just here that a strictly systematic, rigidly methodical and abstractly analytical text-book of psychology will fail as a pedagogical instrument. If it be a sound psychological doctrine that assimilation demands attention and attention is fed by interest, then the creation and maintenance of an interest is an essential of every text-book, as it is of every teacher. It may be well urged that for this purpose an ounce of teacher is worth a pound of text-book, but even the teacher is better equipped to inspire if he preaches from an inspiring text.

It remains to indicate very briefly the distinctive features and contents of the two books. Following an introductory chapter upon the nature of psychological problems, Professor Titchener devotes three chapters to the simplest element of consciousness, sensation, treating it in its qualitative and quantitative aspects and dwelling as well upon the methods of studying sensation. The affective side of mental life is considered in three somewhat widely separated chapters, first as simple affection, then as feeling and emotion, and again as sentiment. Similarly the will, the active side of psychic phenomena, is considered, first as conation and attention, then as voluntary movement, and (in connection with other processes) in the reaction synthesis. The elaborations of sensation, the complexes to which they lead, are treated under the usual headings—perception, ideas, recognition, memory, imagination, self-consciousness and reasoning. It is thus apparent that the method and order of exposition begins with the simplest elements of consciousness—the last results of analysis—and then considers in turn the compounds and elaborations into which these elements are built up.

Professor Wundt's scheme involves a more elaborate systematization. He devotes considerable space to the general methods and problems of psychology by way of introduction, and then discusses the processes of mental life; first, as psychical elements (sensation and simple feelings); second, as psychical compounds (ideas of intensity, space, time, location, etc., as also composite feelings, emotions and volitional processes); third, as interconnection of psychical compounds (consciousness, attention, association, memory, apperception, etc.); fourth, as psychical developments (the mind of animals, of the child, of society and the race); and finally concludes by the discussion, under the title 'Psychical Causalty and its Laws,' of a problem which belongs quite as much to philosophy as to psychology.

As a translation inherently difficult the result is creditable; but it hardly reaches the ideal criterion of the art that conceals art, for the book seems un-English on every page. The type, the binding, the manner of construction, are all unmistakably German and, together with the foreign terminology and mode of presentation, detract considerably from the possible attractiveness of the volume to the English reader.

Viewed as independent contributions to psychology, both works present a considerable measure of originality. The student of Wundt will naturally turn to his other writings for a more complete exposition of his interpretations of psychological problems, but will find in the 'Outlines' (for instance, in the discussion of psychological methods and classification) many pages that form an essential contribution to his published work. Similarly in Professor Titchener's volume one recognizes many a doctrine and exposition that reflects the outcome of special and original investigation, as well as a position resulting from recent research. Viewed both as text-books and as contributions to psychological discussion, the volumes may unhesitatingly be pronounced welcome and interesting; the further proof of their utility must await the test of time and use.

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GEOLOGIC ATLAS OF THE UNITED STATES.

Folio 23, Nomini, Maryland-Virginia, 1896.

This folio consists of four pages of text signed by H. N. Darton, geologist, a topographic map of the district, a map showing the areal geology, and a map showing the distribution of underground waters and artesian wells. The scale of these maps is 1:125,000.

The area represented in this folio is about 938 square miles, which lies partly in Virginia and partly in Maryland. In Virginia it comprises nearly all of Westmoreland county, with parts of Essex, Northumberland and Richmond,

and in Maryland it includes portions of St. Mary, Charles and Calvert counties. It lies entirely within the Costal Plain area. The Potomac river extends northwest and southeast across the middle of the area; the Patuxent river crosses its northeastern corner, and the Rappahannock river crosses its southwestern corner. To the extreme northeastward it extends to the shore of Chesapeake Bay. These waters are all tidal estuaries. Along the river valleys there are wide, low terraces, capped by the Columbia formation, of Pleistocene age. The intervening areas are plateau remnants, capped by Lafayette deposits, of supposed Pliocene age. The underlying formations are the Chesapeake and Pamunkey, the latter extending from the westward only a few miles into the area, along the north side of the Potomac river.

The Pamunkey formation, of which only the uppermost beds are exposed, consists in greater part of glauconitic marls of Eocene age. It is overlain unconformably by the Chesapeake formation, which is characterized by fine sands, marls and clays, portions of which consist largely of diatomaceous remains. The formation is very fossiliferous at some localities. Its age is Miocene. The greatest thickness which it presents in the Nomini area is about 270 feet, but it continues to thicken gradually to the eastward.

