SCIENCE

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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.

DOCTORATES CONFERRED BY AMERICAN UNIVERSITIES.

THE degree of doctor of philosophy has this year been conferred on 266 candidates by 27 institutions. This exceeds by 10 the number conferred in 1901, and is doubtless the largest number ever conferred by American universities. The increase from year to year is, however, uncertain and small, the numbers for the six years being 234, 222, 239, 253, 216 and 266. It seems that the number of graduate students has increased more rapidly than the doctorates, which may possibly be due to somewhat more strict requirements. Still it is rather disappointing that the number of men with a proper training for research and advanced teaching increases so slowly. It should also be remembered that the number studying in Germany tends to decrease.

The statistics here given do not agree with those published subsequently by the U. S. Commissioner of Education, and as the latter figures are widely quoted, it may be well to call attention to the fact that they are valueless. The report of the commissioner records 343 doctorates conferred in 1901, but the table shows that the largest number of degrees conferred on examination was by Taylor University at Upland, Ind., which gave the doctorate of philosophy to no less than 45 candidates. One may well wish to learn something in

regard to a university with such a remarkable record, and the information is given a few pages farther on in the report Taylor 'University' has no productive funds; its income from tuition and other fees was $4,000 and from other sources $500! Unless they are to do more harm than good, the commissioner of education must in this and other cases put his figures in a form that is not misleading.

The following table gives details in regard to the conferring of the degree during the past six years:

DOCTORATES CONFERRED.

	1898.	1899.	1900.	1901.	1902.	1903.	Total
Yale	34	30	26	39	29	36	194
Chicago	36	24	37	36	27	32	192
Harvard	26	24	36	29	31	28	174
Johns Hopkins	33	38	33	30	17	23	174
Columbia	22	33	21	25	32	39	172
Pennsylvania	24	20	15	25	14	29	127
Cornell	19	7	19	21	23	20	109
Michigan	7	4	5	3	10	10	39
Clark	12	5	9	7	1	4	38
New York	5	9	7	6	4	4	35
Wisconsin	5	7	5	5	6	2	30
Virginia	0	2	2	8	6	3	21
Brown	1	3	3	2	2	5	16
Columbian	1	0	5	3	2	4	15
Minnesota	1	2	3	2	3	3	14
California	1	3	2	2	1	3	12
Bryn Mawr	3	3	1	2	2	0	11
Princeton	0	3	3	3	1	1	11
Stanford	2	0	2	2	2	1	9
Nebraska	2	1	1	1	0	0	5
Boston	0	0	0	0	0	4	4
Vanderbilt	0	0	3	1	0	—	4
Washington	0	2	0	1	0	1	4
Georgetown	0	0	0	0	0	3	3
Kansas	0	1	0	0	0	2	3
Lafayette	0	0	0	0	0	3	3
North Carolina	0	0	0	0	2	1	3
Iowa	0	0	0	0	0	2	2
Lehigh	0	0	0	0	0	2	2
Syracuse	0	1	0	0	1	0	2
Cincinnati	0	0	0	0	0	1	1
Colorado	0	1	0	0	0	0	1
Tulane	0	0	1	0	0	0	1
Missouri	0	1	0	0	0	0	1
	234	224	239	253	216	266	1432

It will be noticed that five universities are distinctly in advance, and that a large majority of the degrees—four fifths—are conferred by seven universities. There has been no considerable change in the position of the universities during the years covered by the records, though there is apparently an increase at Columbia and Michigan and a decrease at Johns Hopkins and Clark.

The degree of doctor of science was conferred this year once by Harvard and once by Michigan, and is included with doctorates of philosophy. This degree is not needed as a substitute for the Ph.D. It does not mean that the student has done a different kind of university or even college work, but that he perhaps did not study Latin at school.* Harvard established an M.S. degree four or five years since and then abandoned it. Doubtless the D.Sc. will not survive long.

