

endless life. . . . At all this a kind of godlike delight mixed with shuddering awe comes over me to think that nature by thy power is laid thus visibly open, is thus unveiled on every side."

FLORIAN CAJORI

UNIVERSITY OF CALIFORNIA

AWARDS FOR RESEARCH AT THE UNIVERSITY OF CALIFORNIA

MANY members of the University of California faculty have received awards from the research fund of the university to carry on scientific and scholarly research next year. The research fund was created by the Board of Regents in 1917-18 with an initial appropriation of \$2,000. For the academic year 1927-28 the regents have appropriated \$85,000 in support of specific research projects. This sum is considerably supplemented by balances available on June 30, 1927, and by liberal donations from individuals and foundations. Grants in support of research are made by the president with the advice of the Board of Research, a committee of the Academic Senate, to individual members of the university or to departments on the basis of the merits of their projects and estimates of the cost. These grants are supplementary to provisions for research in regular departmental budgets, particularly such as those of the Lick Observatory, Scripps Institution of Oceanography, Hooper Foundation for Medical Research and the Agricultural Experiment Station.

The Board of Research is composed of the following members of the faculty: A. O. Leuschner, *chairman*, E. C. Hills, C. A. Kofoed, G. N. Lewis, C. B. Lipman, K. F. Meyer, F. J. Teggart, L. B. Loeb, *secretary*.

The awards to date for research for 1927-28 are as follows:

Professor E. B. Babcock and Professor J. L. Collins, for a taxonomic study of the genus *Crepis* and genetic and cytological studies of *Crepis* hybrids.

Professor A. R. Davis and Professor D. R. Hoagland, for the study of plant growth under controlled environment.

Professor C. B. Lipman for two assistants in research on tree injection and on the essential chemical elements essential to plant growth.

Professor H. M. Evans, three awards, supplementary to donations already made to assist in research on the relations between nutrition and fertility, on the effect of the endocrines, especially the hypophysis on the gonads and in a study of the sex cycle of the cat.

Professor R. O. Moody, for a radiographic study of the abdominal viscera.

The Department of Anthropology, Professor R. H. Lowie, *chairman*, for an assistant in research in con-

nection with ethnological and archeological survey of California.

Professor A. L. Kroeber, for an assistant in determining the successive stages of development of the textile arts in prehistoric Peru.

The Department of Bacteriology, Professor K. F. Meyer, *chairman*, for an assistant, for a study on hypersensitiveness with bacterial protein fractions.

Professor G. L. Foster, for a study of carbohydrate metabolism of muscle.

Professor D. M. Greenberg, for research in electrochemistry of protein solutions.

Professor C. L. A. Schmidt, an award supplementary to a grant already made, for an assistant in research on the dissociation constants of amino acids.

Professor E. S. Sundstroem, for a study of acclimatization to low pressures of temperature and effect of low oxygenation on cancerous rats.

Professors T. H. Goodspeed and R. E. Clausen, for genetic and cytological investigations on *Nicotiana*.

The Department of Chemistry, Professor G. N. Lewis, *chairman*, for chemical research by members of the staff as follows:

Professor W. C. Bray, for researches on the mechanism of inorganic reactions, involving the mechanism of catalytic agents in homogeneous and heterogeneous systems.

Professor W. C. Blasdale, for a study of phase relations involved in sea water or marine deposits with special reference to the extraction of valuable constituents from such deposits.

Professor G. E. K. Branch, for a study of polarization in organic molecules and their effects on the rates and methods of reactions.

Professor E. D. Eastman, for a study of high temperature equilibria of metal oxides with special reference to the reduction of the oxides of free metals, the study of the third law of thermodynamics applied to solid solutions, and the free energy of water from the study of the oxygen electrode.

Mr. W. F. Giauque, for a study of problems involving the third law of thermodynamics, and the production of extremely low temperatures by means of high paramagnetic substances.

Professor G. E. Gibson and Professor H. C. Ramsperger, for a study of the absorption spectrum of iodine bromide and related substances.

Professor G. E. Gibson and students, for (1) isotherms of gas mixtures at high pressures with a view to determination of free energy and entropy of mixing, and (2) determination of straggling of alpha particles from radium rays in various gases by the Wilson track method.

Professor T. R. Hogness, for a study of positive ray analysis with special reference to this work as a means of studying molecular reactions.

Professor J. H. Hildebrand, for (1) solubility relations in terms of Raoult's law and internal pressures, and (2) problems related to phenomena of surface tension and colloidal chemistry.

