PROCEEDINGS OF THE HAWAIIAN ACADEMY OF SCIENCE . . .

TWENTY-THIRD ANNUAL MEETING 1947-1948

Published by the University of Hawaii Honolulu, T. H., 1948

THE HAWAIIAN ACADEMY OF SCIENCE WAS ORGANIZED JULY 23, 1925, FOR
"THE PROMOTION OF RESEARCH AND THE DIFFUSION OF KNOWLEDGE"

PROCEEDINGS OF THE HAWAIIAN ACADEMY OF SCIENCE . . .

TWENTY-THIRD ANNUAL MEETING 1947–1948

Published by the University of Hawaii Honolulu, T. H., 1948

FOREWORD

The Hawaiian Academy of Science presents in this volume of its *Proceedings* the program and abstracts of papers presented at its twenty-third annual meeting. All sessions, including the annual dinner and business meeting, were held at the University of Hawaii.

In response to requests, the Secretary has prepared for this number of the *Proceedings* a tabulation of the officers of the Academy from 1925 to date.

OFFICERS

1947–1948

President, Harold St. John
Vice-President, John H. Payne
Secretary-Treasurer, Chester K. Wentworth

Councilor (2 years), Joel B. Cox
Councilor (1 year), Joseph P. Martin
Councilor (1 year), Thomas A. Jaggar (ex officio)

1948–1949

President, John H. Payne
Vice-President, Robert W. Hiatt
Secretary-Treasurer, Chester K. Wentworth

Councilor (2 years), G. Donald Sherman
Councilor (1 year), Joel B. Cox
Councilor (1 year), Harold St. John (ex officio)

THE 23rd ANNUAL MEETING 1947-48

Program

NOVEMBER 13, 1947

J. L. Collins: Early History of the Pineapple.
Winifred R. Vinacke, John A. Rademaker, and Margaret Chave: Consumer Acceptance of Different Kinds of Rice.
Alfred S. Hartwell: Diagnosis and Prognosis of Rheumatic Fever in Hawaii.
W. Edgar Vinacke: Fascination in Flight.

NOVEMBER 14, 1947

E. H. Bramhall: Problems of Telecommunication.
M. H. Halstead and Luna B. Leopold: Use of the Schaefer-Langmuir Dry-Ice Technique in Hawaii. I. Atmospheric Physics of the Formation of Raindrops and the Role of Dry Ice. II. Meteorology of Hawaii in Relation to Use of the Dry-Ice Technique.

MAY 6, 1948

T. A. Jaggar: Abrasion Hardness of Substances.
Robert A. Spurr and Harry Zeitlin: Dipole Moments of Unsymmetrical Ethers.
John H. Payne: Ion Exchange Investigations on Cane Juice.
Leonora N. Bilger: Today's Chemical Laboratory.

MAY 7, 1948

David D. Bonnet: Some Parasitic Copepods from Hawaiian Fishes.
F. R. Fosberg: Salinity and Atoll Vegetation.
H. H. Warner: The Downward Trend in Local Food Production and a Possible Solution.
W. Edgar Vinacke: Stereotyping among Cultural Groups in Hawaii.

MAY 8, 1948

Annual Dinner
Business Meeting
Installation of Officers
Address by the Retiring President
Harold St. John: Origin of the Plants Used for Sustenance in Aboriginal Polynesia.