DOCTORATES CONFERRED IN THE SCIENCES.

	1898.	1899.	1900.	1901.	1902.	1903.	Total
Chicago	12	13	19	16	15	21	96
Johns Hopkins	19	17	20	19	9	10	94
Columbia	10	23	12	13	14	18	90
Harvard	11	7	15	15	14	15	77
Yale	11	15	10	18	10	13	77
Cornell	11	2	11	13	16	13	66
Pennsylvania	8	8	6	12	5	14	53
Clark	12	5	9	7	1	4	38
Wisconsin	2	4	1	3	4	0	14
Michigan	0	3	1	0	5	4	13
California	1	3	1	2	1	3	11
Columbian	1	0	3	1	1	4	10
Virginia	0	2	0	4	1	2	9
Brown	1	0	0	1	2	4	8
Bryn Mawr	1	2	1	2	1	0	7
Stanford	2	0	0	1	2	1	6
Minnesota	0	1	1	0	2	1	5
Nebraska	2	1	1	1	0	0	5
Princeton	0	3	1	0	0	1	5
Washington	0	2	0	1	0	1	4
Kansas	0	1	0	0	0	2	3
New York	1	1	0	1	0	0	3
North Carolina	0	0	0	0	2	1	3
Lehigh	0	0	0	0	0	2	2
Vanderbilt	0	0	1	1	0		2
Colorado	0	1	0	0	0	0	1
Iowa	0	0	0	0	0	1	1
Lafayette	0	0	0	0	0	1	1
Missouri	0	1	0	0	0	0	1
Syracuse	0	0	0	0	1	0	1
	105	115	113	131	106	136	706

In the second table the degrees awarded in the natural and exact sciences are given

* It may be suggested to 'Carolum Guilielmum Eliot · præsidem magnificum' that there is a slight lack of courtesy in calling attention to the fact that a man probably does not know Latin, and then printing his name 'Georgius' on the commencement program.

separately. It will be noticed that the numbers are nearly equally divided between what, for lack of better terms, we must call the sciences and the humanities. The order of the universities is not the same here as for the total number of degrees conferred, showing that the sciences are relatively more favored at some institutions than at others.

DOCTORATES CONFERRED IN THE SCIENCES.

	1898.	1899.	1900.	1901.	1902.	1903.	Total.
Chemistry	27	32	26	28	26	33	172
Physics	11	7	15	23	12	14	82
Psychology	18	15	9	13	8	16	79
Zoology	12	11	11	15	16	12	77
Mathematics	11	13	11	18	8	7	68
Botany	11	11	12	8	11	9	62
Geology	6	5	5	10	6	10	42
Physiology	4	1	4	1	8	8	26
Astronomy	3	2	4	5	2	4	20
Education	0	5	8	2	1	2	18
Sociology	0	5	3	3	4	2	17
Paleontology	0	4	2	1	0	2	9
Bacteriology	0	1	1	1	1	3	7
Anthropology	2	0	2	1	0	1	6
Anatomy	0	0	0	1	0	4	5
Agriculture	0	0	0	0	2	2	4
Engineering	0	0	0	1	0	3	4
Mineralogy	0	2	0	0	1	1	4
Pathology	0	0	0	0	0	3	3
Meteorology	0	1	0	0	0	0	1
	105	115	113	131	106	136	706

In the third table details are given for the separate sciences. More degrees are always conferred in chemistry than in any other science. This year there were 33 degrees in chemistry, 16 in psychology, 14 in physics, 12 in zoology and 10 in geology. We are pleased to note an increase in the number of degrees in pathology, bacteriology, physiology and anatomy. The universities conferring three or more degrees in a science are: Columbia—chemistry 4, geology 4, psychology 4, zoology 3; Pennsylvania—chemistry 5, physics 3; Chicago—chemistry 4, botany 4; Harvard—chemistry 4, psychology 4; Johns Hopkins—physics 4, chemistry 3; Clark—psychology 3; Yale—chemistry 3.

