SCIENCE

FRIDAY, AUGUST 20, 1909

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MSS. intended for publication and books, etc., intended for review should be sent to the Editor of SCIENCE, Garrison-on-Hudson, N. Y.

DOCTORATES CONFERRED BY AMERICAN UNIVERSITIES

FOR the twelfth year statistics have been collected concerning the degrees of doctor of philosophy or of science conferred by the universities of the United States and the data are summarized in the accompanying tables. There were this year conferred 378 degrees, exactly the same number as last year, but an increase of more than 100 over the average of the ten preceding years. Details for these ten years will be found in the issue of SCIENCE for August 30, 1907. The number twelve years ago was scarcely over 200 and now has nearly doubled. Columbia this year conferred 59 degrees, which is the largest number so far from a single institution, and places Columbia before Harvard in the total number of degrees conferred in twelve years, 436 as compared with 418. Chicago with 448 stands first. Yale with 394 stands close to Harvard. The Johns Hopkins, which earlier was at the head of the list, has not maintained its position and is now in the group with Pennsylvania and Cornell. These seven institutions are decidedly before all others in their graduate schools, having conferred 2,579 degrees as compared with 892 by the thirty-five other universities. Among the state universities Wisconsin leads with 110 degrees followed by Michigan with 86 and California with 47.

The second table gives similar details for the natural and exact sciences. Exactly half of the degrees were this year in the sciences whereas in the first ten years covered by these statistics the percentage was 45. Chicago here also stands at the head

TABLE I

DOCTORATES CONFERRED

	Average of 10 years 1898–1907	1908	1909	Total for 12 years 1898–1909
Chicago	35.6	54	38	448
Columbia	32.2	55	59	436
Harvard	33.8	42	38	418
Yale	31.8	32	44	394
Johns Hopkins	30.5	28	27	360
Pennsylvania	22.5	32	29	286
Cornell	18.1	22	34	237
Wisconsin	8.6	17	7	110
Clark	8.7	11	9	107
New York	6.7	15	13	95
Michigan	6.9	4	13	86
Boston	4.4	11	13	68
California	3.3	4	10	47
Princeton	2.6	6	4	36
George Washington	2.8	3	4	35
Virginia	2.8	4	1	33
Minnesota	2.4	3	5	32
Brown	2.3	2	5	30
Bryn Mawr	2.1	4	2	27
Catholic	2.0	1	3	24
Nebraska	2.0	2	2	24
Stanford	1.4	2	3	19
Illinois	.5	5	4	14
Iowa	1.1	2	0	13
Georgetown	1.0	0	0	10
Vanderbilt	.6	1	1	8
Washington	.7	1	0	8
Missouri	.4	3	0	7
Colorado	.5	0	1	6
Indiana	.0	3	3	6
Massachusetts Institute	.3	3	0	6
North Carolina	.5	0	1	6
Cincinnati	.3	0	2	5
Northwestern	.4	0	1	5
Pittsburgh	.1	4	0	5
Washington and Lee	.4	1	0	5
Syracuse	.2	0	2	4
Kansas	.3	0	0	3
Lafayette	.3	0	0	3
Dartmouth	.1	1	0	2
Lehigh	.2	0	0	2
Tulane	.1	0	0	1
Total	271.5	378	378	3,471

