PROCEEDINGS HAWAIIAN ACADEMY OF SCIENCE

FOURTH ANNUAL MEETING

MAY 9-11, 1929

BERNICE P. BISHOP MUSEUM

SPECIAL PUBLICATION 15

HONOLULU, HAWAII
PUBLISHED BY THE MUSEUM
1929

HAWAIIAN ACADEMY OF SCIENCE

The Hawaiian Academy of Science was organized July 23, 1925, for "the promotion of research and the diffusion of knowledge."

During the year 1928-29, three special public meetings of the Academy were held: to hear Dr. Michael Guyer on July 18, 1928, Dr. T. D. A. Cockerell on July 26, 1928, and Dr. Martha Jones on September 27, 1928.

The sessions of the Fourth Annual Meeting were held at the Biology Building, University of Hawaii, and the Honolulu Academy of Arts, May 9 to 11, 1929, ending with a banquet at the University Club.

OFFICERS

1925-1926

President, Frederick C. Newcombe
Vice-President, C. Montague Cooke, Jr.
Secretary-Treasurer, Edward L. Caum
Councilor (2 years), Otto H. Swezey
Councilor (1 year), Frederick G. Krauss

1926-1927

President, Arthur L. Dean
Vice-President, Frederick Muir
Secretary-Treasurer, Edwin H. Bryan, Jr.
Councilor (2 years), Charles S. Judd
Councilor (1 year), Otto H. Swezey
Councilor (at large), Frederick C. Newcombe

1927-1928

President, Guy R. Stewart
Vice-President, John F. G. Stokes
Secretary-Treasurer, Paul Kirkpatrick
Councilor (2 years), Nils P. Larsen
Councilor (1 year), Charles S. Judd
Councilor (at large), Arthur L. Dean

1928-1929

President, Nils P. Larsen
Vice-President, Harold S. Palmer
Secretary-Treasurer, Paul Kirkpatrick
Councilor (2 years), Edwin H. Bryan, Jr.
Councilor (1 year), vacant
Councilor (at large), Guy R. Stewart

1929-1930

President, Harold S. Palmer
Vice-President, Harold L. Lyon
Secretary-Treasurer, Edward L. Caum
Councilor (2 years), Robert T. Aitken
Councilor (1 year), Edwin H. Bryan, Jr.
Councilor (at large), Nils P. Larsen

PROGRAM OF THE FOURTH ANNUAL MEETING

THURSDAY, MAY 9, 7:30 P. M.

Biology Building, University of Hawaii

Preliminary announcements.

Election of members.

Appointment of committees.

Presentation of papers:

Mr. D. M. Weller and Dr. N. P. Larsen: The black spore of Hawaii; a report of a two-year pollen survey of the air of Honolulu.

Dr. E. D. W. Brown: Notes on the fern flora of Polynesia.

Mr. Otto Degener: The genus *Bidens (Campylotheca)* in the Hawaiian islands.

Dr. F. B. H. Brown: Notes on plant succession in the Marquesas.

Mr. J. F. G. Stokes: Suggested culture drifts to Hawaii.

FRIDAY, MAY 10, 7:30 P. M.

Honolulu Academy of Arts

Presentation of Papers:

Dr. Martha Jones, Dr. G. P. Pritchard and Dr. N. P. Larsen: Odontoclasia, A form of rampant tooth decay.

Dr. R. W. Leigh: Dental morphology and pathology of prehistoric Guam.

Dr. H. S. Palmer: The geology of Molokini.

Dr. T. A. Jaggar: Graded swelling and shrinking of volcanoes.

SATURDAY, MAY 11, 2:30 P. M.

Biology Building, University of Hawaii

Presentation of Papers:

Mr. O. H. Swezey: Recent immigrant insects in Hawaii that are not pests.

Dr. G. H. Godfrey: Some studies on the location of plant parasitic nematodes in plant tissues.

Mrs. Frances Paxton: Some immunological observations.

Mrs. Lois Godfrey: Methods of determining ultra-violet in sunlight.

Dr. C. H. Edmondson: Effects of ultra-violet rays on regeneration of appendages of *Atya bisulcata.*

SATURDAY, MAY 11, 7:00 P. M.

University Club

Banquet.

Constitutional order of business.

Presidential address.

Installation of new officers.

Adjournment.