The names of those on whom the degrees were conferred and the subjects of their theses are as follows:

UNIVERSITY OF CHICAGO.

Solomon Farley Acree: 'Condensations in the Aromatic Series.'

Theodore Christian Frye: 'Fertilization and Attendant Phenomena in *Asclepias* and *Acerates*.'

Eugene Paul Schoch: 'The Red and the Yellow Mercuric Oxides and the Mercuric Oxychlorides.'

Edward Emery Slosson: 'On Acylhalogenamine Derivatives and the Beckmann Rearrangement.'

Charles Hugh Neilson: 'The Hydrolysis and Synthesis of Fats by Platinum Black.'

Ralph Waldo Webster: 'On Osmotic and Ionic Effects in the Absorption of Liquids by Animal Tissues.'

William Albert Hamilton: 'On the Convergency of the Series in the Determination of the Elements of Parabolic Orbits and the Errors Introduced in the Elements by Imperfections of the Observations.'

Mary Hefferan: 'A Comparative Study of a Group of Chromogenic Bacteria.'

Charles Ingbert: 'The Enumeration of the Modulated Nerve-Fibers in the Dorsal Spinal Nerve-Roots of Man.'

William J. Moenkhaus: 'The Development of the Hybrids Between *Fundulus heterocletus* and *Menithia notata* with Especial Reference to the Behavior of the Maternal and Paternal Chromatin.'

Henry Taber Upson: 'Molecular Rearrangements in the Orthoamino Phenol Derivatives.'

John Broadus Watson: 'The Psychic Development of the White Rat Correlated With the Growth of its Nervous System.'

Harry Gideon Wells: 'Experimental Fat Necrosis.'

William Clinton Alden: 'The Evolution of the Darien Lobe of the Lake Michigan Glacier.'

Bennett Mills Allen: 'The Development of the Ovary and the Testis in the Mammals.'

Wallace Walter Atwood: 'The Glaciation of the Wasatch Mountains.'

John Frederick Garber: 'The Life History of *Ricciocarpus natans*.'

Kate Gordon: 'On the Psychology of Meaning.'

George Mellinger Holferty: 'Contribution to the Life History of *Potamogeton*.'

Oswald Veblen: 'A System of Axioms for Geometry.'

Harry Nichols Whitford: 'The Ecological Relations of the Coniferous Forests of the Flathead Valley, Montana.'

COLUMBIA UNIVERSITY.

Joseph Hershey Bair: 'The Practice-curve; a Study in the Formation of Habits.'

Rudolph Michael Binder: 'Feeling as the Principle of Individuation and Socialization.'

Myrick Nathaniel Bolles: 'The Concentration of Gold and Silver in Iron Bottoms reduced from Highly Ferruginous Copper Mattes.'

William Campbell: 'The Microscopical Examination of the Alloys of Copper and Tin.'

Charles William Dickson: 'The Ore Deposits of Sudbury, Ontario.'

George Irving Finlay: 'The Nephetite-syenite and Associated Dikes in the San Carlos Mountains, Tamaulipas, Mexico.'

Philip Bovier Hawk: 'Influence of Hemorrhage upon Metabolism.'

Ernest Norton Henderson: 'A Study of Memory for Connected Trains of Thought.'

Douglas Wilson Johnson: 'The Geology of the Cerrillos Hills, New Mexico.'

Ernest Beckwith Kent: 'Constructive Work in Elementary Education.'

Joseph Edward Kirkwood: 'The Comparative Embryology of the Cucurbitaceæ.'

Richard Swann Lull: 'Footprints of the Jura-Trias of North America, with a Preliminary Revision of the Eastern, Vertebrate Fauna of the Period.'

James Franklin Messenger: 'The Perception of Number.'

James Burt Miner: 'Rhythms: Motor, Visual, and Applied.'