Abstracts

EARLY HISTORY OF THE PINEAPPLE

Pineapples are indigenous to America and were unknown to people of the Old World before the discovery of America. On November 4, 1493, Columbus and his men, on the second voyage to the New World, found pineapples, "the flavor and fragrance of which astonished and delighted them," growing on the island of Guadeloupe in the Lesser Antilles. At this time the natives of the American tropics recognized at least three distinct varieties, all of which were seedless. The place of origin of the pineapple appears to have been in the eastern part of South America at about the 25th parallel of latitude in the home of the Tupi-Guarani Indians. These people are believed to have been instrumental in its distribution through tribal migrations and border trading. Records of the extent of distribution of the pineapple in pre-Columbian times are meager and consist largely of reports of the fruit having been seen by the early voyagers and travelers. These records, however, indicate that pineapples were widely distributed in the American tropics, from Mexico in the north to central Brazil in the south, in the period before 1493. Oviedo, who lived in Spanish America from 1513 to 1547, wrote that he believed this fruit to be old and very common, for it was found in all of the islands and on the mainland of South America. Two references suggest that the pineapple was known to the ancient Assyrians and one that the ancient Egyptians also had the fruit. The majority of botanists, however, insist that the pineapple was not known to the Old World before the discovery of America. There is some biological evidence that the pineapple has been cultivated in America by aboriginal people for many centuries.

J. L. COLLINS

CONSUMER ACCEPTANCE OF DIFFERENT KINDS OF RICE

Rice is of interest to the nutritionist because of the large amounts used in the Territory; more than 5 million pounds are imported monthly. A high rice diet may have several deficiencies, but the most difficult to remedy is that of thiamine. Converted rice is a processed rice which has twice the thiamine value of white rice, although only one-fourth that of brown. If it is more acceptable than brown rice, it may be of value in improving the diet of the many rice-eating people of Chinese, Japanese, and Filipino ancestry in Hawaii.

Accordingly, the acceptability of brown, white, and converted rice was measured by two methods. Plate waste of rice was measured in six school cafeterias.

Results showed that white rice was preferred and that preference for brown vs. converted was variable. In the University of Hawaii, where educational processes had had the longest time to work, plate waste of the three kinds of rice was the same.

Two hundred Honolulu families were interviewed before and after using converted rice. Tabulation of their answers revealed that 81 per cent preferred white rice, whereas only 3 per cent preferred brown rice. Converted rice was preferred by 12 per cent, being thus more acceptance than brown but less acceptable than white. Caucasians found both brown and converted rice more acceptable than did the Oriental groups.

It is expected that the acceptability of converted rice will increase after the public has had time to become accustomed to this new rice and to be educated as to its value.

WINIFRED R. VINACKE, JOHN A. RADEMAKER, AND MARGARET CHAVE

DIAGNOSIS AND PROGNOSIS OF RHEUMATIC FEVER IN HAWAII

(No abstract.)

ALFRED S. HARTWELL

FASCINATION IN FLIGHT

"Fascination" is an auto-hypnotic phenomenon to which some aircraft pilots are occasionally subject. It differs from "aviator's vertigo" in that whereas the latter is a complex of physiological and psychological response resulting in sensations and feelings which do not accord with objectively correct environmental facts, "fascination" is a state of narrowed attention, associated with excessive concentration on some object or task, with a resulting loss of voluntary control over behavior. Data bearing upon "fascination" were obtained from interviews with 77 U. S. Navy aviators of widely diversified training and experience. They were asked to describe in detail incidents of "vertigo" and "fascination" from their flying careers. About 10 per cent of the incidents primarily involved "fascination" and 3 per cent involved both "fascination" and "vertigo." The phenomenon was reported as occurring in dive (or glide) bombing (where it is often termed "target-fixation"), in formation flight, in landing, in gunnery runs, and in tail-chasing ("dog-fighting"). Poor depth perception, which is likely to feature all of these conditions, probably contributes to its occurrence. A combination of "vertigo" and "fascination" was most clearly indicated in formation flight, in landing, and during "instrument fixation." It is likely that some pilots are more susceptible to "fascination" than others. The introduction of techniques to break up the sequence of events leading to excessive concentration would effectively reduce its occurrence.

[Opinions or conclusions contained in this report are those of the author. They are not to be construed as reflecting the views or the endorsement of the Navy Department.]

W. EDGAR VINACKE

PROBLEMS OF TELECOMMUNICATION

Present problems of telecommunication deal primarily with radio-communication via the ionosphere and hence concern characteristics of the ionosphere as "seen" by radio waves of various frequencies. The ultimate fate of a signal of given frequency impinging on the ionosphere depends almost entirely on two factors: (1) the prevailing maximum electron density at the points of reflection and (2) energy absorption due to low level ionization. These factors set practical limits for the highest and lowest useful frequencies for reliable communication over the path and determine the optimum operating frequency.

