

SCIENCE

EDITORIAL COMMITTEE: S. NEWCOMB, Mathematics; R. S. WOODWARD, Mechanics; E. C. PICKERING, Astronomy; T. C. MENDENHALL, Physics; R. H. THURSTON, Engineering; IRA REMSEN, Chemistry; JOSEPH LE CONTE, Geology; W. M. DAVIS, Physiography; HENRY F. OSBORN, Paleontology; W. K. BROOKS, C. HART MERRIAM, Zoology; S. H. SCUDDER, Entomology; C. E. BESSEY, N. L. BRITTON, Botany; C. S. MINOT, Embryology, Histology; H. P. BOWDITCH, Physiology; J. S. BILLINGS, Hygiene; WILLIAM H. WELCH, Pathology; J. McKEEN CATTELL, Psychology; J. W. POWELL, Anthropology.

FRIDAY, AUGUST 31, 1900.

DOCTORATES CONFERRED BY AMERICAN UNIVERSITIES.

CONTENTS:

<i>Doctorates Conferred by American Universities</i>	321
<i>Inertia and Gravitation</i> : PROFESSOR REGINALD A. FESSENDEN	325
<i>The Work of the Society for Agricultural Education</i> : PROFESSOR W. J. BEAL	328
<i>The British Association</i>	334
<i>Variation among Hydromedusæ</i> : PROFESSOR CHARLES W. HARGITT	340
<i>Lateral Line Organs in Eumica Auriculata n sp.</i> : PROFESSOR AARON A. TREADWELL.....	342
<i>Scientific Books</i> :—	
<i>Buckingham's Outline of the Theory of Thermodynamics</i> : PROFESSOR J. E. TREVOR. <i>Jorgensen's Microorganisms and Fermentation</i> : H. W. C. Books Received.....	343
<i>Scientific Journals and Articles</i>	345
<i>Discussion and Correspondence</i> :—	
<i>Eminent American Men of Science</i> : PROFESSOR HENRY MONTGOMERY	346
<i>International Commission on Atomic Weights</i> : J. L. H.	346
<i>Plant Embryo-Sacs</i> . DR. K. M. WIEGAND	347
<i>Scientific Notes and News</i>	347
<i>University and Educational News</i>	352

MSS. intended for publication and books, etc., intended for review should be sent to the responsible editor, Professor J. McKeen Cattell, Garrison-on-Hudson N. Y.

REPORTS received from official sources show that during the past year the degree of doctor of philosophy has been conferred by 22 universities on 233 candidates. The numbers given by each university in the humanities and in the sciences and a comparison with the two preceding years are shown in the following table:

	Humanities.	Sciences.	Total for 1900.	1899.	1898.
Chicago.....	18	19	37	24	36
Harvard	21	15	36	24	26
Johns Hopkins..	13	20	33	38	33
Yale	16	10	26	30	34
Columbia	9	12	21	33	22
Cornell	8	11	19	7	19
Clark	0	9	9	5	12
Pennsylvania...	3	6	9	20	24
New York.....	7	0	7	9	5
Columbian	2	3	5	0	1
Michigan.....	4	1	5	4	7
Wisconsin.....	4	1	5	7	5
Brown	3	0	3	3	1
Minnesota	2	1	3	2	1
Princeton	2	1	3	3	0
Vanderbilt	2	1	3	0	0
California	1	1	2	3	1
Stanford.....	2	0	2	0	2
Virginia	2	0	2	2	0
Bryn Mawr ...	0	1	1	3	3
Nebraska	0	1	1	1	2
Tulane	1	0	1	0	0
Colorado	0	0	0	1	0
Kansas	0	0	0	1	0
Missouri	0	0	0	1	0
Syracuse	0	0	0	1	0
Washington...	0	0	0	2	0
Total.....	120	113	233	224	234

The table shows that the degree was conferred nine times more often than last year, but once less often than in 1898. For the three consecutive years beginning with 1898, the degree has been conferred in the sciences 105, 115 and 113 times; in the humanities 129, 109 and 120 times. Students are consequently pretty equally divided between the two divisions as here drawn. The separation is, of course, somewhat arbitrary. Psychology, sociology and education have been placed with the sciences, while philosophy and political economy are included under the humanities. Yet a student of philosophy may have interests falling strictly under the sciences—in the sense of the natural and exact sciences in which this word must for convenience be used—while a student of education may have but few such interests.