Ida Helen Ogilvie: 'The Geology of the Paradox Lake Quadrangle, New York.'

George Braxton Pegram: 'Secondary Radioactivity in the Electrolysis of Thorium Solutions.'

Herman Simon Riederer: 'The Quantitative Determination of Bismuth as Molybdate.'

Louis Franklin Snow: 'The College Curriculum in the United States.'

Harry Beal Torrey: 'On Regeneration on Hydroids.'

Stephen Francis Weston: 'Justice in Taxation.'

HARVARD UNIVERSITY.

Frederick Bonnet: I., 'The Changing Hydrolytic Equilibrium of Chromic Sulphate'; II., 'The Compressibility of Metals.'

Charles Theodore Burnett: 'Influences on the Judgment of Number.'

David Raymond Curtiss: 'Binary Families in a Triply Connected Region, with Especial Reference to Hypergeometric Families.'

Knight Dunlap: 'Tactual Time: An Experimental Investigation.'

William Curtis Farabee: 'Hereditary and Sexual Influences in Meristic Variation: A Study of Digital Malformations in Man.'

Lawrence La Forge: 'The Geology of Somerville, Massachusetts.'

Thomas Calvin McKay: 'On the Relation of the Hall Effect to the Current Density in Gold.'

Kenneth Lamartine Mark: 'The Expansion of Gases by Heat under Constant Pressure.'

Amos William Peters: 'Metabolism and the Reaction of Division in Protozoa.'

Horatius Chamberlain Porter: 'Derivatives of Tetrabromorthobenzoquinone.'

David Camp Rogers: 'Coordinations in Space Perceptions.'

Marlow Alexander Shaw: 'Illusions of a Kinesthetic Character.'

Wilfred Newsome Stull: I., 'Association of Energy with Matter'; II., 'The Speed and Nature of the Reaction of Bromine on Oxalic Acid.'

Thomas Wayland Vaughan: 'The Eocene and Lower Oligocene Coral Faunas of the United States, with Descriptions of a Few Doubtfully Cretaceous Species.'

George Byron Gordon: 'The Serpent Motive in the Ancient Art of Mexico and Central America.'

UNIVERSITY OF PENNSYLVANIA.

Christian Carl Carstens: 'Endowments: A Study of Certain American Bequests.'

Dana Brackenridge Casteel: 'The Cell-Lineage and Early Larval Development of *Fiona marina*, a Nudibranch Mollusc.'

Homer Munro Derr: 'A Method of Petrographic Analysis Based upon Chromatic Interference with Thin Sections in Parallel Polarized Light.'

William Hastings Easton: 'The Reduction of Nitric Acid in Metallic Nitrates to Ammonia by the Electric Current.'

Franz Frederick Exner: 'The Rapid Precipitation of Metals, by the Rotation of the Anode, in the Electrolytic Way.'

Leon Wilson Hartman: 'A Spectrophotometric Study of the Luminous Radiation from the Nernst Lamp Glower under Varying Current Density.'

Burt Laws Hartwell: 'The Action of Organic Bases upon the Rare Earths.'

Carl Kelsey: 'The Negro Farmer.'

William McClellan: 'Thermo-Electric Behavior of Nickel Nitrate.'

Lewis Irving Neikirk: 'Groups of Order p^m which contain Cyclic Subgroups of Order p^{m-3}.'

James Allen Nelson: 'The Early Development of *Dinophilus;* a Study in Cell Lineage.'

Orville Paul Phillips: 'A Comparative Study of the Cytology and Movements of the Cyanophyceæ.'

George Philipp Scholl: 'The Electrolytic Determination of Manganese and its Separation from Iron and Zinc.'

Walter Thomas Taggart: 'Electrolytic Determination of Nickel and Phosphate Solution.'

CORNELL UNIVERSITY.

James Adrian Bizzell: 'Behavior of Phosphoric Acid in the Soil.'