The Lafayette formation, which ranges from 25 to 40 feet in thickness, consists of sandy loams of orange, brown and buff tints, often variegated, containing irregularly disposed bands and sprinklings of small quartzite pebbles and coarse sands. The pebbles and larger sand grains are orange-tinted, mainly by superficial staining. The plateau surface, capped by this formation and deeply incised and dissected by the larger drainage depressions, inclines gently southeastward at an altitude ranging from about 190 feet along the northern and western border of the area to about 90 feet along its eastern border. Its greatest altitude is 200 feet in a portion of Nomini cliffs. It has also in most cases a slight slope into each of the river valleys.

The Columbia formation is a deposit of loam merging downward into coarser materials containing beds of quartzite, gravel and boulders. Its thickness averages about 20 feet. Its surface extends from altitudes of 5 to 60 feet above tide level.

The principal economic features are underground waters, which on the lower lands furnish flows for artesian wells. Three water-bearing horizons are known—one at the base of the Pamunkey formation, another 100 feet higher in the Pamunkey formation, and a third in the lower sandy members of the Chesapeake formation. They all dip to the eastward at a very moderate rate. There are many artesian wells which obtain water supplies from 160 to 305 feet. On the artesian well sheet of the folio distinctive underground contours are given to show the depths below tide level to all of the water-bearing horizons.

Other economic resources of the area are marls in the Pamunkey and Chesapeake formations, diatomaceous deposits in the Chesapeake formation which are often sufficiently pure for commercial use, brick clays, potters' clays, sand and gravel.

Folio 26, Pocahontas, Virginia-West Virginia, 1896.

This folio, by Marius R. Campbell, consists of five pages of text, a topographic sheet (scale 1: 125,000), a sheet of areal geology, one of economic geology, another of structure sections, and, finally, a sheet giving a generalized columnar section of the district.

The territory mapped and described in this folio embraces an area of 950 square miles, the southern portion of which is in Virginia and the northern portion in West Virginia. It is located west of New (Kanawha) river, at the place where the State line leaves East River Mountain, the last of the valley ridges toward the northwest, and follows the irregular crests of the ridges within the coal field. The southern portion of this territory is within the limits of the Appalachian valley, and its surface is marked by linear mountains and narrow valleys, which are the characteristic forms of this central division of the Appalachian province. The northern portion is within the Cumberland plateau region, and its surface is that of a table-land deeply dissected, so that it now presents a confused mass of irregular ridges and hills,

only the summits of which reach the original level of the plateau.

The geologic structure of this region varies as the topography varies. In the northern portion the rocks are nearly horizontal, their northwestward slope being rarely more than 200 feet per mile, whereas in the southern portion the rocks have been highly compressed in a horizontal direction, forming huge folds, which in many places have broken, allowing one portion of the fold to slip over the other. It is this tilted condition of the strata which gives rise to the regular topographic forms of the Appalachian valley. The attitude of the rocks is shown on the structure-section sheet by four sections which cross various portions of the territory.

The geologic history of this region is recorded in the rocks, which tell of prevailing marine conditions from early Cambrian to late Carboniferous time. There were deposited during that time sediments to the extent of 17,000 or 18,000 feet in thickness, which have since been hardened into limestone, shale and sandstone. Of this great mass the limestones form about 6,700 feet; the shales, 9,500 feet, and the sandstones, about 1,400. On lithologic grounds these have been divided into twenty-three separate and distinct formations, which are shown on the general geologic map by various colors and patterns.

There is little variety in the mineral resources of this region. Coal, iron ore and marble constitute about all of the mineral wealth of the territory. A limited area of coarse gray marble occurs along the northern front of Big Walker Mountain, but no development has been undertaken.

Iron ore occurs in two formations of the Upper Silurian rocks. It is of good quality, and probably in sufficient quantity to be of commercial importance, but its inaccessibility has prevented development.

Coal is by far the most important mineral resource of this region. The territory represented by this sheet embraces almost the entire Flat Top or Pocahontas coal field at present developed. All operations are confined to the great No. III. or Pocahontas seam of coal, which is semi-bituminous and ranges in thickness from 4 to 10 feet. It is exposed along the valley of Bluestone river from Pocahontas to the edge of the territory, along Tug Fork, in the valley of Elkhorn creek, from Coaldale to Kimball, near the edge of the area and at several places on the head streams of Guyandotte river. Mining is restricted to the Bluestone region and the valley of Elkhorn creek. In these two areas there are at present in operation thirty-seven distinct mines, which in 1894 produced 3,096,867 long tons of coal.

