficult study out of doors, and have the help and wisdom of those who have spent years in wandering in search of such places as many wish to visit and such specimens as many would gladly gather. The building is entirely inadequate to the demands of those attending, but it is believed that when the merits of the station are known and its opportunities fairly presented it will not lack for suitable quarters.

The summer session opened on July 18, and continues five weeks. The illustrated pamphlet, giving full information, will be sent to any one requesting it.

Morton J. Elrod.
University of Montana,
Missoula, Mont.

SCIENTIFIC BOOKS.

The Evolution of Earth Structure with a Theory of Geomorphic Changes. By T. Mellard Reade. New York, Longmans, Green & Co. 1903.

This work may be considered as a sequel to the well-known volume entitled 'The Origin of Mountain Ranges,' by the same author, which appeared in 1886. It is divided into three parts. The first of these treats of 'Geomorphic Changes' and deals with Regional Oscillation, the Relation of Continental Evolution to Mountain Building, Continental Growth and the Sub-Oceanic Configuration of the Earth's Crust. The second part deals with the 'Dynamics of Mountain Structure' and the experimental elucidation of the same, while the third part is made up chiefly of reprints of papers by the author on subjects allied to those just mentioned, which papers have appeared at various times and in different journals.

The author first cites numerous cases where there is distinct evidence of changes of level in the earth's crust, with concomitant bending of the strata composing the crust. He considers the principle of isostacy as quite inadequate to the explanation of these movements, since the mass of the solid earth involved in upward movement is entirely too great to be explained by any sedimentation which has taken place in the same period of time. These changes of level the author believes must be due to change in bulk of certain sections or portions of the earth's crust, without change of mass; the irregularities in the earth's surface, in fact, arising from differences in the specific gravities of the earth's crust and the underlying matter. These specific gravities are not stable, but are subject to slow changes consequent upon changes of temperature. A rise in temperature and increase in volume create a protuberance; a fall in temperature, on the other hand, gives rise to a depression, even to one of those profound abysses of the ocean aptly named 'deeps.' The cause of these secular variations in temperature, however, is not set forth, although in the mind of the author it seems to be in some way connected with chemical changes taking place in

a solid globe. The very high specific gravity of the earth's interior as compared with that of the lithosphere, is believed by the author to be due to an increase in density of the materials composing the deeper parts of the earth's interior, due to pressure, and is not, according to him, to be attributed to a difference in character of these materials as is commonly supposed.

The great continental or epirogenic uplifts above referred to are not to be confused with the comparatively trivial expansions and contractions to which mountain building is due and which are dealt with by Mr. Mellard Reade in his 'Origin of Mountain Ranges,' as well as in part two of the present work. These latter are local and due to tangential 'creeps' in the lithosphere and surface rocks, which are accompanied by a lateral transfer of material from one place to another, and result from the uneven heating of great masses of sediment. The great continental movements result from alteration in volume of certain portions of the earth's crust, unaccompanied except to a minor extent by lateral movement.

These great movements, moreover, have a very important influence on the secular variation of sea level, since there can be no alteration in the contour of that portion of the surface which is covered by the ocean without a corresponding change of oceanic beach levels over the whole surface of the globe.

In the second part of the book, the author enters upon a description of the results of an experimental investigation into the forms developed in certain materials by heating and by compression. These are presented for the elucidation of the problem of the origin of mountain ranges, and represent a continuation of the results already set forth in the author's former volume on the subject. The materials employed in these experiments were varied in character. At first the action produced by alternately heating and cooling a lead plate, fixed about the edges in a solid framework, was investigated. Anticlinal folds, simple and overturned, were thus developed in the plate, which became thinner in portions of its area owing to the transferrence of lead to the site of the fold.

Subsequently a series of experiments were carried out on the effects of lateral compression on narrow plates of lead alternating with strips of calico and covered by pieces of board, so arranged as to leave a vacant space above the middle of the composite plate. On compression anticlinal folds of several types were developed.

Bars of soap were then compressed in a similar manner, but could not be made to bend, a fault with slickensided surfaces always developing. Alternate layers of damp sand and of sand mixed with coal dust were then tried, and again the material would not fold, but sheared, developing a double set of sharply defined overthrust faults. Layers of moist sand were then alternated with sheets of tea lead and submitted to compression in the same way. In this case the lead prevented the sand shearing, but developed a complicated series of overturned folds to which the sand accommodated itself.