Arthur Wesley Browne: 'Contribution to the Chemistry of Hydronitric Acid and the Trinitrides.'

William Weber Coblentz: 'Some Optical Properties of Iodine.'

Elmer Reginald Drew: 'The Radiant Efficiency of the Electric Discharge through Gases at Low Pressures.'

Jacob Goodale Lipman: 'Nitrogen-fixing Bacteria.'

Sanford Alexander Moss: 'The Gas Turbine.'

Perley Gilman Nutting: 'Ultra-violet Rotary Dispersion.'

Hugh Daniel Reed: 'The Cranial Osteology and Relationships of the Family Percopsidæ.'

William Albert Riley: 'The Embryological Development of the Skeleton of the Head of *Blatta.*'

Emil Peter Sandsten: 'Conditions which Affect the Fertility of Pollen.'

Ernest William Schoder: 'An Experimental Study of the Resistances to the Flow of Water in Pipes.'

John Edgar Teeple: 'On Bilirubin, the Red Coloring-matter of the Bile.'

George Washington Tapley Whitney: 'Recent Theories of Psychical Causality.'

YALE UNIVERSITY.

John Charles Blake: 'On Colloidal Silver and Gold.'

Wilton Everett Britton: 'Vegetation of the North Haven Sand Plains.'

Edgar Roscoe Cumings: 'The Morphogenesis of *Platystrophia;* A Study of the Evolution of a Paleozoic Brachiopod.'

William Ebenezer Ford, Jr.: 'Investigations in Mineralogy.'

Henry Franklin Merriam: 'Researches in Organic and Inorganic Chemistry.'

Helen Abbot Merrill: 'On Solutions of Differential Equations which Possess an Oscillation Theorem.'

Oscar Stoddard Pulman, Jr.: 'The Quantitative Determination of Uranium, with Applications to the Estimation of Phosphoric Acid; to which is Appended a Method for the Determination of Molybdic Acid, with Application to the Estimation of Phosphoric Acid.'

Allen Douglas Risteen: 'The Numerical Evaluation of the Absolute Thermodynamic Scale of Temperature.'

Henry Hollister Robinson: 'Geology of San Francisco Mountain and Vicinity, Arizona.'

Elias Howard Sellards: 'A Study of Some Paleozoic Plants and Insects.'

Carl Ebin Stromquist: 'On a Special Case of the Generalized Integral of Length, together with Certain Contributions to the General Theory.'

Frank Pell Underhill: 'Further Experiments on the Physiological Action of the Proteoses.'

George Benjamin White: 'Purin Metabolism and Allantoin Formation, an Experimental Study.'

JOHNS HOPKINS UNIVERSITY.

Benjamin Franklin Carver: 'A Study of New Semi-permeable Membranes Prepared by the Electrolytic Method.'

Henry Augustus Converse: 'On a System of Hypocycloids of Class Three Inscribed to a given 3-line and some Curves Connected with it.'

John P. Coony: 'A Study of Some New Semi-permeable Membranes.'

Charles Keyser Edmunds: 'Some Optical Properties of Selenium: A. Metallic Reflection Phenomena; B. Reflecting Power.'

John Gale Hun: 'The Invariant Relations of Two Triangles.'

Albert Johannsen: 'The Serpentines of Harford County, Maryland.'

George Wiles Middlekauff: 'Measurements of Certain Wave-lengths in the Spark-spectra of Iron and Titanium, Together with a Study of the Possible Influence of Capacity and Self-Induction in the Spark Circuit.'

Joseph Haines Moore: 'The Absorption and Fluorescent Spectra of Sodium Vapor.'

Atherton Seidell: 'The Precipitation of Zinc by Manganese Peroxide, with Especial Reference to the Volhard Method of Determining Manganese.'

Arthur Whitmore Smith: 'A Determination of the Heat of Fusion of Ice.'

BROWN UNIVERSITY.