Utilization of frequencies approaching the optimum makes for dependability through higher signal strength and for operating efficiency through a decrease in lost transmission time attributable to fading signals. Only by selecting proper frequencies, and thereby reducing the number required for a given circuit, can inter-circuit interference due to congestion in the useful radio spectrum be minimized and maximum reliability of communication realized.

Predictions of temporal and geographic ionospheric variations based on direct measurements by the pulse technique afford the scientific foundation for frequency allocations over new circuits, or changes in those already established. Inasmuch as charts representing world-wide ionospheric conditions involve, of necessity, considerable extrapolation both in time and space —particularly in the Pacific Sector, which comprises about a fourth of the earth's surface—it is desirable to gauge their validity by analysis of traffic data over existing circuits.

Operating logs for a number of long western-Pacific circuits have been examined, and the indicated circuit performance compared with that predicted. With few exceptions satisfactory agreement has been realized.

E. H. BRAMHALL

USE OF THE SCHAEFER-LANGMUIR DRY-ICE TECHNIQUE IN HAWAII

I. ATMOSPHERIC PHYSICS OF THE FORMATION OF RAINDROPS AND THE ROLE OF DRY ICE

The artificial inducement of precipitation through seeding with dry ice in the United States and Australia has apparently been successfully attempted only with clouds penetrating into sub-freezing temperatures.

Since an ample supply of sublimation nuclei is frequently absent, suspended water droplets are often carried into regions considerably below 0° C. before they freeze. In the laboratory, water droplets in air free of sublimation nuclei will reach temperatures of −34° C. before any freezing or sublimation occurs. Dr. Schaefer and Dr. Langmuir of General Electric reasoned that if clouds containing super-cooled water droplets came into contact with particles or objects at temperatures below −35° C., for example, actual ice crystals would be formed which would serve as nuclei for the formation of snowflakes. Then, according to the Bergeron theory of the formation of rain, the snowflakes would grow at the expense of the water droplets because of the difference in the saturated vapor pres-

sure over ice and over water. As the ice crystals reached a sufficient size, they would fall from the cloud as snow or rain.

While the Bergeron theory is generally accepted, an extension may still be added. Once an ice crystal has started to fall it will be colder than its environment, especially after it has entered the layer of air warmer than freezing and has not yet completely melted. While it is thus cooler than the suspended droplets about it, its saturated vapor pressure will, therefore, be lower than that of its surroundings. In the region near freezing, this difference in vapor pressure resulting from a 1° C. temperature difference is roughly twice the maximum gradient between ice and super-cooled water.

It is this extension of the theory which we have tried to adapt to the Hawaiian area. Instead of using actual ice crystals to set up these small-scale temperature gradients, it was expected that much the same result might be obtained merely by the intense cooling of a portion of the existent droplets with solid carbon dioxide. The initial tests indicate that under certain circumstances this may be possible.

M. H. HALSTEAD

II. METEOROLOGY OF HAWAII IN RELATION TO USE OF THE DRY-ICE TECHNIQUE

It is well known that local weather in Hawaii is dominated by the trade winds and topography, but quantitative details of the interrelation of these factors are far from complete.

As in all trade-winds areas, an inversion of temperature results from gradual subsidence of air traveling from the northeast around the semi-permanent high pressure cell over the eastern Pacific. This inversion, the elevation of which averages about 8,000 feet over Hawaii, is a layer of stability hindering the upward movement of air parcels and providing a limiting height to the tops of normal clouds. The inversion also confines the moist air to the layers below it. The inversion has a diurnal change in height, midday maximum and a nocturnal minimum. Day-to-day variations in height and intensity also occur and are related to the passage of pressure troughs or fronts.