ABSTRACTS OF PAPERS

PRESIDENTAL ADDRESS

By

NILS P. LARSEN

An educated man has been defined as "One who knows something about everything and everything about something." It is to try to fulfil this desire that prompts us to get together.

In this day and age of rush, bustle and materialism—in an age of scientific magic and an age in which material worth is frequently measured in millions —in an age in which the word "scientific" is applied and used in connection with every charlatan—in an age in which great cults arise on metaphysical smoke or mental aberrations without even an attempt coldly to gather facts or carefully to consider underlying principles or painstakingly to try to disprove observations, hesitatingly and slowly drawing conclusions—in such an age the Hawaiian Academy of Science was conceived, fathered and born, and we are now gathered at its fourth birthday feast.

We have the pleasure of living, I believe, in an interesting American community. Recently a keen lawyer was visiting here. After he had been here for some weeks he said, "It seems to me this is rather an unusual community; worth—what a man is or is striving to become—seems to be considered as important as what he has or the social position he holds." Perhaps it is true—let us hope it is true! It seems it is this spark, this hope, this ideal that the Academy of Science should subtly stand for. Truth for truth's sake, new facts for the joy of acquisition, experimentation for the pleasure of proving. Does our membership actually believe this? Are we willing joyfully to cooperate to make more work possible? Can we gather more frequently, informally to exchange opinions, to broaden our own interests and make our own conclusions more sound? This, I believe, is also the purpose of the Academy. Teaching is stimulation—do we teach?

It is a pleasure to look over our membership and realize the fascinating fields of research they represent—[Here a short review was given of the work of the Sugar Planters' Experiment Station, the Pineapple Packers' Experiment Station, the Bishop Museum, the University of Hawaii, the Queen's Hospital Research Department, the work of Service men and of independent researchers.]

In casting about for something of interest to you in my own field of endeavor, there occurred to me an argument we had recently. The question

was, "Have we any right to experiment upon the human body?" My answer was, "No!" How then is progress possible? A pneumonia experiment was recalled to illustrate the point. The therapeutic agent was first tested on a pure culture of the organisms, then on mice after inoculation, then on monkeys after the introduction of the organism and the disease was well under way. After this chain was successful then the human was tried, but only on each alternate case. This is not experimenting on the human in the true sense, but applying proven animal facts to the human. The alternate case treatment is essential, since without it the proof is not complete, and without complete proof progress is hindered or with false proof many are harmed. The giving of pills or medicines to a patient without careful analysis is much more like experimentation, since that hinges on the fact that probably 80 per cent of all our ailments will run a natural course to recovery. One reason for a research department in a hospital is to try to keep the scientific method in use actively and to prevent the 'post hoc, propter hoc' method of reasoning.

THE BLACK SPORE OF HAWAII

By

D. M. Weller and N. P. Larsen

This paper is the result of two years' study of the pollen, etc., in the air of Honolulu, carried out under the direction of the Research Department of the Queen's Hospital. Microscope slides smeared with albumen and glycerin were exposed daily at six stations in Honolulu—in the downtown section, in Makiki, halfway up Manoa Valley, at the head of Manoa Valley, at Waikiki and at Kaalawai. Microscopic examination of these slides showed the presence of many kinds of pollen grains, fern and fungus spores, and dust particles, varying in number according to the season and the weather. The pollen grains, spores, etc., on a 22 mm. by 22 mm. area of each slide were identified and tabulated. The number varied from one to over a thousand. Thus quantitative data were secured daily on the kind and quantity of pollen, spores, etc., that was in the air throughout a two years' period. From the data thus gathered it was apparent that the pollen flow of certain plants had definite seasonal peaks while others had not. The flow of the latter was graphically represented by low, flat curves, in contrast to the peak of the other type. A significant exception was the consistent high flow throughout the year of a black fungus spore case, as yet unidentified, but previously known and isolated in connection with another problem. The source of this black spore case was located in the bur of the sand-bur grass, *Cenchrus*

hillebrandianus. Skin reactions had been obtained from pure cultures of these isolations, but not until the present pollen survey had demonstrated its general distribution and extremely high numbers in the air at all seasons was it regarded as a factor in hay fever and asthma, in relation to which afflictions this study has a definite bearing. As is well known, a certain proportion of humans is hypersensitive to pollens as well as to other proteins. This sensitivity expresses itself by symptoms of hay fever and asthma whenever the patient is brought in contact with the specific substance. The value of the pollen survey lies first, in locating the types of pollen which are present in the air in appreciable amounts, and second, in obtaining a sufficient quantity of the important types to test on the skins of sufferers. Such tests have been made with some 25 Hawaiian pollens as well as many Mainland pollens on hundreds of skins.