The degrees were in all cases the Ph.D., with the exception of one D.Sc. from Harvard. The University of Chicago conferred the degree of Ph.D. on nine students in the divinity school. These have not been included above as it is not certain that the work has been equivalent to that of the other candidates. The same holds, however, for some of the degrees in education and in chemistry in which cases perhaps a technical or professional degree should be given.

The University of Pennsylvania has during the year decided to require the printing of the doctors theses, and steps in this direction have been taken at Harvard. The degree seems not to have been given *causa honoris* by any important institution.

It appears from the tables and from the data on which they are based that the humanities are favored at Harvard and Yale and the sciences at Johns Hopkins, Columbia and Cornell. Last year Johns Hopkins gave more than its proportionate share of degrees in chemistry, physics, zoology and physiology, Chicago in mathematics, geol-

ogy, sociology and education, Harvard in physics, zoology and anthropology, Columbia in astronomy, botany, zoology and education, Yale in paleontology and psychology, Cornell in botany and psychology and Clark in mathematics, psychology and education.

The distribution of students among the different sciences for 1900 and for the two preceding years is as follows :

	1900	1899	1898
Chemistry	26	32	27
Physics	15	7	11
Botany	12	11	11
Mathematics	11	13	11
Zoology	11	11	12
Psychology	9	15	18
Education	8	5	—
Geology	5	5	6
Astronomy	4	2	3
Physiology	4	1	4
Sociology	3	5	—
Anthropology	2	0	2
Paleontology	2	4	0
Bacteriology	1	1	0
Mineralogy	0	2	0
Meteorology	0	1	0
	113	115	105

The names of those on whom the doctorate was conferred for work in the sciences and the titles of their theses are as follows :

JOHNS HOPKINS UNIVERSITY.

Homer Van Valkenburg Black : The Permanganates of Barium, Strontium, and Calcium.

William Martin Blanchard : The Chlorides of Parabromorthosulphobenzoic Acid and some of their Derivatives.

Hall Canter : Orthophenylsulphonebenzoic Acid and related Compounds.

Charles Edward Caspari : An Investigation of the Fatty Oil contained in the seeds of *Lindera Benzoin*. II. Lauric Acid and some of its Derivatives.

Hardee Chambliss : The Permanganates of Magnesium, Zinc, and Cadmium.

James Edwin Duerden : West-Indian Madreporian Polyyps.

Luther Pfahler Eisenhart : Infinitesimal Deformation of Surfaces.

Wightman Wells Garner : Action of Aromatic Sulphonchlorides on Urea.

Lawrence Edmonds Griffin : The Anatomy of *Nautilus Pompilius*.

Joseph Cawdell Herrick : The Influence of Variation of Temperature upon Nervous Conductivity, studied by the Galvanometric Method.

David Wilbur Horn : A Study of the Action of Carbon Dioxide on the Borates of Barium, and of the Action of Acid Borates on Carbonate of Barium at High Temperatures.

William Bashford Huff : The Spectra of Mercury.

Robert Edmund Humphreys : The Action of Phenol on the Chlorides of Orthosulphobenzoic Acid.

Charles Ranald McInnes : Supersculated Sections of Surfaces.

Austin McDowell Patterson : The Reduction of Permanganic Acid by Hydrogen and Ethylene and a Study of some of its Salts.

Louis Maxwell Potts : Rowland's New Method for measuring Electric Absorption and Energy Losses due to Hysteresis and Foucault Currents, and Detection of Short Circuits in Coils.

Albert Moore Reese : Structure and Development of the Thyroid Gland in *Petromyzon*.