Inoculation of clouds with dry ice cannot result in appreciable rain if the cloud cannot build in height by natural processes after the impetus is provided by seeding. The impetus starts a natural chain reaction only if the clouds are already closer to a rain condition than on an average day. These requirements imply that success with the Schaefer-Langmuir technique in Hawaii depends primarily on the choice of day, which in turn requires recognition of the limiting conditions and an appropriate forecast.

Trials to date only roughly define these limiting conditions. It is estimated that only one day in ten or twenty meets minimum requirements, and appreciable amounts of rain can be produced even less often. Nevertheless, under the particular requirements of sugar and pineapple, man-induced rain may still be an invaluable aid in critical periods or in abnormally dry areas.

LUNA B. LEOPOLD

ABRASION HARDNESS OF SUBSTANCES

This paper is an abridgment of an article in three parts entitled: I. Malacometry, or relative softness measurement; II. Tests at high, medium, and low speeds; III. Comparisons and simplification. The original contains 9 tables listing 200 substances, 5 text figures, and 7 plates. The work described was conducted in the University of Hawaii Department of Volcanology between 1942 and 1948 and involved an analysis of the work of Auerbach, who followed Hertz, and the present author's insistence on the kinetic aspect of hardness testing in contrast to the static elastic limit of indentation of Hertz, Auerbach, and Brinell. Adopting abrasion by diamond, the definition of the author is: relative softness is the rate of volumetric yielding to identical collision rhythmically applied. Wear of diamonds is examined, and the best method is found to be an inverted drill press, with a cut diamond octahedron as centered drill bit pointed upward, on the shaft of an inductor synchronous motor revolving at 100 rpm. The specimen surface is clamped to face downward against the window opening of a hinged arm, weighted for 300 grams pressure of specimen on diamond.

Both time and volume methods of evaluating sclerometric and malacometric properties of woods, steels, and minerals are tested, relative to corundum and talc, respectively, as control substances. The essential quality of relative softness is not resistance, as in the case of sclerometry, but internal mobility of the substance, different under different applications of abrading energy. Slow abrasions and long tests give most consistent averages, and massive talc of Macon, Ontario, is the best control mineral. Depth is read to microns by a dial indicator micrometer.

T. A. JAGGAR

DIPOLE MOMENTS OF UNSYMMETRICAL ETHERS

Molecules consist of assemblages of positively and negatively charged particles. In the case of polar molecules the effective center of the positive charges does not coincide with the effective center of the negative charges, so that an electric asymmetry arises. The extent of this asymmetry is measured by the dipole moment of the molecule.

It has been shown by Debye that the dipole moment of a substance can be calculated from its density, refractive index, and dielectric constant. The substance must be in the gaseous state or in dilute solution in a non-polar solvent. This paper describes the determination of the dipole moments of several unsymmetrical ethers in benzene solution. Most of the compounds studied had not been measured in this way before. The work was suggested by previous determinations of the dipole moments of the alcohols, ethers, and cellosolves which seemed to indicate that the dipole moments of the unsymmetrical ethers might change with increasing complexity of the molecule.

It was found that the dipole moments of the unsymmetrical ethers are approximately the same, showing a similarity of structure for all these compounds. The fact that the moments differ from zero shows that the molecules cannot have a linear configuration at the

bonds linking carbon to oxygen. Two of the ethers studied had moments somewhat lower than the others; the deviation is perhaps beyond experimental error. It is planned to study this deviation further by the determination of the dipole moments of these same compounds in the gaseous state.

R. A. SPURR AND H. ZEITLIN

ION EXCHANGE INVESTIGATIONS ON CANE JUICE

Laboratory studies have demonstrated the value of ion exchange resins in effecting the separation of many of the constituents of cane juice. These resins are giant organic molecules of two types—the cation exchange and the anion exchange. The cation exchange resins possess active acidic groups which can react with the basic ions of the cane juice by means of ion exchange and thus remove the ions from solution. The anion exchange resins are characterized by active basic groups which can remove the acidic ions from the juice. By a combined action of the two types of resins, the ionic compounds can be removed from the juice, leaving the sugars and other non-ionic compounds in a purer state. The recovery of the sugars by customary methods of crystallization is increased, and a higher initial state of purity for all products is obtained.