The black spore, which had never before been mentioned as a symptom producer, was found to be present in larger quantity than any other protein of the air. Good skin reactions have already been obtained in about a dozen cases. This discovery opens the field to the whole range of fungus spores, and these may well be a very important source of sensitivity in a community where they are present in the air in large amounts the year round. [Illustrated by charts.]

THE GENUS BIDENS (CAMPYLOTHECA) IN HAWAII

By

OTTO DEGENER

The common Spanish needle, *Bidens pilosa,* was accidentally introduced into the Hawaiian islands in the early days. There are many relatives of this plant native to the Hawaiian islands, found especially at higher elevations. Hillebrand's "Flora of the Hawaiian Islands" (published in 1888), describes 12 species and 9 varieties, a total of 21 kinds. Since then the number of known species and varieties has been increased to 34 and 16 respectively. Of these 50 kinds, 10 were found by me and my assistants.

The Hawaiian plants seem to represent a synthetic group, exhibiting characteristics that are more or less intermediate between those of the genera *Bidens, Coreopsis* and *Cosmos* of continental regions. The reason for this may be that the ancestor of the Hawaiian forms arrived in these islands in a geologic period when the above three genera had not yet been fully differentiated into distinct, clear-cut groups. Some botanists have in consequence considered Hawaiian plants as belonging to the genus *Bidens,* while others

have considered the same plants as representatives of *Coreopsis*. A third group has decided that they form a distinct genus, *Campylotheca*.

The various Hawaiian species and varieties of *Bidens* are for the most part extremely localized in distribution, usually growing on only a single mountain or on but a few ridges. [Illustrated by specimens.]

SUGGESTED CULTURE DRIFTS TO HAWAII

By

JOHN F. G. STOKES

Hawaiian native culture, although basically Polynesian, embraces many features not found among other Polynesians. Some of these might perhaps be attributed to development in isolation, influence of environment, decay of customs, incomplete observation, modern contact or some other influence, much of which however might require involved explanation. It is suggested that some of these cultural features may have been introduced by ocean drift, through the agency of the North Pacific current. It is known that much inanimate drift material from both Asia and North America is stranded on Hawaiian beaches, and it is probable that human drifts arrived in the same way. In fact, several instances are known. Thus from Asia may have come the lua wrestling, the bent massage stick, Hawaiian checkers, the process of pulping fiber for tapa, and forms of wooden bowls, suggesting pottery prototypes. From the American side might be recognized small ivory figures, the sled on runners, and certain forms of food pounders. Most important, however, are gambling and processes of crystallizing salt, present on both continents. In addition there are many indeterminate items, such as the *piikoi,* a missile for entangling, the strangling cord, canoe of rushes, tapa-making implements, ornamental knotting on bags, tanning of fish nets, feather helmet types, basketry types and technic, various dancing appliances, use of wooden spittoons, and a number of stone artifacts. The extensive use of stone is perhaps the most extraordinary. [Illustrated by maps.]

ODONTOCLASIA: A FORM OF RAMPANT TOOTH DECAY

By

MARTHA JONES, G. P. PRITCHARD AND N. P. LARSEN

Detailed dental examinations were made on 2050 children of all races ranging in age from 6 months to 6½ years. A type of dental lesion, called odontoclasia, was observed in a very large percentage of the children. It is

related to and may be associated with caries, ordinary decay, but differs in that it occurs in very young babies, even breast-fed infants only three or four months of age; it attacks all teeth, the upper anteriors being most susceptible; it progresses in broad lines through enamel and dentin; it has been experimentally produced in the dog and occurs spontaneously in island-born puppies.