Herbert Meredith Reese : An Investigation of the Zeeman Effect with reference to Cadmium, Zinc, Magnesium, Iron, Nickel, Titanium, Carbon, Calcium, Aluminium, Silicon and Mercury.

Richard Burton Rowe : The Paleodevonian Formations in Maryland : a study of their Stratigraphy and Faunas.

Elisha Chisholm Walden : A Plethysmographic Study of the Conditions during Hypnotic Sleep.

THE UNIVERSITY OF CHICAGO.

John Charles Hessler : On Alkyl Malonic Nitrile Derivatives.

William McPherson : The Constitution of the Oxyazo Compounds.

Henry Chalmers Biddle : Ueber Derivate des Kuretins und der Formhydroxamsäure und ihre Beziehungen zur Knallsäure.

William Gillespie : Determination of all Hyperelliptic Integrals of the first kind of Genus 3 reducible to Elliptic Integrals by Transformations of the Second and Third Degrees.

Annie Marion MacLean : The Acadian Element in the Population of Nova Scotia.

Forest Ray Moulton : A Particular Class of Periodic Solutions of the Problem of Three Bodies.

Howell Emlyn Davies : The Occurrence of the Typhoid Bacillus in Typhoid Fever Patients.

Jacob Dorsey Forrest : The Development of Industrial Organizations.

Thomas Cramer Hopkins : The Genesis of Certain Limonite Ores of Pennsylvania.

Gilbert Ames Bliss : The Geodesic Lines on the Anchor Ring.

William Arthur Clark : Suggestion in Education.

Robert Francis Earhart : Sparking Distances between Plates for Small Distances.

Walter Eugene Garrey : The Effect of Ion upon the Aggregation of Infusoria.

Michael Frederic Guyer : The Spermatogenesis of Normal and Hybrid Pigeons.

Derrick Norman Lehmer : Asymptotic Evaluation of certain Totient-Sums.

William Newton Logan : A North American Epicontinental Sea of Jurassic Age.

John Hector McDonald : Concerning the System of the Binary Cubic and Quadratic with application to the Reduction of Hyperelliptic Integrals to Elliptic Integrals by a Transformation of Order Four.

Frank Lincoln Stevens : The Compound Oosphere of *Albugo Bliti*.

Ella Flagg Young : Isolation in School Systems.

HARVARD UNIVERSITY.

Harrison Hitchcock Brown : The Dialectic Constant of Water.

Roland Burrage Dixon : The Language of the Maidu Indians of California.

Waldermar Koch : Orthobenzochinone and some of its Derivatives.

Theodore Lyman : False Spectra from the Rowland Concave Grating.

William Edward McElfresh : The Influence of Occluded Hydrogen upon the Electrical Properties of certain Metals.

George Thomas Moore : A Contribution to the Knowledge of the Structure and Development of certain Unicellular Algae, with especial Reference to the Question of Polymorphism in the Chlorophyceae.

Harry George Parker : On the Occlusion of Baric Chloride by Baric Sulphate ; A Revision of the Atomic Weight of Magnesium.

George Washington Pierce : Application of the Radio-Micrometer to the Measurement of Short Electric Waves.

Charles William Prentiss : The Otocyst of Decapod Crustacea : Its Structure, Development, and Physiology.

Herbert Wilbur Rand : A Study of the Regenerating Nervous System of Lumbricidae, with special regard to the Centrosome of Nerve Cells.

Charles Henry Rieber : Tactual Illusions : An Experimental Proof of the Spatial Harmony of Sight and Touch.

John Reed Swanton : The Morphology of the Chinook Verb.

Alvin Sawyer Wheeler : The Reduction Products of Dehydromucic Acid.

Stephen Riggs Williams : Changes Incident to the

Migration of the Eye in *Pseudopleuronectes americanus*, together with some Observations on the Optic Tract and Optic Tectum.

Amadeus William Grabau : Phylogeny of Gastropoda : I. The Fusidae and their Allies.

COLUMBIA UNIVERSITY.