The method was extended to semi-commercial scale operation in a raw-sugar factory during 1946 and 1947. The results showed that a good-quality white sugar can be produced in yield averaging 5 per cent higher than present raw sugar operations. Instead of blackstrap molasses, there remains as an end product an edible syrup of 77 per cent total sugar content. The recovery of potassium sulfate, aconitic acid, and various amino acids as by-products is possible.

JOHN H. PAYNE

TODAY'S CHEMICAL LABORATORY

A long and careful study of modern chemical laboratories for university undergraduate and graduate students, inspired by a legislative appropriation for a new laboratory at the University of Hawaii, was made by the inspection of many mainland laboratories, by a study of published books and symposia, and by consultation with experts.

It is generally agreed that laboratories must be built to a well-defined purpose and that plans must be adjusted to available funds, must not be architecturally handicapped by the tradition of campus buildings, and must be flexible, that is, constructed to permit of change.

In view of the great variety found in chemical laboratories and the lack of a recognizable modern pattern, the proposed laboratory for the University of Hawaii is best described as a composite of the desirable features noted among many laboratories.

The three-story, concrete, lanai-type structure, well adapted to climatic conditions in Hawaii, will be built entirely above the ground and will be oriented to north and south exposures.

All laboratories will be provided with separate preparation rooms, balance rooms, spacious hoods individually controlled, built-in steam baths and hot plates, running distilled water, compressed air, suction, a variety of electrical outlets, safety showers, and all-steel doors. The plans include special laboratories for agricultural, industrial, and micro chemistry. Special attention has been given to the planning of stockrooms, lecture rooms, shop, library, and seminar rooms.

First and foremost the building will be functional, but the planning has given attention to beauty of surroundings and to pleasant living within the building.

LEONORA N. BILGER

SOME PARASITIC COPEPODS FROM HAWAIIAN FISHES

A review of the life history, distribution, and economic importance of the parasitic copepods from Hawaii was presented. A discussion of their possible use in connection with zoogeographical studies was made, together with a review of the history of parasitic forms.

The species of parasitic copepods listed below, together with their hosts, have been previously recorded by the author mentioned:

SPECIES	HOST	REPORTED IN HAWAII
Dysgamus atlanticus Steenstrup and Lutkens	Free-swimming	Wilson 1942
Pandarus satyrus Dana	Blue shark	Wilson 1907
Pandarus smithii Rathbun	Shark(?)	Wilson 1932
Lernaea carassi Tidd	Goldfish and amphibia tadpoles	Edmondson 1945
Pseudomolgus hawaiiensis Wilson	Tectibranch mollusc	Wilson 1921
Teredicola typica Wilson	Shipworm *(Teredo milleri)*	Wilson 1942 (a)

The following list of parasitic copepods is here reported from the Hawaiian region for the first time:

SPECIES	HOST
Caligus aliuncus Wilson	Aku, *Euthynnus alleteratus* (Rafinesque)
Euryphorus coryphaenae Kroyer	Mahimahi, *Coryphaena hippurus* Linn.
Brachiella thynni Cuvier	Ahi, *Thynnus* sp.
Elytrophorus brachyptera Gerstaecker	Ahi, *Thynnus* sp.
Gloiopotes sp.	Ono, *Acanthocybium solandri* (Cuvier)

DAVID D. BONNET

SALINITY AND ATOLL VEGETATION

The native flora of coral atolls consists of relatively few species of plants, these mostly widespread strand forms. The vegetation is relatively simple, consisting of several types of forest, scrub, swamp, and, rarely, grassland. These types are distributed on an islet in relation to distance from the inner and outer beaches. From island to island they are distributed in relation to the abundance of rainfall, the more luxuriant forests and the more mesophytic vegetation being found toward the centers of islets and on those atolls where the rainfall is greatest.