One-third of the babies under one year of age had odontoclasia, and the peak of incidence of this disease was reached in the three-year old children and maintained its high level through the kindergarten age, 76.9 per cent of the kindergarten children, of all races except Caucasian, being affected. Among the city kindergarten children 81.9 per cent of the Orientals showed odontoclasia, while 0.7 per cent were decay-free; the percentages for the Hawaiians were 55.0 and 1.8, and for the Caucasians 8.2 and 46.8. In the country districts the dental condition of the Japanese was far worse, while that of the Polynesians (Hawaiians and Samoans) was distinctly better. The incidence of odontoclasia is high in Hawaiian-born Filipino children. The findings indicate that both Polynesians and Filipinos in Hawaii are undergoing a progressive dental deterioration, which may in time reach the distressing condition now suffered by the Japanese. The evidence at hand indicates that the initial lesion has its beginning in abnormal tooth structure resulting from faulty maternal diet during pregnancy. [Illustrated by lantern slides:]

DENTAL MORPHOLOGY AND PATHOLOGY OF PREHISTORIC GUAM

By

R. W. LEIGH

Somatological features of note are: streaming of enamel toward bifurcation, particularly of the inferior second and third molars, terminating in an acute point; corrugation of the enamel on the facial aspect of the superior premolars and molars; marginal ridges on the superior incisors in moderate degree in 20 per cent of skulls; a cusp formula which tends to be $\frac{4\text{-}4\text{-}4}{5\text{-}4\text{-}4}$. The inferior first molar is constant; the inferior second molar is quadricuspid in 80 per cent of the cases; the superior third molar is very variable. Such a cusp formula is not indicative of a primitive race. The superior third molar in many cases is vestigial. Some males have large angular jaws and large teeth with accessory roots.

The palate is short, broad and roundish; 95 per cent are brachyusanic. The average dental index is 42.6, the group tends to be mesodont. The average gnathic index is 98.9, thus the group is mesognathous. In many

crania, particularly females, there is a subnasal prognathism; the incisors are somewhat procumbent, with an end-to-end occlusion and fullness of the oral region. There are marked sexual differences, otherwise homogeneity characterises the group, probably resultant from inbreeding. The somatology is unmistakably Mongoloid.

The natives of ancient Guam subsisted exclusively upon the flora and fauna of their insular habitat: fish, fowl, breadfruit, taro, yams, rice, bananas, coconuts. As throughout the tropical Pacific, they are cooked in pits in the earth with heated stones.

Betel nut was the narcotic to which they were strongly addicted; this is a cultural trait of wide Oriental distribution. The nut used is from the betel palm, *Areca catechu*; a part of the nut is wrapped with a few leaves of the betel pepper, *Piper betel,* and the whole sprinkled with a pinch of lime, procured by burning coral. The betel juice produces a soluble red pigment which colors the saliva, lips and mouth a rich red, and gradually but permanently discolors the enamel, particularly on the facial surfaces: the quid is habitually held in the buccal recess. Heavy lime accretions are deposited upon the teeth with resultant pathological processes.

This habit, together with their soft diet requiring but little mastication, were the primary factors in producing a high incidence of chronic degeneration of the investing tissues. All females and 65 per cent of males beyond forty years of age had teeth involved by periodontal disease. Third molars were most frequently affected. No person under thirty years had lost any teeth at decease; periodontoclasia was the major cause of loss in later life.

Dental caries, mostly of the senile type, occurs in 18 per cent of the skulls examined; sixteen per cent evidence periapical lesions, secondary to caries, attrition and fracture. Impacted lower third molars caused extensive disturbance. Serious lesions of the palate and nose of some individuals were evidently resultant from yaws.

Ethnic deformation was practised to a limited extent by filing a lattice design on the facial surfaces of the superior six anterior teeth; and staining the teeth an orange to black color was customary. [Illustrated by specimens.]

THE GEOLOGY OF MOLOKINI

By

HAROLD S. PALMER

Molokini is a small islet lying between Haleakala and Kahoolawe. It has a crescent-shaped outline, as it is in the remnant of a tuff crater rim. It was built by two sets of eruptions, which were separated by a rather long

interval of erosion. Drifting of the volcano ejecta by the trade winds caused unequal accumulation with the result that the crater is rather unsymmetrical. The south side has been the most strongly eroded despite the fact that the prevailing winds are from the northeast, for the south side is more exposed to the action of the waves.

[Illustrated by lantern slides.]

GRADED SWELLING AND SHRINKING OF VOLCANOES

By

T. A. JAGGAR

Changes of tilt and of elevation at Kilauea have been noted. The outbreak of lava in Halemaumau February 20, 1929, produced the record on a crater seismograph, including small earthquakes with centrifugal tilt before the outburst; cessation of tilt and continuous tremor during the lava fountaining; reversed or centripetal tilt and excessive tremor as the end of action approached; and cessation of both when the lava stopped flowing.