A series of experiments were then carried out on the circular compression of disks of various materials, with the development of domed folds of many types, some of them showing spiral or screw-like movements, similar to those described by Mrs. Gordon in her paper on 'The Torsion Structure of the Dolomites.'

The third part of the book consists of 'Reprints, Speculations and Closing Remarks.'

Among the reprints are the author's well-known papers on the 'Denudation of the Two Americas,' 'The North Atlantic as a Geological Basin,' and a 'Theory of Slate Structure and Slaty Cleavage.' It also includes chapters on 'Time as a Geological Factor,' and on the bearing of the present investigations in the supposed permanence of ocean basins and continents, on which latter much-debated question the conclusion is reached that 'interchanges of such magnitude have occurred in the distribution of the oceans and land masses during geologic time that it would be a misnomer to call them permanent.'

The book, while containing many interesting observations and embodying much research, would be improved by a more careful elaboration of the material which it contains,

in its present form its various parts showing a certain lack of unity. It is well printed and elaborately illustrated.

Frank D. Adams.
McGill University, Montreal.

Catalogue of the Crosby Brown Collection of Musicians' Portraits. Biographical Sketches. New York, The Metropolitan Museum of Art. 1904. 8vo. Pp. vii + 131.

In the series of handbooks relating to Mrs. Brown's great collection which have received notice in Science as they have appeared this little volume is part IV. Along with musical instruments she has collected many hundred portraits of musicians; over 400 of these have been mounted, approximately in chronological order, on hinged frames, and placed in the exhibition galleries.

This catalogue gives a sketch of the life and works of the musicians whose portraits are exhibited, arranged in order of framing. It has also indexes, classified, geographical and alphabetical. It is noticeable that no American is found in the list and no living Englishman; this is doubtless largely due to the fact that photographs have been excluded except in one instance. In view of the many fine prints in the collection the addition of the names of artist and engraver would have added to the value of the work, and interested a wider circle of people in the collection.

The pamphlet does not call for extended review here; its special interest to readers of Science arises from the fact that it is a well-considered attempt to make a museum collection thoroughly intelligible to the public.

Charles K. Wead.

SCIENTIFIC JOURNALS AND ARTICLES.

The *Botanical Gazette* for July contains the following articles: W. J. Land has made an important contribution in the results of his study of "Spermatogenesis and oogenesis in *Ephedra trifurca*." Among the important results may be mentioned the occurrence of two persistent prothallial cells in the male gametophyte, no wall separating the second prothallial from the generative and tube nuclei; also the remarkable pollen chamber developed by the breaking down of the nucellar beak to the embryo sac, the necks of the archegonia projecting into the pollen chamber and coming immediately in contact with the pollen grains.—R. E. Smith presents 'The water-relation of *Puccinia asparagi*,' being a contribution to the biology of a parasitic fungus; both the direct and indirect results are discussed.—D. T. MacDougal presents a somewhat detailed account of 'Delta and desert vegetation' and shows that the region offers unusual opportunities for comparison of the most high developed xerophytic types of the desert with the broad-leaved forms of the delta which root in the mud.—J. C. Arthur has given an account of the discovery of 'The Aecidium of maize rust,' which is found on species of *Oxalis*. The communication is intended not only to announce an interesting fact, but also to illustrate a method of observation not yet commonly understood.—B. E. Livingston and G. H. Jensen have published a short statement of a somewhat striking result obtained from 'An experiment on the relation of soil physics to plant growth,' which gives somewhat conclusive evidence in favor of the view that the amount of water present in the surface layers of the soil is largely dependent upon the size of the soil particles.

DISCUSSION AND CORRESPONDENCE.

THE BIOLOGICAL SURVEY OF THE WATERS OF THE PACIFIC COAST.

To the Editor of Science: The biological survey of the waters of the Pacific adjacent to the coast of southern California recently inaugurated by the San Diego Marine Biological Association will be prosecuted continuously for a number of years. The laboratory connected with the survey, at present located at Coronado, is under the immediate charge of the resident naturalist, and is ready at all times of the year for occupancy by investigators.

The director is authorized by the managing board of the association to offer the privileges of the laboratory to biologists who may desire to visit this locality for a period in the prosecution of special researches. Such facilities