TABLE II

DOCTORATES CONFERRED IN THE SCIENCES

	Average of 10 years 1898–1907	1908	1909	Total for 12 years 1898–1909	Per Cent.
Chicago	16.4	37	20	221	49
Johns Hopkins	16.8	17	20	205	57
Columbia	13.4	21	23	178	41
Harvard	14.1	13	14	168	40
Yale	12.4	16	27	167	42
Cornell	10.4	15	24	143	60
Pennsylvania	9.0	18	13	121	42
Clark	7.7	11	8	96	89
Wisconsin	2.8	6	1	35	32
Michigan	2.9	1	5	34	40
California	2.4	2	6	32	68
George Washington	1.7	2	2	21	60
Princeton	1.1	3	3	17	47
Brown	1.2	2	2	16	53
Nebraska	1.3	1	2	16	66
Stanford	1.1	2	2	15	78
Virginia	1.1	2	0	14	42
Bryn Mawr	1.0	1	0	11	41
Minnesota	.7	1	2	10	31
New York	.6	1	3	10	11
Washington	.7	1	0	8	100
Catholic	.5	—	2	7	20
Iowa	.7	0	0	7	54
Indiana	.0	3	3	6	100
Massachusetts Institute	.3	3	0	6	100
Illinois	.3	0	2	5	36
Missouri	.3	2	0	5	71
North Carolina	.3	0	1	4	66
Vanderbilt	.3	1	1	4	50
Washington and Lee	.3	1	0	4	80
Kansas	.3	0	0	3	100
Northwestern	.2	0	1	3	60
Boston	.1	0	1	2	3
Cincinnati	.1	0	1	2	40
Colorado	.2	0	0	2	33
Dartmouth	.1	1	0	2	100
Lehigh	.2	0	0	2	100
Georgetown	.1	0	0	1	10
Lafayette	.1	0	0	1	33
Syracuse	.1	0	0	1	25
Total	123.2	184	189	1,605	46

of the list, having overtaken the Johns Hopkins two years ago. At the Johns Hopkins 57 per cent. of all degrees have been in the sciences, at Cornell, 60 per cent.; whereas at Harvard the percentage is 40, at Columbia 41 and at Yale and Pennsylvania 42. This year just one third of the degrees at Harvard were in the sciences, whereas at Yale the percentage was 60. It is noticeable that sciences do not predominate in the state institutions, as would probably be expected. The percentages of degrees in the sciences for Wisconsin, Washington, California, Nebraska and Minnesota, respectively, are 32, 40, 68, 66 and 31. The change in the position of the leading universities in the number of degrees awarded in the sciences is indicated by the number of scientific men included among the leading 1,000 scientific men of

the United States,[1] who mostly received the doctor's degree prior to or at the beginning of the period covered by these statistics. The numbers are: Johns Hopkins, 102; Harvard, 57; Columbia, 38; Yale, 28; Cornell, 26; Chicago, 23; Pennsylvania, 12.

TABLE III

	Average of 10 years 1898–1907	1908	1909	Total for 12 years 1898–1909
Chemistry	32.0	54	39	413
Physics	15.5	22	25	202
Zoology	14.7	25	18	190
Psychology	13.4	23	21	178
Mathematics	12.1	23	13	157
Botany	12.6	11	16	153
Geology	7.1	5	11	87
Physiology	4.1	7	13	61
Astronomy	3.4	1	7	42
Bacteriology	1.4	1	5	20
Agriculture	1.0	2	7	19
Anthropology	1.0	4	4	18
Paleontology	1.6	1	1	18
Anatomy	.9	2	0	11
Pathology	.5	2	3	10
Mineralogy	.6	0	3	9
Engineering	.8	0	0	8
Metallurgy	.3	0	1	4
Geography	.1	1	2	4
Meteorology	.1	0	0	1
Total	123.2	184	189	1,605

	1908	1909	Total for two years
Economics	17	41	58
English	30	27	57
History	32	22	54
Philosophy	25	14	39
German	14	14	28
Romance Languages	12	14	26
Greek	13	11	24
Latin	12	12	24
Oriental	9	14	23
Education	6	9	15
Political Science	9	4	13
Sociology	6	5	11
Theology	7	2	9
Law	1	0	1
Music	1	0	1
Total	194	189	383

In the third table is given the distribution of the degrees among the different subjects. Chemistry, as always, is at the head of the list, but shows some decrease. Zoology and mathematics are also somewhat below their average, whereas physics and psychology are above; but such changes from year to year are not significant. A real tendency may, however, be indicated by the increased number of degrees in physiology, bacteriology, pathology, agriculture and anthropology.