Tumefaction, due to subterranean vesiculation and rise of temperature, is here in evidence. In 1918 and 1919 this reached proportions such that the entire edge of Halemaumau pit swelled up 15 feet and more, as the bench magma, or semisolid lava paste, rose with the liquid lava to the rim level.

Levelling measurements of Kilauea summit in 1912, 1922 and 1926 showed that the summit away from the active pit rose two feet between 1912 and 1922. This was the rising lava episode. The summit subsided from 2 to 9 feet from 1922 to 1926, the sinking lava episode. With the engulfment and steam-jet eruption of 1924, there went subsidence of nine to thirteen feet of a shore-line fault rift block at the southeast point of Hawaii island. This was succeeded by engulfment into voids in the mountain of 7,000,000,000 cubic feet of old rim rock at the pit. Here was evidence, during a distinct cycle involving both Kilauea and Mauna Loa, of swelling mountain during rising lava, and of shrinking and collapsing mountain during sinking lava.

The bench magma itself swells and shrinks during the minor phases of eruptivity for periods of months. The rim rock swells and shrinks during the crisis of pit filling. The mountain swells and shrinks during the cycle 1913-1924. There appears to have been a major cycle of 134 years from 1790 to 1924 with a maximum of flowing lava in the middle, 1855, when both Kilauea and Mauna Loa reached a grand maximum. There were twelve cycles within the 134 years, making the length of average cycle 11.1 years. This happens to be the sun-spot cycle, and the lava minima of the Kilauea system corresponded somewhat to the sunspot minima, as shown in the following table:

FLOW DURATION DAYS	FLOODING LAVA	LOW LEVEL	SUN-SPOT MINIMA
71	1914-1923	1924	1924
28	1903-1907	1913	1913
37	1892-1899	1902	1901
247	1881-1887	1891	1889
207	1872-1877	1880	1878
307	1859-1868	1869	1867
411	1852-1855	1858	1856
111	1840-1843	1847	1843
21	1832	1836	1833
7	1823	1825	
.....	.....	1814	
7	1801	1803	
....	1789?	1792	

[Illustrated by charts.]

RECENT IMMIGRANT INSECTS IN HAWAII THAT ARE NOT PESTS

By
O. H. Swezey

Contrary to the general belief, immigrant insects, those arriving without intentional intervention of man, are not all pests, although it is certain that many of them, such as the sugar cane leaf-hopper, the cane borer, the Mediterranean fruit-fly, the melon fly, the horn fly, the rose beetle, the *Anomala* beetle, the rice borer and many scale bugs, mealy-bugs and plant lice, are decided pests. Quite a number of immigrant insects are of no economic importance, while some are beneficial and of considerable economic value. Among the beneficial may be mentioned *Cremastus hymeniae,* a parasite on many kinds of leaf-roller caterpillars; *Casinaria infesta,* another leaf-roller parasite; *Hyposoter exiguae,* a parasite on armyworms; *Telenomus nawai,* which parasitizes the nut-grass army worms; *Litomastix floridana,* which attacks the cabbage looper caterpillar. A very recent addition to the immigrant fauna is *Erebus odora,* the "black witch moth." It is a large, attractive species, and while not economically beneficial, it is not rated as a pest anywhere. [Illustrated by slides.]

SOME STUDIES ON THE LOCATION OF PLANT PARASITIC NEMATODES IN PLANT TISSUES

By
G. H. Godfrey

An improved technique of killing and staining plant parasitic nematodes in situ, developed by me, has greatly aided the study of these animals and

their effect on their host plants. Sections of root tissue treated by this method show nematodes in all stages from the egg to the adult in their natural position in the tissues. Demonstration material made by the method described would be of great value in teaching certain phases of agriculture, particularly home gardening, as it would clearly show the insidious increase of the parasitic nematodes from small initial infections, and by analogy, the nature of plant diseases in general. [Illustrated by slides.]

SOME IMMUNOLOGICAL OBSERVATIONS FROM QUEEN'S HOSPITAL LABORATORY

By

FRANCES PAXTON

The paper gives a brief review of the development of the blood tests for syphilis and the methods in use in the Queen's Hospital laboratory. Some comparisons are made of the results of the Wassermann and Kahn tests. A survey of the different nationalities shows the relative percentage of positive bloods. [Illustrated by charts.]