Caleb Allen Fuller: 'The Distribution of Sewage in the Waters of Narragansett Bay and its Relation to the Oyster Beds.'

George Freeman Parmenter: 'The Action of Acetic Anhydride on Acids of the Phenylpropiolic Series.'

Michael Xavier Sullivan: 'Synthetic Culture Media and the Biochemistry of Bacterial Pigments.'

Ralph Winifred Tower: 'The Comparative Anatomy and Physiology of the Swim-bladder of Fishes.'

CLARK UNIVERSITY.

Roy T. Wells: 'On the Induction of Currents in Cylindrical Cores.'

Lonna Dennis Arnett: 'Ideas of the Soul.'

Fred Kuhlmann: 'Experimental Studies in Mental Deficiency: Three Cases of Imbecility (Mongolian) and Six Cases of Feeble-mindedness.'

Edgar James Swift: 'Studies in the Psychology and Physiology of Learning.'

COLUMBIAN UNIVERSITY.

Edwin Allston Hill: 'The Constitution of Oxyacids from the Thermochemical Standpoint.'

William Mather Lamson: 'On Iron and Steel Domes.'

Thomas Malcolm Price: 'The Influence of Varying Strength Solutions of Formaldehyde on Some of the Enzymes of Animal Origin.'

Harriet Richardson: 'Contributions to the Natural History of the Isopoda.'

UNIVERSITY OF MICHIGAN.

Louis Merwin Gelston: 'The Intracellular Toxins of the Diphtheria and Typhoid Bacilli.'

Mary Frances Leach: 'A Contribution to the Study of the Chemistry of the Bacillus Coli Communis.'

Mary Wheeler: 'The Chemistry of Bacterial Cells, with Special Reference to the Yellow Sarcine and the Typhoid Bacillus.'

Charles Willis Johnson: 'On the Action of Oxidizing Agents upon Morphine.'

UNIVERSITY OF CALIFORNIA.

Arthur Scott King: 'The Structure of Arc Spectra, and Some Effects of Change in Physical Conditions.'

Harold King Palmer: 'An Application of the Crossley Reflector of the Lick Observatory to the Study of very Faint Spectra.'

Joel Stebbins: 'The Spectrum of o Ceti.'

UNIVERSITY OF KANSAS.

Hamilton Perkins Cady: Chemistry.

Clarence Erwin McClung: Zoology.

LEHIGH UNIVERSITY.

Joseph W. Richards: 'A Calorimetric Study of Copper.'

Herman E. Keifer: 'A Study of Some Derivative of Meta-Diazo-Benzene-Sulphonic Acid, and the Action of certain Alcohols on Asym-Meta-Diazo-Xylene-Sulphonic Acid.'

UNIVERSITY OF VIRGINIA.

James Park McCallie: 'A Problem in Periodic Orbits, Second Order Perturbations of Jupiter and Saturn, Independent of the Eccentricities and of the Inclinations.'

J. P. Montgomery: 'On some New Compounds of Urea with Acids and Salts.'

STATE UNIVERSITY OF IOWA.

Mabel Clare Williams: 'Normal Illusions in Representative Geometrical Forms.'

LELAND STANFORD JUNIOR UNIVERSITY.

Anton Julius Carlson: 'Contributions to the Physiology of the Central Nervous System of the Snake.'

LAFAYETTE COLLEGE.

George W. Twitmyer: 'The Diagnosis and Treatment of Backward, Dull and Defective School Children.'

UNIVERSITY OF MINNESOTA.

Harold L. Lyon: 'On the Embryogeny of *Ginkgo biloba*.'

UNIVERSITY OF NORTH CAROLINA.

Royall Oscar Eugene Davis: 'The Atomic Weight of Thorium.'

PRINCETON UNIVERSITY.

Archer Everett Young: 'Isothermal Asymtotic Curves.'

WASHINGTON UNIVERSITY.

James Arthur Harris: 'The Dehiscence of Anthers by Apical Pores.'