The institutions which this year conferred two or more degrees in a science are: in *chemistry,* Yale, 7; Cornell and Johns Hopkins, 6 each; Harvard and Pennsylvania, 5 each; Columbia, 4; in *physics,* Cornell, Johns Hopkins, Pennsylvania and Yale, 3 each; California and Michigan, 2 each; in *zoology,* Columbia, 5; Harvard, 4; Chicago, 3; Johns Hopkins, 2; in *psychology,* Clark, 4; Columbia and Cornell, 3 each; Chicago and Harvard, 2 each; in *mathematics,* Johns Hopkins and Yale, 3 each; Chicago, Columbia and Harvard, 2 each; in *botany,* Chicago, 4; Cornell, 3; Michigan, 2; in *geology,* Chicago and Yale, 3 each; Cornell, Johns Hopkins and Michigan, 2 each; in *physiology,* Yale, 6; Columbia and Johns Hopkins, 2 each; in *astronomy,* California, Chicago and Indiana, 2 each; in *anthropology,* Clark, 3; in *agriculture,* Cornell, 5; in *mineralogy,* Columbia, 2. In other subjects, Columbia leads with 13 degrees in the political sciences. Harvard gave 8 and Columbia 6 degrees in English. The only other instance in which more than four degrees were given by a department was of five degrees in German at Chicago.

The names of those on whom the degree was conferred in the natural and exact sciences, with the subjects of their theses, are as follows:

YALE UNIVERSITY

Isaiah Bowman: "The Geography of the Central Andes."

[1] Cf. SCIENCE for December 7, 1906.

Horace Thomas Burgess: "Point-circle Correlations."

Charlton Dows Cooksey: "Corpuscular Secondary Röntgen Rays."

Arthur Wayland Dox: "The Intracellular Enzymes of Penicillium and Aspergillus, with especial Reference to those of Penicillium Camemberti."

Graham Edgar: "The Quantitative Estimation of Vanadium."

William Ruthven Flint: "The Complexity of Tellurium."

George Edward Gage: "Studies on the Biology and Chemistry of Nitroso Bacteria."

George Frederick Gundelfinger: "On the Geometry of Line Elements in the Plane with Reference to Osculating Vertical Parabolas and Circles."

Fred Harvey Heath: "The Iodometric Determination of Associated Copper, Arsenic and Antimony."

Warren Witherell Hilditch: "Studies on the Influence of Alcohol upon Metabolism."

Albert Wallace Hull: "Ionization produced by Ultra-violet Light of very short Wave-lengths."

Ellsworth Huntington: "Changes in Climate of recent Geological Time."

Israel Simon Kleiner: "Studies in Intermediary Metabolism—the Physiological Action of some Pyrimidines."

Leonard Merritt Liddle: "Studies in Pyrimidines and Research on Halogen Amino Acids."

John Franklin Lyman: "Experimental Studies on the Metabolism of the Purins in the Mammalian Organism."

David Ford McFarland: "Investigation of the Action of Alkyl Halides on some Mercapto Pyrimidines; and a Study of some Molecular Rearrangements in the Amidine and the Thiocyanacetanilide Series."

Victor Caryl Myers: "The Chemistry and Physiology of the Pyrimidines, Thymine, Cytosine and Uracil."

George Elwood Nichols: "A Morphological Study of *Juniperus communis* var. *depressa*."

Levi Fatzinger Noble: "The Geology of the Shinumo Area, Grand Canyon, Arizona."

Joseph Ezekiel Pogue, Jr.: "The Cid Mining District of Davidson County, North Carolina. A Region of Ancient Volcanic Rocks."

Thomas Edmund Savage: "The Stratigraphy of the Lower Paleozoic Formations in Southwestern Illinois."

Mary Davies Swartz: "Nutrition Investigations on the Carbohydrates of Lichens, Algæ and related Substances."

Thomas Smith Taylor: "The Retardation of Alpha Rays by Metal Foils and Gases; and its Variation with the Range of the Alpha Particles."

Edwin Ward Tillotson, Jr.: "On the Synthesis of Malonic Ester, with special Reference to the Influence of Catalytic Agents in the several Reactions."

Mary Shore Walker: "A Generalized Definition of an Improper Multiple Integral."

Hiram Lee Ward: "A Study of Metallic Oxalates, with special Reference to the Separation of Copper as the Oxalate."

Robert Day Williams: "A Study of Reaction Movements."

CORNELL UNIVERSITY

Frank Carney: "The Pleistocene Geology of the Moravia Quadrangle."

Charles Frederick Clark: "A Statistical Study of Variation in Timothy (*Phleum pratense*)."

Marshall Baxter Cummings: "Orchard Survey of Niagara County, New York."

Henry Platt Cushing: "Geology of the Thousand Island Region, New York."

Ludwig Reinhold Geissler: "The Measurement of Attention."