METHODS OF DETERMINING ULTRA-VIOLET IN SUNLIGHT

By

LOIS K. GODFREY

Ultra-violet irradiation is a physiological necessity, and although curative in certain pathological conditions, is not a panacea, much present-day advertising to the contrary notwithstanding. The short ultra-violet wave-lengths of the sunlight are absorbed by ordinary window glass, and also to a lesser extent by the special glasses advertised.

Several photochemical methods of measurement have been tried out, and the results of over two years' observations, using the method which seemed best, were presented, showing some of the factors which affect the amount of ultra-violet in the sun's radiation. Heavy clouds over the face of the sun materially lower the amount, but high white clouds, in a position to reflect the sunlight, increase the amount over that observed when the sky is perfectly clear. A hazy atmosphere cuts down the amount of ultra-violet, but other weather conditions, such as humidity, wind velocity, and temperature have little or no effect. Depth of the atmospheric layer to be penetrated by the ray had a great effect, as the short wave-lengths are more strongly refracted than the longer ones. Thus there is less ultra-violet in the sunlight

at the beginning and the end of the day. Similarly it operates during the winter months, the effect increasing with distance from the Equator. [Illustrated by diagrams.]

EFFECT OF ULTRA-VIOLET RAYS ON REGENERATION OF APPENDAGES OF ATYA BISULCATA

By

CHARLES H. EDMONDSON

Radiation by ultra-violet rays greatly retards the regeneration of mutilated chelipeds in a common fresh-water prawn, *Atya bisulcata,* especially when the ventral surface of the animal is illuminated.

Exposures of 1 to 5 minutes daily of the dorsal and ventral surfaces of the animals were made at 20, 32, 44 and 52 cm. from the arc. Duration of experiments was usually 8 to 10 days.

With dorsal treatments at 52 cm. from the arc, little or no variation from the normal rate of regeneration was seen. Ventral treatments resulted in marked retardation of regeneration at all distances from the arc and at all lengths of exposure. Single treatments during periods of 8 days showed no effect. Treatments on alternate days showed little or no effect. By altered dosage a differential retardation was noted.

It is suggested that by a ventral illumination the rays fall directly upon the stumps of the mutilated appendages which are regions of high activity as the multiplication of cells occurs here at a rapid rate under normal conditions. The metabolism of surface cells is probably interfered with and their activity retarded or inhibited. With a dorsal exposure and low dosage the rays probably do not penetrate the chitinous exoskeleton and have no appreciable effect on the metabolism of the animal. At close range (32 or 20 cm.) the intensity seems to be sufficient to affect the metabolism of the animal whether the rays fall upon the dorsal or ventral surface. [Illustrated by charts.]

CONSTITUTION

Article I. Name

The name of this society shall be The Hawaiian Academy of Science.

Article II. Objects

The objects of this Academy shall be the promotion of research and the diffusion of knowledge.

Article III. Membership

1. The members of the Academy shall be known as Members and Corresponding Members.

2. Any resident of the Territory of Hawaii, interested in science, shall be eligible for election as a Member.

3. Any person not a resident of the Territory of Hawaii, who is interested in scientific problems relating to Hawaii, shall be eligible for election as a Corresponding Member.

Article IV. Nomination and Election of Members

1. Nomination to membership in either class shall be made in writing to the Council at least two weeks before the Annual Meeting. Each nomination must be signed by three Members of the Academy.

2. The Council shall examine into the fitness of nominees and, at a business session of the Academy, shall recommend for election such nominees as it approves.

3. The Members of the Academy shall vote on the nominees by ballot. Each member shall prepare his own ballot, and the names of all nominees may be written on one slip of paper.

4. At any time prior to two months before the Annual Meeting, the Council shall have the power to enroll as Members applicants about whose eligibility no Councilor has doubt. The names of such persons shall be submitted by the Council at the Annual Meeting for confirmation by the Academy.

5. Election to Membership in either class shall require a favorable vote from three-fourths (¾) of the Members present.

Article V. Officers and Committees.

1. The officers of the Academy shall be a President, who shall not be eligible for re-election until one year from the end of his last incumbency, a Vice-President, and a Secretary-Treasurer. There shall also be a Council.

2. The Council shall be composed of the officers, the retiring President, and two additional Councilors to be elected by the Members of the Academy.

3. The officers shall be elected annually. The additional Councilors shall be elected, one each year, to serve for a period of two years.