George Neander Bauer : The Parallax of μ Cassiopeia and the Positions of 56 Neighboring Stars as deduced from the Rutherford Photographic Measures.

William Isaac Chamberlain : Education in India.

Caroline Ellen Furness : Catalogue of Stars within One Degree of the North Pole, and Optical Distortion of the Helsingfors Astrophotographic Telescope, deduced from Photographic Measures.

August Henry Gotthelf : The Action of Nitrils on Organic Acids.

David Griffith : The North American Lordariaceæ.

Tracy Elliot Hazen : The Ulothricaceæ and Chætophoraceæ of the United States.

Charles Judson Herrick : The Cranial and First Spinal Nerves of Menidia ; a Contribution on the Nerve Components of the Bony Fishes.

Aladine Cummings Longden : Electrical Resistance of Thin Films Deposited by Kathode Discharge.

Hermann Andreas Loos : A Study on the Constitution of Colophony Resin.

Frederick Clark Paulmier : The Spermatogenesis of *Anasa tristis*.

Rudolph Rex Reeder : The Historical Development of School Readers and Method in Teaching Reading.

Frank Clarence Spencer : The Education of the Pueblo Child : a Study of Arrested Development.

CORNELL UNIVERSITY.

William Chandler Bagley : The Apperception of the Spoken Sentence.

Charles Edward Brewer : The Constitution of Galein and Coerulein.

Kary Cadmus Davis : A Taxonomic Study of North American Ranunculaceæ as found in Gardens or Native.

Stevenson Whitcomb Fletcher : Pollination in Orchards.

Charles Tobias Knipp : The Surface Tension of Water above 100° Centigrade.

Gertude Shorb Martin : The Dying Out of Uncivilized Insular Peoples in Contact with Modern Civilization—a Study in Social Selection.

William Fairfield Mercer : The Development of the Wings of the Lepidoptera.

Wilhelm Miller : Chrysanthemums.

Edward Charles Murphy : The Windmill : Its Efficiency and the Conditions of its Economic Use.

William Alphonso Murrill : The Development of

the Archegonium and Fertilization in the Hemlock Spruce.

Guy Montrose Whipple : An Analytic Study of the Judgment-Process in Discrimination of Clangs.

YALE UNIVERSITY.

Joseph Barrell : The Geology of the Elkhorn District, Montana.

Ernest William Brown : Contribution to the Chemistry of the Formation of Uric Acid in Man.

Alexander Cameron : Tactual Perception.

Herdman Fitzgerald Cleland : A Study of Fossil Faunas in the Hamilton Stage of New York.

Joseph Hall Hart : The Action of Light on Magnetism.

Herbert Edwin Hawkes : Examination and Extension of Peirce's Linear Associative Algebra.

Cloyd North McAllister : Researches on Writing.

William Kent Shepard : A new Solution for the Copper Voltmeter.

William Valentine : Researches on Substitution ; The Action of Bromine on Metachlor-, Metabrom-, and Metaiodanilines ; The examination of Thiobenzoic Acid in regard to its action on compounds containing Amido, Imido, and Hydroxyl Groups.

George Reber Wieland : Osteology of Some Fossil Turtles ; A Study of American Fossil Cycads : 1. Geological Distribution ; 2. Structure of the Leaf.

CLARK UNIVERSITY.

John S. French : On the Theory of the Pertingents to a Plane Curve.

Frank B. Williams : Geometry on Ruled Quartic Surfaces.

S. Elmer Slocum : On the Continuity of Groups Generated by Infinitesimal Transformations.

Halcott C. Moreno : On Ruled Loci in n -fold Space.

Thomas Rich Crosswell : Amusements of Worcester School Children.

Norman Triplett : The Psychology of Conjuring Deceptions.

Frederick Eby : The Reconstruction of the Kindergarten.

Willard Stanton Small : Studies of the Psychology of the White Rat.

Charles Herbert Thurber : The Principles of School Organization.

UNIVERSITY OF PENNSYLVANIA.