Arthur Witter Gilbert: "Studies of Heredity in Plants."

Clarence Frederic Hale: "Contributions to the Chemistry of Hydrazine."

Chester Deacon Jarvis: "American Varieties of Beans."

Harry Houser Love: "Studies in Variation."

Gustav Ernst Fredrick Lundell: "Anhydrous Hydronitric Acid."

Ellen S. McCarthy: "The Determination of Benzine in Illuminating Gas."

Louise Sherwood McDowell: "Some Electrical Properties of Selenium."

Joseph Vance McKelvey: "The Groups of Birational Transformations of Algebraic Curves of Genus 5."

James Oscar Morgan: "The Effect of Soil Moisture and Soil Temperature upon the Availability of Plant Food."

Taizo Nakashima: "Contributions to the Study of the Affective Processes."

William Henry Pyle: "An Experimental Study of Expectation."

Burton Justice Ray: "Some Trisazo Compounds of Resorcin."

John Moore Reade: "Studies in Sclerotinia."

Donald Reddick: "The Black Rot Disease of Grapes."

Ralph Cuthbert Snowdon: "The Electrolytic Reduction of Nitrobenzene."

John Houston Squires: "Studies of certain Properties of an Unproductive Soil."

Orin Tugman: "The Effect of Electrical Oscillations on the Conductivity imparted to Gases by an Incandescent Kathode."

Chauncey William Waggoner: "A Study of Some of the Physical Properties of a Series of Iron-carbon Alloys at the Temperature of Liquid Air."

John Anderson Wilkinson: "The Phosphorescence of some Inorganic Salts."

COLUMBIA UNIVERSITY

George Herbert Betts: "The Distribution and Functions of Mental Imagery."

Thomas Clachar Brown: "Studies on the Morphology and Development of certain Rugose Corals."

Chester Arthur Darling: "Sex in Diœcious Plants."

Walter Hollis Eddy: "The Synthesis of some Proteid Salts."

Ross Aiken Gortner: "On some New Quinzoline Derivatives."

Louise Hoyt Gregory: "Observations of the Life History of *Tillina magna*."

George Wilber Hartwell: "Plane Fields of Force Invariant under Projective Transformations."

Harry Levi Hollingworth: "The Inaccuracy of Movement (with special Reference to Constant Errors)."

Royal Preston Jarvis: "Investigations on Jigging."

Otto Kress: "Does Thorium exist as Thorium Silicate in Monazite?"

Alfred Hemmer Kropff: "Diaminoisophalic Acid and certain of its Derivatives."

Maurice Allison Lamme: "On the Specific Gravities of Niobium and Tantalum Pentoxides."

Alfred Peirce Lothrop: "The Effects of Bone Ash in the Diet on the Gastro-intestinal Conditions of Dogs."

Charles Searing Mead: "The Chondrocranium of an Embryo Pig, *Sus scrofa:* A Contribution to the Morphology of the Mammalian Skull."

Fernandus Payne: "Some New Types of Chromasome Distribution and their Relation to Sex."

Jacob Rosenbloom: "A Contribution to the Study of the Nature and Origin of the Bince Jones Protein; with Bibliography."

Edward Sapir: "The Takelma Language of Southwestern Oregon."

Charles Edward Taylor: "A New Rapid Volumetric Method for the Determination of Niobium in the Presence of Tantalum and its Application to the Analysis of Niobium Minerals."

Myron Owen Tripp: "Groups of Order p^3q^2. (February 16.)"

Harold Worthington Webb: "A Systematic Study of Electric Wave Vibrators and Receivers."

Maurice Francis Weinrich: "Rutherford Photographs of Stars surrounding B Cygni."

David Day Whitney: "Studies of Sex Determination and Sex Production in *Hydatina senta*."

Herbert Hollingsworth Woodrow: "A Quantitative Study of Rhythm: A Psycho-physical Investigation of Intensity and Duration in Rhythm."

UNIVERSITY OF CHICAGO

George Cromwell Ashman: "Studies in Radioactivity."

Walter Van Dyke Bingham: "Studies in Melody and Movement."

Robert Earle Buchanan: "The Morphology of *Bacillus radicola*."

Liborio Gomez y Pineda: "Studies in Rocky Mountain Spotted Fever."