The ground water on an atoll is never very far below the surface and it is usually perceptibly brackish, except on islands where there is abundant rainfall.

The clue to the nature of the flora and vegetation is found in the behavior of introduced plants. Numerous species have been brought, either accidentally or deliberately, to the atolls of the Pacific, but relatively few of them have survived and still fewer can be considered successful, even under the protection and cultivation of man. Those that are not especially successful but which still manage to survive show, without exception, signs of a severe chlorosis (yellow coloring) of the type commonly associated with excess of sodium and the resulting deficiency of assimilated potassium. Even some of the plants which survive and reproduce themselves, such as the papaya, often show signs of chlorosis. Also, they are much more successful toward the center of the islets where the salinity is lower. Very few of the introduced plants, excepting those which are themselves strand plants and those which are exceedingly shallow-rooted herbs living in the surface of the soil where the excess of salt is leached out by even moderate rains, have succeeded in becoming naturalized.

On the wetter atolls a specialized type of agriculture has developed which utilizes the lens of relatively fresh water that exists at the center of a land mass surrounded by salt water. Pits into which vegetable refuse is thrown are dug. The pits are deep enough to reach below the water table, and the organic matter decomposes into a muck which will support *Cyrtosperma, Colocasia,* sugar cane, bananas, and even various other plants, such as ornamentals that do not survive or prosper on the ordinary surface of the coral islet. It is probable that this muck, besides providing a more fertile substratum, retards the diffusion outward of the available fresh water as well as the diffusion inward of salt water that always accompanies dry periods.

One may summarize the flora, both indigenous and introduced, of these atolls by saying that only plants that have developed a high tolerance for salinity have been able to survive; thus the flora has been limited to relatively few species. The flora is larger (species more numerous) in more or less direct proportion to the amount of rainfall and the area of the islet.

The vegetation may be summarized by saying that it is heavier and more luxuriant in direct relation to the amount of rainfall and the area of the island. This is because, as is well known, salinity produces a condition of physiological drought. Saline areas are characterized by a sparse vegetation similar to that of deserts. Where the rainfall is sufficient and the area is large enough to maintain a permanent (Ghyben-Herzberg) lens of fresh or almost fresh water, the vegetation of the interior portions is more or less mesophytic and luxuriant.

F. R. FOSBERG

THE DOWNWARD TREND IN LOCAL FOOD PRODUCTION AND A POSSIBLE SOLUTION

Territorial production of fresh vegetables is declining in spite of high dollar returns. Truck crop production in 1947 was 8 million pounds less than in 1946 and 28 million pounds less than in 1945. At the same time, unloads from California of the vegetables commonly grown in Hawaii are increasing. Imports of these vegetables increased nearly 50 per cent in 1947 compared with 1946.

Most local farmers are unwilling to pay prevailing wages for the agricultural labor needed to expand their operations. Moreover, the total acreage required to supply the needs of Honolulu is not sufficient to justify the use of labor-saving equipment in order to lower the labor cost per ton. California growers, however, producing these commodities for shipment to scores of cities the size of Honolulu on the Mainland, reduce the labor cost of production by mechanized operations on large acreages exactly as has been done in the pineapple industry in Hawaii. This trend toward low-cost mechanized farming on the Mainland has caused the sharp decline in local rice production during the last 25 years and is now showing signs of similarly affecting the local production of vegetables.

Mechanized labor-saving production in Hawaii is justified only when supplying the large mainland demand. Existing quarantine barriers prohibit the development of such an outlet. We are faced with a difficult combination of high wages, small farms, and export restrictions.

Recent scientific development indicates possible sterilization and treatment methods by which these quarantine restrictions can be modified. Great advances were made during the war in the application of electronics to the problem of food treatment and sterilization. Similar work was done in the field of supersonics as a means of killing insects by high-frequency vibrations. Practically no effort has been made to apply these new principles to the local problem of sterilizing tropical fruits for shipment to the Mainland. Quick freezing, too, holds other attractive possibilities for mainland shipment, but to date little or no effort has been made to apply the knowledge in this field to the processing of locally grown tropical fruits such as papayas and mangoes.