Folio 28, Piedmont, West Virginia-Maryland, 1896.

This folio consists of six pages of text, signed by N. H. Darton and Joseph A. Taff, geologists, and closing with a series of vertical sections showing the positions and thicknesses of the coal beds; a topographic map; a sheet showing the areal geology of the district; another showing the economic geology; a third exhibiting structure sections, and a fourth containing a columnar section and a key to the synonymy of the various formation names. The maps are on a scale of 1:125,000.

The area represented is about 925 square miles. In Maryland it comprises the southern portion of Garrett county and a small area in the southwestern corner of Allegany county. In West Virginia it includes nearly all of Grant county, the western portions of Hardy and Mineral counties, the northeastern portion of Tucker county, and a narrow area of Preston county, adjacent to the Maryland boundary line. Its southeastern corner is in a region of Appalachian ridges, and it extends northwestward over the Allegheny Mountains and the upper Potomac coal basin to the headwaters of the Youghiogheny river, a branch of the Monongahela river.

The geologic formations comprise members ranging from the sandstones in the middle of the Silurian to the upper Coal Measures of the Carboniferous. In the southeastern portion of the area there are two sharp anticlinal uplifts which bring up the Silurian rocks in two prominent mountains, New Creek Mountain and Patterson Creek Mountain. To the westward lies the coal basin, which extends from the Allegheny front to the Backbone Mountain. Along its center is cut the deep gorge of the north branch of the Potomac river. The basin is a relatively shallow

one, but it contains about 3,000 feet of Carboniferous deposits. To the westward is the anticlinal region of Devonian rocks which underlie the characteristic glade country about Oakland, Mountain Lake Park and Deer Park. West of Oakland is another synclinal basin, containing about 2,500 feet of Carboniferous beds.

The geologic classification does not differ materially from that outlined by W. B. Rogers and others, but geographic names have been applied to all of the formations. The lowest members are a series of sandstones and quartzites, which have been referred to as No. IV. and 'Medina.' This series has been subdivided into the Juniata formation, consisting of brownish-red sandstones and shales; the Tuscarora quartzite, and the Cacapon sandstones, consisting of thin-bedded red sandstones. Next there is the representative Clinton formation, which has been designated the Rockwood formation, as in other folios; the Lewistown limestones, including representatives of the Helderberg and associated limestones, and the Monterey sandstones, Romney shales, Jennings formation and Hampshire formation, representing the Devonian deposits. As the last three formations are not sharply separated from one another, the patterns by which they are represented on the map are merged in a narrow zone along their boundaries. The Carboniferous period is represented by the Pocono sandstone; the Greenbrier limestone; the Canaan formation, which in a general way is a representative of the Mauch Chunk shales; the Blackwater formation, which represents the Pottsville conglomerate in greater or less part; the Savage formation and Bayard formation, which are the Lower Coal Measures; the Fairfax formation, or Lower Barren Measures, and the Elk Garden formation, a part of the Upper Coal Measures.

The principal coal beds are in the Savage formation, containing the 'six foot' or Davis coal bed; the Bayard formation, containing the coal bed known as the 'four-foot,' or 'three-foot,' or 'Bayard,' or 'Thomas' coal, and the Elk Garden formation, containing the 'fourteen-foot' coal bed.

On the economic sheet of this folio the coal-bearing formations are strongly emphasized, and underground contours are introduced to show the lay of the 'six-foot' coal bed in the Savage formation for each 100 feet. Other economic resources of the area are red hematite iron ores in thin beds in Rockwood shales and limestones at several horizons, of which the lower member in the Lewistown is locally available for cement.

Folio 29, Nevada City Special, California, 1896.

This folio, by Waldemar Lindgren, consists of seven pages of text, three special topographic maps (scale 1:14,400)—the Grass Valley, Nevada City and Banner Hill—three corresponding maps showing the economic geology, and three others giving structure sections.

These maps, on a scale of about four inches to the mile, have been prepared to illustrate the detailed structure of the gold-mining regions in the vicinity of Nevada City and Grass Valley. Each of them comprises an area three miles wide by four miles long, the total area being nearly thirty-six square miles. The Nevada City and Grass Valley areas fall within the boundaries of the Smartsville atlas sheet, while the larger part of the Banner Hill area falls within those of the Colfax atlas sheet. The relief is that common to the middle foothill region of the Sierra Nevada—that is, the surface is a very irregular and undulating plateau, deeply trenched by the canyons of the recent river systems.