William Duncan MacMillan: "Periodic Orbits about an Oblate Spheroid."

Wales Harrison Packard: "On Resistance to Lack of Oxygen in Animals."

Wanda May Pfeiffer: "The Morphology of *Leitneria Floridana*."

Alma Gracey Stokey: "The Anatomy of Isoetes."

Katashi Takahashi: "Histogenesis of the Lateral Line System in Necturus."

Sister Helen Angela Dorety: "Anatomy of the Seedling of Ceratozamia."

Arnold Dresden: "The Second Derivatives of the Extremal-integral."

Nielsine Johanna Kildahl: "The Morphology of Phyllocladus."

Edson Sunderland Bastin: "Chemical Composition as a Criterion in Identifying Metamorphosed Sediments."

Herbert Earle Buchanan: "Periodic Oscillations of Three Finite Masses about the Lagrangian Circular Solutions."

Thomas Buck: "Oscillating Satellites near the Lagrangian Equilateral Triangle Points."

Elwood S. Moore: "Geology of the Onaman Iron Range District."

Harvey Andrew Peterson: "The Influence of Complexity and Dissimilarity in Memory."

Marion Lydia Shorey: "The Effect of the Destruction of Peripheral Areas on the Differentiation of the Neuroblasts."

Clinton Raymond Stauffer: "The Relationship of the Middle Devonian Faunas of Ohio."

Harry Lewis Wieman: "A Study in the Germ Cells of *Leptinotarsa signaticollis*."

JOHNS HOPKINS UNIVERSITY

William Edward Burge: "Analysis of the Ash of the Normal and Cataractous Lens."

N. Trigant Burrow: "The Determination of the Position of a Momentary Impression in the Temporal Course of a Moving Visual Impression."

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J. Frank Daniel: "Adaptation and Immunity of the Lower Organisms to Ethyl Alcohol."

Lucius Junius Desha: "On the Mechanism of Oxime Formation and Hydrolysis, and the Use of the Hydrogen Electrode in the Presence of certain Organic Compounds."

Eugene Edward Gill: "The Osmotic Pressure of Cane Sugar Solutions at 5°."

William Dana Hoyt: "Physiological Aspects of Fertilization in Ferns."

Clinton Maury Kilby: "Redetermination of the Wave-lengths of the Arc and the Spark-lines of Titanium, Manganese and Vanadium; the Effect of Capacity and Self-induction on the Wave-Lengths of the Spark-lines."

David Deitch Leib: "On a Complete System of Invariants of Two Triangles."

Charles Frederick Lorenz: "The Physical Properties of Flames when carrying Electric Currents."

Thomas Poole Maynard: "The Corrigans Formation of Maryland."

Sidney Nirdlinger: "I. On the Reactions of Diazoalkyls with 1-Phenyl-2-Methylurazole; II. On the Rearrangement of the Tautomeric Salts of 1, 4-Diphenyl-5-Thiourazole and 1, 4-Diphenyl-5-Thioendourazole."

Louis J. Rettger: "The Coagulation of Blood."

Asa Arthur Schaeffer: "Selection of Food in *Stentor cæruleus*."

Maurice Roland Schmidt: "Conductivity and Viscosity in Mixed Solvents containing Glycerol."

Joseph Theophilus Singewald, Jr.: "The Iron Ores of Maryland in the Piedmont and Appalachian Regions."

Edgar Apple Slagle: "On the Theory of Indicators and the Reaction of Phthaleins and their Salts."

Herman Ivah Thomsen: "Some Facts in regard to Plane Rational Curves."

Emanuel George Zies: "The Osmotic Pressure of Cane Sugar Solutions at 0°."

HARVARD UNIVERSITY

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Edgar Davidson Congdon: "Studies of the Effects of Alpha, Beta and Gamma Rays of Radium upon the Growth, Structure and Pigment Migration of Animals.

Joseph Augustine Cushman: "The Phylogeny of the Miliolidæ."

Louis Serle Dederick: "Certain Singularities of Transformations of Two Real Variables."

Harley A. Flint: "Certain Derivatives of Tetrabromorthobenzoquinone."

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Walter Kurt Van Haagen: "Tantalum and some of its Halides."

Frank Wenner: "A Theoretical and Experimental Study of the Vibration Galvanometer."