Professor W. M. Latimer, for (1) studies of the distribution of thermal energy in solids at low tempera-

tures with reference to the determination of the entropy and free energy of chemical substances, (2) problems relating to the effect of ionic sizes in solution in reference to the energy and reactivity of ions, and (3) Professor Latimer and students, the electrode potential of aluminum from the entropy of aluminum ion.

Professor G. N. Lewis, for (1) the photon theory and the nature of light, (2) the magnetic factors involved in molecule formation, and (3) photon theory applied to the rates and mechanism of chemical reactions, and the limiting entropies at high pressures and other thermodynamic problems.

Dr. A. Lachman, for (1) a study of Benzil rearrangement, and (2) auto-reduction of nitric esters to ammonia and stability of petroleum oils.

Professor A. R. Olson, for (1) experiments on the nature of light, (2) chemical effects of X-rays, and (3) resonance and ionization potentials of atoms.

Professor C. W. Porter, for (1) photochemical reactions with special reference to the synthesis of organic compounds, and (2) problems relating to organic molecular rearrangements.

Professor H. C. Ramsperger, for a study of the thermal and photochemical decomposition of azomethene and the photochemical rearrangement of chlor-acetanilid.

Professor M. Randall, for a systematic collection of activity data on electrolytes in aqueous solutions.

Dr. G. K. Rollefson, for a study of the atomic energy levels as interpreted from soft X-ray data.

Professor T. D. Stewart, for a study of the decomposition of quaternary amides and of the reactivities of ethylene and the properties of alpha cyanamides.

Professors C. Derleth and R. E. Davis, for experimental work in connection with the arch dam investigation of the Engineering Foundation.

Professor John S. Shell, for research in dental alloys.

Mr. P. Byerly, for a detailed analysis of earth motion during the passage of seismic waves of various types.

Professor N. E. A. Hinds, for a geological study of nature and metamorphic effects of granodioritic intrusives in the vicinity of Redding, California.

Department of Geology, Professor George D. Louderback, *chairman*, for researches in sedimentation and sedimentary petrology.

Professor Franz Schneider, for copying and expressage of necessary letters in connection with the publication of a volume of Gutzkow's letters in conjunction with Professor H. H. Houben, Berlin.

Professor Lucille Johnson, for a study of the colloidal nature of certain foods.

The Department of Household Science, Professor Agnes Fay Morgan, *chairman*, for the departmental research program, "occurrence and function of vitamins in human food."

Professors Agnes Fay Morgan and Katherine Scott Bishop, for investigations of the effect of salt and anti-rachitic vitamin deficiencies upon reproduction in rats.

Professor Ruth Okey, for studies of metabolism of women.

The Department of Hygiene, Dr. John N. Force,

chairman, for research in communicable diseases by members of the department as follows:

Smallpox vaccinations: A survey of the potency of smallpox vaccine sold in San Francisco, by Dr. Force and Miss Eddie.

A comparison between the method for potency determination suggested by Force and Leake and a modification of the intradermal method of Groth, by Professor Beattie and Miss Lorraine Worrall.

Simultaneous changes in blood and skin following smallpox vaccinations, by Miss Bernice U. Eddie.

Diphtheria immunization: A series of observations on the effect of the corneal inoculation of guinea pigs with virulent diphtheria organisms, by Miss Beattie.

Relation of tonsils to infectious diseases, by Dr. Cunningham.

Statistical analysis of standard methods of milk counting, by Mr. Brew, Miss Beattie, Miss Wakefield, and Miss Hyde.

Diphtheria mortality: A study of the statistical correlation between diphtheria mortality and certain population factors, Mrs. Lucia.

Dr. R. G. Aitken, associate director of the Lick Observatory, for assistants in preparing printer's copy of a General Catalogue of Double Stars.

The Medical School, Professor L. S. Schmitt, acting dean, for medical research by members of the staff as follows:

Department of medicine: Cardiovascular studies, by Dr. W. J. Kerr and staff of the Department of Medicine.

Haematological studies, by Dr. E. H. Falconer.

Tuberculosis studies, by Dr. Frederick Eberson.

Studies on the action of drugs, by Dr. W. J. Kerr.

Studies of the relation of salts of certain metals to the function of Langerhans' tissue in the pancreas, by Drs. W. J. Kerr and R. E. Allen.

Department of surgery: Thyroid and appendicitis studies, by Dr. W. I. Terry.

Urological research, by Dr. F. Hinman and staff.

Neurosurgery, by Dr. H. C. Naffziger.

Department of pediatrics: Clinical studies on hypersensitiveness.

Department of obstetrics and gynecology: Studies on hemorrhage in pregnancy, carcinoma and fibroids.