4. An Auditing Committee of two shall be appointed annually by the Council. The Auditing Committee shall examine the financial accounts of the Academy and report their condition at the final business meeting of the Academy.

Article VI. Election of Officers

1. At the final session of the Annual Meeting, the Council shall present a list of nominations for officers and councilors of the Academy. Not more than two names shall be listed for any office.

2. Any Member of the Academy may nominate for any office any Member other than those named in the foregoing list, and such a nomination, if seconded, shall be added to the Council's list.

3. When the list of nominations is complete, each Member shall write on a slip of paper, as his ballot, one name for each position to be filled.

4. The person receiving the highest number of votes for a particular office shall be declared elected.

Article VII. Duties of Officers

1. The President shall preside at the meetings of the Academy, perform other duties provided for him in these rules, and carry out such functions as usually pertain to the chief officer of such a society. He shall deliver an address at the Annual Meeting.

2. The Vice-President shall perform the functions of the President in the absence of the latter.

3. The Secretary-Treasurer shall be the custodian of the records and papers of the Academy, shall keep a record of the proceedings of the Academy, and make a written report of the year's activity of the Academy at the Annual Meeting.

The Secretary-Treasurer shall collect the dues of the Members, administer all funds, keep a detailed account of the receipts and expenditures of the Academy, and render a written report at the Annual Meeting.

4. The Council, besides performing the duties assigned in Articles IV, V, VI, VII and IX of this Constitution, shall initiate business for the Annual Meeting, and, in the intervals between the meetings of the Academy, shall strive in every way to promote the interests and efficiency of the Academy as opportunity may be found so to do.

Article VIII. Meetings

1. The Academy shall hold a stated meeting in April or May of each year, to be known as the Annual Meeting. The Annual Meeting shall be announced by a preliminary circular, at least three months before the meet-

ing, calling for papers for the program. Final announcement, giving date and place of meeting, shall be sent out a suitable time prior to each meeting. The program, place and date shall be determined by the Council.

2. All Members desiring to present papers at the Annual Meeting must forward to the Council, at a time which it will set, full titles of all papers which they propose to present, with a statement of the time which each will occupy in delivery. The Council reserves the right to call for an abstract of any paper offered, and to pass upon its fitness for the program.

3. Special meetings of the Academy may be called by the Council. A meeting must be called by the Council upon the written request of ten Members.

4. Stated meetings of the Council shall be held coincidently with stated meetings of the Academy. Special meetings of the Council may be called by the President at such times as he may deem necessary.

5. At stated meetings of the Academy the Members present shall constitute a quorum.

6. Four members of the Council shall constitute a quorum. The Council may appoint a substitute for any of its members absent from the Island of Oahu, for any member resigned, or for any member indefinitely incapacitated.

Article IX. Publications

The Academy shall encourage the publication of papers, presented at its meetings, in appropriate scientific journals. The Council shall give authors such aid as it may in securing publication.

Article X. Dues

1. The dues of Members shall be one dollar ($1.00) per annum, payable within one month following the Annual Meeting. Corresponding Members shall pay no dues.

2. Any Member of the Academy in arrears for eighteen months in the payment of Annual dues shall thereby forfeit his membership in the Academy, provided the Secretary-Treasurer shall have sent the delinquent Member two written notices of the existence of this rule.

Article XI. Order of Business

The order of business at the final session of the Annual Meeting shall be as follows:

a. Call to order by the presiding officer.
b. Reading of minutes of preceding meeting.
c. Announcements.
d. Recommendations from the Council.

e. Report of the Secretary-Treasurer.
f. Appointment of Auditing Committee.
g. Election of Members and Corresponding Members.
h. Reports of Committees.
i. New Business.
j. Election of President, Vice-President, Secretary-Treasurer, and additional Councilor.

Article XII. Amendments

This Constitution may be amended at any Annual Meeting by a three-fourths (¾) vote of the Members present, provided that notice of the proposed amendment has been given to the Members a month previously.