Edgar Theodore Wherry: "Contributions to the Mineralogy of the Newark Group in Pennsylvania."

CLARK UNIVERSITY

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Louise Ellison: "Consciousness in Relation to Learning."

Burton Noble Gates: "Biological Studies of the Honey Bee."

Hikozo Kakise: "An Experimental Study on the Conscious Concomitants of Understanding."

John Augustus Magni: "The Ethnological Background of the Eucharist."

Howard Washington Odum: "The Religious Folk-Songs of the Southern Negroes."

Eugene C. Rowe: "Voluntary Movement."

Inman Lyon Willcox: "The Psychological Aspect of Sin and Salvation."

UNIVERSITY OF CALIFORNIA

Simpson Leroy Brown: "The Residual of Inductance and Capacity in Resistance Coils, a Standard Resistance with Balanced Inductance and Capacity."

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Edward Arthur Fath: "The Spectra of some Spiral Nebulæ and Globular Star Clusters."

Arend Lourens Hagendoorn: "The Purely Maternal Character of the Hybrids produced from the Eggs of Strongylocentrotus."

Frederic Addison Harvey: "Atmospheric Radioactivity in California and Colorado and the Range of the Particles from Radium B."

Adolph Knopf: "Geology of the Seward Peninsula Tin Deposits, Alaska."

UNIVERSITY OF MICHIGAN

Walter Francis Colby: "Coefficient of Expansion of Nickel near its Critical Temperature."

Richard de Zeeuw: "Comparative Viability of Seeds, Bacteria and Fungi when treated with certain Chemical Agents."

Frank John Mellencamp: "Thermodynamics of Concentration Cells."

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Lucas Petrou Kyriakides: "A Contribution to the Study of the Relation between Color and Constitution in the Triphenyl-methane Series."

INDIANA UNIVERSITY

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Isaac McKinney Lewis: "The Chromosomes in Pinus and Thuja."

Vesto Melvin Slipher: "The Spectrum of Mars."

NEW YORK UNIVERSITY

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PRINCETON UNIVERSITY

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BROWN UNIVERSITY

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Frederick George Keyes: "The Condensation of Meta-nitrophenylpropiolic Acid to Naphthalene."

CATHOLIC UNIVERSITY OF AMERICA

Richard Stephen Burke: "Theory of Comparison in Psychology."

Thomas Patrick Irving: "The Ultimate Source of the Spectrum."

GEORGE WASHINGTON UNIVERSITY

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George Whitfield Stiles: "The Possibility of Shellfish Contamination from Sewage-polluted Waters."

UNIVERSITY OF ILLINOIS

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UNIVERSITY OF WISCONSIN

Willibald Weniger: "Infra-red Absorption Spectra."

DURER'S "CONTRIBUTION" TO GESNER'S NATURAL HISTORY

THE statement that Dürer "contributed" one or more drawings to Gesner's famous "Natural History" was called to my attention many years ago, when the error appeared to be sufficiently obvious, but not having the proper materials then in hand, it was not traced to its source.

Attention was again directed to the subject by a recent history of biology, in which it is stated that "his (Gesner's) friend supplied one of the originals—the drawing of the rhinoceros." Again in a delightful essay on Gesner, written some years ago by a revered teacher and friend, we are told that "the names of very few of the draughtsmen and engravers" of the "History" are known, but Gesner says that Lucas Schrön drew the birds, and that Albrecht Dürer made the cut of the rhinoceros.

This suggests that Dürer was not only the author of the engraving, but that he actually made it for Gesner's work, and this impression is confirmed when we read farther on of "His contemporary and friend, Dürer."

The truth of the matter is easily set forth. Albert Dürer made the original of the rhinoceros picture, but he did not "contribute" it to the "Historia Animalium," nor was he strictly a contemporary, or in any sense a friend of the author.

When Albrecht Dürer (1471–1528) died, a world-famous artist, Conrad Gesner (1516–1565) was a lad of twelve, and the "Historia Animalium" (1551–1558) did not begin to appear until nearly forty years after the engraving of the rhinoceros was made and published. Gesner simply borrowed this plate, and in accordance with his commendable custom, acknowledged it in a descriptive note or legend placed beside the cut. Dürer's name here appears for the first, and so far as I have