Morton Githens Lloyd : The Transversal Thermomagnetic Effect in Bismuth.

Anna Jane McKeag : The Sensation of Pain : an Experimental and Critical Analysis.

George Ward Rockwell : An Electrolytic Study of Pyroracemic Acid.

Charles Lawrence Sargent : Alloys of Tungsten and of Molybdenum obtained in the Electric Furnace.

Charles Hugh Shaw : A Comparative Study of the flowers of *Polygala polygama* and *P. pauciflora*, with a Discussion of Cleistogamy.

Albert Duncan Yocum : An Inquiry into the Fundamental Processes of Addition and Subtraction.

COLUMBIAN UNIVERSITY.

Eugene Byrnes : Experiments on the direct Conversion of the Energy of Carbon into Electrical Energy.

Charles Russel Ely : Investigation of Phenomenon of Deliquescence and of the Capacity of Salts to attract Water Vapor.

Ernestine Fireman : The Action of Phosphonium Iodide on Tetra and Penta Chlorides.

UNIVERSITY OF CALIFORNIA.

Walter Charles Blasdale : A Chemical Study of the Indument found on the Fronds of *Gymnogramme triangularis*.

BRYN MAWR COLLEGE.

Florence Peebles : Experiments in Regeneration and in Grafting of Hydrozoa.

UNIVERSITY OF MICHIGAN.

Eugene Cyrus Woodruff : The Effects of Temperature on the Tuning Fork.

UNIVERSITY OF MINNESOTA.

Bruce Fink : Contributions to a Knowledge of the Lichens of Minnesota.

UNIVERSITY OF NEBRASKA.

Charles Fordyce : The Cladocera of Nebraska.

PRINCETON UNIVERSITY.

Henry Norris Russell : The General Perturbations of the Major Areis of Eros caused by the Action of Mars ; with the corresponding Terms in the Mean Longitude.

VANDERBILT UNIVERSITY.

J. Magruder Sullivan : Coal Tar Pitch and its High-boiling Fractions and Residue.

UNIVERSITY OF WISCONSIN.

Carl Edward Magnusson : The Anomalous Dispersion of Cyanin.

INERTIA AND GRAVITATION.

It was shown by J. J. Thomson ('Effects produced by the Motion of Electrified Bodies,' *Phil. Mag.*, April, 1881), that a charged body has more inertia than an uncharged one.*

* The formula there given contains a slight slip in the numerical coefficient, as was first pointed out by Heaviside. $\frac{1}{3}$ should be written for $\frac{1}{2}$.

In 1890* and 1891† the writer introduced, for the first time, the conception that it was not only, as in the electrochemical theories of Davy, Berzelius, Helmholtz, and others, atoms in chemical combination or the dissociated components of a molecule, which had charges ; but that all atoms, even in such substances as metallic copper and silver, possessed charges, and that the so-called neutral atoms were not devoid of charges, 'but had equal quantities of both kinds of electricity.'

For practically a year it was found impossible to secure publication of this theory, the two principal objections which the editors to whom it was sent made to it being that in the first place it was a fundamental fact that all electric charges must reside on the outside of conductors, and that consequently the atoms of a conductor, such as copper, could not possibly have individual charges, and secondly that 'the atoms, being self-evidently conductors themselves, or else the metal as a whole could not conduct,' the postulated equal charges on the atoms would immediately neutralize each other. A brief note was finally published by the kindness of the editor of the *Electrical World* in that paper,† but accompanied with an editorial to the effect that though the numerical relations connecting the elastic constants with atomic volume, discovered by the writer and adduced as proof of the theory, were no doubt interesting, the theory was probably wrong, and the efforts due 'to intermolecular forces just about sufficient to account for the particular sort of strain which we know as an electric charge.'

The above is not mentioned for the purpose of discrediting the judgment of the editors referred to, for when even specialists did not, at a much later date, see that it could be reconciled with the physical facts,

* Lecture, Elect. Soc., Newark, May, 1890.

† *Elec. World.*, Aug. 8 and Aug. 22, 1891.