MEMBERS

Abel, F. A. E.
Adams, Romanzo
Agee, H. P.
Aitken, R. T.
Alexander, W. P.
Andrews, Carl B.
Arnold, H. L.
Baker, Ray J.
Barnhart, G. H. W.
Barnum, C. C.
Bean, Ross S.
Bomonti, H. F.
Bond, B. D.
Bond, K. D.
Bowers, F. A.
Brodie, Alex.
Brodie, H. W.
Brown, Elizabeth D. W.
Brown, F. B. H.
Bryan, E. H., Jr.
Bryan, L. W.
Bryan, Royden
Burkland, A. O.
Bush, William
Campbell, E. L.
Carpenter, C. W.
Carson, Max H.
Cartwright, Bruce
Cassidy, Gertrude H.
Cassidy, Morton H.
Castle, Ethelwyn A.
Caum, Edw. L.
Chung, H. L.
Cook, H. A.
Cooke, C. M., Jr.
Cooke, D. A.
Cooke, R. A.
Cooper, Lucy V.
Cooper, W. J.
Cornelison, A. H.
Crawford, D. L.
Davis, A. L.
Davis, L. F.
Dean, Arthur L.
Degener, Otto
Denison, F. C.
Denison, H. L.
Deverill, W. E. H.
Dewar, Margaret M.
Dickey, Lyle A.
Dillingham, F. T.
Donaghho, J. S.
Donahue, Blanche
Doty, Ralph E.
Edmondson, C. H.
Eguchi, G. M.
Ehrhorn, E. M.
Eller, W. H.
Elliott, Raymond
Emory, Kenneth P.
Erwin, Ada B.
Fennel, E. A.
Fisher, G. W.
Ford, Alex. H.
Fronk, C. E.
Fujimoto, Giichi
Gantt, Mrs. P. H.
Giffard, W. M.
Godfrey, G. H.
Godfrey, Lois K.
Gregory, H. E.
Hadden, F. C.
Hance, F. E.
Handy, E. S. C.
Handy, Willowdean C.
Hansson, Frederick
Harl, V. A.
Hartung, W. J.

Henke, L. A.
Holmes, Henry
Horner, J. M.
Illingworth, J. F.
Jaggar, T. A., Jr.
Johnson, Horace
Jones, Martha
Judd, Albert F.
Judd, Charles S.
Kangeter, J. H.
Katsuki, I.
Keller, A. R.
Kerns, Kenneth R.
Kirkpatrick, Paul
Koehler, Lucy J.
Krauss, Beatrice H.
Krauss, F. G.
Kutsunai, Y.
Larrabee, Louise M.
Larrison, G. K.
Larsen, L. D.
Larsen, Nils P.
Leigh, R. W.
Lennox, Colin G.
Livesay, T. M.
Louttit, C. M.
Lyon, Harold L.
Lyon, Maude F.
MacNeil, W. J.
Manglesdorf, A. J.
Martin, J. P.
Masunaga, Eichi
McAllep, W. R.
McCleery, W. L.
McEldowney, G. A.
McGeorge, W. T.
McKay, William
McLennan, R. H.
Miller, Carey D.
Miyake, Iwao
Moe, Kilmer O.
Moir, W. W. G.
Morita, Helene T.
Munro, G. C.
Nacamura, W. T.
Neal, Marie C.
Neilson, N. M.
Northwood, J. d'A.
Odgers, George
Oliveira, Juliette M.
Ostergaard, Jens M.
Palma, Joseph
Palmer, H. S.
Paxton, Frances
Paxton, G. E.
Pemberton, C. E.
Pinkerton, F. J.
Pope, Willis T.
Popert, W. H.
Porteus, S. D.
Pritchard, G. P.
Radir, Paul L.
Renton, G. F.
Ripperton, J. C.
Rosa, Joseph S.
Roberts, E. D.
Russ, Glen W.
Sideris, C. P.
Smith, Madorah E.
Smith, R. N.
Smith, W. Twigg
Spalding, P. E.
Stender, H. K.
Stewart, G. R.
Stokes, J. F. G.
Straub, G. F.
Swezey, O. H.
Taylor, H. J. W.
Thompson, Eleanor
Thompson, H. L.
Thompson, Laura M.
Thurston, L. A.
Topping, D. L.
Van Zwaluwenburg, R. H.

Verret, J. A.
Voorhees, J. F.
Waldron, Gwendolyn C.
Warner, Bernice
Waterman, T. T.
Weeber, Lorle S.
Weinrich, William
Weller, D. M.
Wendt, W. A.
Westervelt, W. D.
Westgate, J. M.
Whitney, L. A.
Wilder, G. P.
Willard, H. F.
Williams, F. X.
Wist, Joseph E.
Withington, Paul
Yang, Y. Chan
Zschokke, T. C.