Professor C. F. Gross, for research in mechanics in connection with the testing of models of various rudders as to shape of area.

Professors J. N. LeConte and Blake R. Vanleer, for an investigation of centrifugal pump losses.

Professors B. M. Woods and John E. Younger, for the study of tailspin and wing flutter.

The Department of Physics, Professor E. E. Hall, *chairman*, for research in physics by members of the department. The various projects are:

Dr. S. K. Allison, for the measurements of the relative intensities of X-ray spectral lines from different targets.

Professor R. T. Birge and students, for studies of spectral series in the band spectra of various molecules with a special reference to the relative intensities of

the various spectral terms. For this purpose a sum of money was appropriated for the purchase of a Moll microphotometer which will also be used by Professors Brackett and Hopfield and their students.

Mr. R. B. Brode, for studies on the free paths of electrons in gases and the process of ionization by electron impact.

Professor F. S. Brackett, for photographic investigations of spectra from soft X-rays to the near infra-red.

Professor F. S. Brackett and students, for accurate intensity measurements of spectral lines.

Professor E. Dershem, for a measurement of indices of refraction of elements of high atomic number for wave lengths between 1 and 20 angstroms.

Professor E. E. Hall and students, for (1) a direct measurement of the distribution of atomic and molecular velocities of various substances by a modification of the revolving plate method, and (2) the electrical and thermal conductivity of metals in strong transverse and parallel magnetic fields.

Professor J. J. Hopfield and students, for (1) a study of emission and absorption spectra of gases and vapors in the extreme ultra-violet. For this purpose, including two small vacuum spectrographs, a new 15-foot spectrograph has been built and is being put into operation. (2) The excitation of molecular spectrum of hydrogen by collisions of the second class with active nitrogen.

Mr. Arthur von Hippel, International Education Board fellow, for studies on the ionization by impact of positive rays in streams of metallic vapor.

Professor L. T. Jones, for the study of diffusion of gaseous hydrogen through heated platinum.

Professor L. B. Loeb, for a study of gaseous ion mobilities in mixtures of hydrogen with different gases.

Professor L. B. Loeb and A. Joffe, for the direct mass determination of gaseous ions by means of a high speed centrifuge.

Professor L. B. Loeb and students, for (1) direct measurement of the rate of recombination of ions in gases using X-ray ionization and a new method of measurement capable of investigating large ranges of ionic concentration, and (2) a direct measurement of electron attachment to neutral molecules using high frequency alternations to separate ions and electrons. (3) Application of Erikson air blast method to mobilities of ions in gaseous mixtures. Also other problems involving ionic mobility cataphoresis of gas bubbles in high electric fields in non-ionizing liquids and studies on the nature of mechanism of spark discharge in inert gases.

The Department of Psychology, Professor G. M. Stratton, *chairman*, for psychological research by members of the department.

Professor William Popper, for a study of the Arabic text of Ibn Taghri Birdi's "Annals."

Professor Frederick J. Teggart, for a study of migrations in Europe and Asia.

Professor J. F. Daniel, two awards, for drawings necessary to illustrate a paper on the elasmobranch fishes, and for a study of the effects of alcohol on mice.

Professor S. F. Light, for statistical investigations on termites.

The Department of Geography, Professor Carl Sauer, *chairman*, for a study of the geography of Lower California.

Professor R. Schevill, for publication of a history of the Golden Age Theater in Spain.

Professor John A. Marshall, for research in etiology of dental caries.

Professor John B. Leighly, for a study of the Finns of the Lake Superior region.

The Department of Zoology, Professor C. A. Kofoid, *chairman*, for research in zoology by graduate students under the direction of the staff.

Professor C. A. Kofoid, three awards, supplementary to grants already made to assist in a study of human intestinal Protozoa, a study of the Dinoflagellata and of the Tintinnina of the Eastern Tropical Pacific.

The following awards were made to members of the faculty at the University of California at Los Angeles:

Dr. Carl Epling, for research work on the taxonomy of the Labiatae of South America.

Dr. A. W. Haupt, for investigations on Californian Hepaticae.

Dr. William Newton, for a study of carbohydrate transformations in vegetable and fruit tissue.

Dr. O. A. Plunkett, for studies on the Fungi and Myxomycetes of southern California.

Professor O. L. Sponsler, for research in the molecular structure of carbohydrates.

Professor A. P. McKinlay, for photostats necessary in a classification of the manuscripts of Arator.

Professor Margaret S. Carhart, for photostat reproductions of letters necessary in the editing of the correspondence of Joanna Baillie.