New emphasis needs to be placed on local research in these fields. If successful in discovering new methods of treatment not injurious to the fresh fruit or satisfactory quick-freezing processes, large new opportunities will be opened up for the production of tropical fruits as well as winter vegetables for export. Such operations could be on a big enough scale to justify the mechanization so necessary to meet the increasing

labor costs. Only in this direction is the future bright for those farmers who presently are faced with the serious problems of large-scale, low-cost imports from California.

H. H. WARNER

STEREOTYPING AMONG CULTURAL GROUPS IN HAWAII

Stereotyping is an ethnocentric phenomenon representing a generalized, uncritical characterization applied by one group to another. It disregards individuals of the other group, who are judged in terms of alleged traits of their attributed group. Hawaii affords a particularly good place to study stereotyping because self-characterizations of several cultural groups can be determined as well as their characterizations of other groups. The preliminary data reported here are based upon spontaneous characterizations made by students in a class at the University of Hawaii. They listed traits which they believed descriptive of Japanese, Chinese, Caucasians ("Haoles"), Filipinos, Koreans, Negroes, Hawaiians, and Samoans. Results obtained from the first three of these groups have been analyzed in terms of the traits most frequently assigned to each group, the frequency with which traits were assigned to each, the amount of agreement on terms used (the sharpness of the stereotype), and the favorableness of the stereotype. These preliminary data show remarkable agreement within a given group on terms used to characterize both themselves and the other groups, although some groups are more sharply defined than others. However, Japanese, Chinese, and Caucasians differ in their characterizations of the same group, suggesting important implications with reference to intergroup attitudes and relationships.

Research is continuing, with a more standardized procedure, to collect adequate data from both Koreans and Filipinos in addition to the three larger groups. Further data will permit fuller determination of the stereotypes and a more accurate appraisal of their favorable and unfavorable aspects.

W. EDGAR VINACKE

ORIGIN OF THE PLANTS USED FOR SUSTENANCE IN ABORIGINAL POLYNESIA

Presidential address 1948.

In aboriginal times, the natives of Hawaii obtained their drink from one plant and their vegetable food from seventeen cultivated plants. The natives in other parts of Polynesia used all of these and raised four additional species of food plants that had not been transplanted to Hawaii. Thus the total of Polynesian sustenance plants was 21 for food and one for drink, though the coconut, here tabulated as a food plant, was also used for drink. A close study of these 22 plants was made. As point of origin, 21 of them had the East Indies or Indomalaya. Only one, the sweet potato (*Ipomoea Batatas*) was of South American origin. These economic plants were all in cultivation in the East Indies as far east as New Guinea. Most of them were present in western Micronesia, but they diminished eastward, and in the eastern Carolines, about half of them were unknown. Evidence as to origin and dispersal is found in the vernacular names. For instance, *Colocasia esculenta* was known in Hawaii as "kalo" or "taro," in Polynesia as "taro," in Fiji as "ndalo," in Java as "talies," "tales," and "taloes." Not all of the names could be traced so far, but a definite trend toward the southern group—the East Indian islands and the Indomalayan region—is noted.

From these types of evidence it is deduced that all but one of the Polynesian sustenance plants originated in the Indomalayan region and dispersed, not through Micronesia, but eastward along the East Indies to Melanesia and Polynesia. Similarly it is deduced that the Polynesian peoples followed the same southern route.