Sedimentary rocks, chiefly referred to the Calaveras formation, occupy small, usually narrow and long areas imbedded in the predominating igneous masses. Granodiorite occupies a large part of the Nevada City and Banner Hill districts, while a small massif of the same rock is found in the Grass Valley district. Large areas of diabase, porphyrite and brecciated forms of these rocks surround and separate the granodiorite areas. In the southwestern part of the Nevada City district and the northeastern part of the Grass Valley a large and complicated massif is found, consisting in part of diorite, in part of gabbro, pyroxenite and serpentine.

The slates of the Calaveras formation are the oldest rocks. Next younger are the diorities, gabbros and serpentines. Still later are the diabases and porphyrites, and the intrusion of granodiorite closes the succession of igneous rocks.

The bed-rock series is, as usual, in places covered by several hundred feet of Neocene gravels and rhyolitic and andesitic tuffs, the gently sloping top of the andesitic ridges forming a principal feature of the landscape.

The Neocene auriferous gravels have been extensively worked in the Nevada City and Banner Hill districts, both by the drifting and the hydraulic processes, and considerable ground still remains which probably can be profitably worked. The gold-quartz veins are numerous and belong to several distinct systems. They are found in any of the formations represented on the sheet, and generally cross the contacts without change. In the Banner Hill district the veins are narrow but rich, and have a general east-west direction and a northerly or southerly dip. In the Nevada City district the quartz veins have a general north-south direction and an easterly dip of of about 45°. Large dislocations producing over-thrust faults have occurred along several of the veins. In the Grass Valley district there is one system with a west-northwest direction and a steep northerly or southerly dip. On this system the celebrated Idaho mine is located. Most of the veins in the central and southern part of the district have a northerly direction and a flat easterly or westerly dip. The veins are often accompanied by strongly developed sheeting of the country rock.

SCIENTIFIC JOURNALS.

AMERICAN JOURNAL OF SCIENCE.

THE June number begins with an article by Theo. Holm, the fourth in a series of studies on the Cyperaceæ. This contains a full morphological and anatomical study of the species *Dulichium*, and is illustrated by a page of figures. J. C. Branner discusses the subject of bacteria in relation to the decomposition of rocks. The literature of the subject is reviewed and references given to various authors who have believed that the bacteria played an important part in this direction. The author decides, however, that it is highly improbable that any considerable amount of rock decomposition is due to this cause. J. H. Pratt and H. W. Foote describe a new mineral species from the Corundum mine, of Buck Creek, Clay county, North Carolina, to which they have given the name *wellsite*, after Professor H. L. Wells, of New Haven. The mineral belongs to the zeolites and is a silicate of aluminum, barium, strontium and calcium, crystallizing in the monoclinic system. It is particularly interesting since it forms another member of the Phillipsite group to which the species *Phillipsite*, *Harmotome* and *Stilbite* belong.

Howard D. Day discusses the magnetic increment of rigidity of wires in strong magnetic fields. The special subject discussed is "the increase of resistance to torque produced by the magnetization of twisted wires of various diameters, when the magnetic field increases to many times the amount needed to bring out the ordinary magnetic saturation. The object of the research was to make a clear comparison between the phenomenon of magnetization or magnetic intensity, on the one hand, and the phenomena of magnetic rigidity on the other; to show that the two are quite distinct in character—that the former practically subsides in relatively weak fields, whereas the latter are not as fully complete even in the highest fields applied." The apparatus employed is described and figured, and the results presented in a series of curves. It is seen that "as the fields become stronger the increment of rigidity varies more and more regularly with the twist, the tendency being that in fields indefinitely large the increment of rigidity would be proportional to the twist applied."

P. F. Schneider describes a geologic fault at Jamesville, near Syracuse, N. Y. The interest of the matter lies largely in the fact that this region has been shown to be characterized by a number of igneous dikes. H. L. Wells and H. W. Foote have two articles on chemical subjects, the first describing certain double halogen salts of cæsium and rubidium, and the second being devoted to the double fluorides of zirconium with lithium, sodium and thallium.

A. St.C. Dunstan, M. E. Rice and C. A. Kraus give the results of some observations made on the broadening of sodium lines by intense magnetic fields. Their results confirm the recently published work of Zeeman. They state that using fields ranging from 0 to 7800