Dr. C. M. Zierer, for a geographic study of the Ventura County, California, coastal plain.

Dr. C. H. Crickmay, for research in the delimitation of Triassic and Jurassic systems on Harbledown Island, B. C.

Professor W. J. Miller, for a study of the geology of the San Gabriel Mountains and of Deep Spring Valley, California.

Professor Frank J. Klingberg, for assistants in a study of the anti-slavery movement in England and the results of emancipation.

Professor Louis K. Koontz, for a study of the Virginia frontier, 1763-1775.

Professor J. M. Adams, for a study of conditions governing the growth of snowflakes.

Dr. Glenn James, for an investigation of methods of summing series.

Professor S. J. Barnett, for investigations in magnetism and electrodynamics.

Professor H. W. Edwards, for a determination of the number of electrons in the K and L rings of several elements by measurements of the index of refraction using X-rays.

Professor J. W. Ellis, for research in infra-red spectroscopy.

Professor V. O. Knudsen, for studies in physiological and architectural acoustics.

Professor C. G. Haines, for a comparative study of review of legislative acts by courts.

Professor Ellen B. Sullivan, for research in delinquency and home rehabilitation.

Dr. Gordon H. Ball, for an investigation of the life histories of various intestinal Protozoa.

Professor Bennett M. Allen, for research on the influence of the endocrine glands of amphibian larvae upon growth and development.

Professor John C. Parish, for historical research in

The data show definitely that once puberty is established, which occurs in the albino rat at about 65 days of age, the ratios between humerus length and body length, and femur length and body length are practically constant, notwithstanding the actual increases which take place in bone and body size. Thus given a humerus or a femur of a male or female albino rat of 65 days of age or over, it is possible to compute from its length the body length of the animal from which the bone was taken, and from this the approximate body weight as well as that of the several organs, more particularly the brain and spinal cord, by the use of the "standard" values established by Donaldson.

BONE LENGTH-BODY LENGTH RATIOS OF ALBINO RATS

Age in days	Male				Body weight gm.	Female		
	Body weight gm.	Hum. L. Body L.	Fem. L. Body L.	Hum. L. Fem. L.		Hum. L. Body L.	Fem. L. Body L.	Hum. L. Fem. L.
23	27	.141	.155	.905	29	.142	.157	.903
30	41	.135	.158	.853	39	.138	.162	.855
50	75	.128	.159	.806	74	.128	.159	.805
65	121	.125	.159	.785	105	.127	.161	.785
75	133	.125	.160	.785	116	.127	.162	.785
100	162	.125	.163	.771	138	.127	.164	.776
150	263	.126	.164	.765	183	.127	.165	.773

connection with a monograph on John Stuart and the Indian boundary line.

Professor Henry R. Brush, for photostat copies of manuscripts necessary in a study of French historical poetry.

SPECIAL ARTICLES

LONG-BONE LENGTH AND BODY SIZES

IN going over some bone-length, body-length relations observed in a series of albino rats used as controls for another study, it was noted that a singular consistency in ratios existed, regardless of age or body size, once the animals had passed the pre-pubertal stage of development. On remarking this to Dr. H. H. Donaldson, of this institute, he reminded me of the idea attributed to Cuvier that it should be possible to reconstruct an animal from a single bone. While I have been unable to track down this statement in the literature, the figures in the accompanying table show that the principle is not at all preposterous, providing certain obvious limitations are recognized.

The ratios given in the table were derived from length measurements of the humerus, femur and body of ten or more rats of each sex of each age series from 50 days onward. The 20- and 30-day-old groups were composed of 20 animals of each sex.

It will be noted that, of the two bones, the humerus length bears the more constant ratio to the body length, that of the femur tending to increase slightly with age. While this increase is numerically small, its occurrence in both sexes, combined with the fact that the humerus length-femur length ratio consistently decreases with age marks the distinction as valid, and indicates that of the two the humerus is the better bone for reconstruction purposes.

FREDERICK S. HAMMETT

THE WISTAR INSTITUTE
OF ANATOMY AND BIOLOGY

DIETARY REQUIREMENTS FOR REPRODUCTION¹

XII. THE INEFFICIENCY OF THE LACTATING MOTHER (MUS NORVEGICUS ALBINUS) TO SECRETE VITAMIN B IN THE MILK AND THE RELATION OF SUCH PHENOMENON TO INFANT MORTALITY

For the past eight years I have been attempting to induce lactating albino rats to rear and wean their

¹ Aided by grants from Eli Lilly and Co., Indianapolis, and the Committee on Scientific Research of the American Medical Association. Research paper No. 49, Journal Series, University of Arkansas.