HAROLD ST. JOHN

ACADEMY OFFICERS

YEAR	PRESIDENT	VICE-PRESIDENT	SECRETARY-TREASURER	COUNCILOR (1 YEAR)	COUNCILOR (2 YEARS)	COUNCILOR (EX OFFI
1925–26	Frederick C. Newcombe	C. Montague Cooke, Jr.	Edward L. Caum	Frederick G. Krauss	Otto H. Swezey	.....
1926–27	Arthur L. Dean	Frederick Muir	Edwin H. Bryan, Jr.	Otto H. Swezey	Charles S. Judd	Frederick C. Newco
1927–28	Guy R. Stewart	John F. G. Stokes	Paul Kirkpatrick	Charles S. Judd	Nils P. Larsen	Arthur L. Dean
1928–29	Nils P. Larsen	Harold S. Palmer	Paul Kirkpatrick	.....	Edwin H. Bryan, Jr.	Guy R. Stewart
1929–30	Harold S. Palmer	Harold L. Lyon	Edward L. Caum	Edwin H. Bryan, Jr.	Robert T. Aitken	Nils P. Larsen
1930–31	Edward S. C. Handy	Harold L. Lyon	Edward L. Caum	Robert T. Aitken	Harry L. Arnold	Harold S. Palmer
1931–32	Harold L. Lyon	Charles S. Judd	Edward L. Caum	Harry L. Arnold	D. Le Roy Topping	Edward S. C. Handy
1932–33	Charles S. Judd	Charles H. Edmondson	Edward L. Caum	D. Le Roy Topping	Romanzo Adams	Harold L. Lyon
1933–34	Charles H. Edmondson	Edwin H. Bryan, Jr.	Edward L. Caum	Romanzo Adams	John F. Voorhees	Charles S. Judd
1934–35	Edwin H. Bryan, Jr.	Harold A. Wadsworth	Edward L. Caum	John F. Voorhees	Walter Carter	Charles H. Edmond
1935–36	Chester K. Wentworth	Harold A. Wadsworth	Beatrice H. Krauss	Walter Carter	Edward L. Caum	Edwin H. Bryan, Jr.
1936–37	Harold A. Wadsworth	Walter Carter	Mabel Slattery	Edward L. Caum	Oscar C. Magistad	Chester K. Wentwo
1937–38	Oscar C. Magistad	Walter Carter	Mabel Slattery	Albert J. Mangelsdorf	Willard H. Eller	Harold A. Wadswo
1938–39	Walter Carter	Harry L. Arnold	Mabel Slattery	Willard H. Eller	Cyril E. Pemberton	Ralph J. Borden†
1939–40	Harry L. Arnold	Cyril E. Pemberton	Mabel Slattery	Harry F. Clements	Carey D. Miller	Walter Carter
1940–41	Cyril E. Pemberton	Harry F. Clements	Mabel Slattery	Carey D. Miller	Julius L. Collins	Harry L. Arnold
1941–43*	Harry F. Clements	Carey D. Miller	Mabel Slattery	Julius L. Collins	Peter H. Buck	Cyril E. Pemberton
1943–44	Carey D. Miller	Julius L. Collins	Mabel Slattery	Peter H. Buck	Thomas A. Jaggar	Harry F. Clements
1944–45	Julius L. Collins	Peter H. Buck	Chester K. Wentworth	Thomas A. Jaggar	Colin G. Lennox	Carey D. Miller
1945–46	Peter H. Buck	Thomas A. Jaggar	Chester K. Wentworth	Colin G. Lennox	Christopher J. Hamre	Julius L. Collins
1946–47	Thomas A. Jaggar	Harold St. John	Chester K. Wentworth	Christopher J. Hamre	Joseph P. Martin	Peter H. Buck
1947–48	Harold St. John	John H. Payne	Chester K. Wentworth	Joseph P. Martin	Joel B. Cox	Thomas A. Jaggar
1948–49	John H. Payne	Robert W. Hiatt	Chester K. Wentworth	Joel B. Cox	G. Donald Sherman	Harold St. John

* The 2-year period, 1941–1943, during which activities were curtailed by wartime conditions and the same persons held office, was originally called the Seventeenth Annual Me but was later designated the Seventeenth and Eighteenth Annual Meetings in order to reconcile the numbers with the number of elapsed years since the date of founding.

† Mr. Borden was elected as a 1-year councilor.

NECROLOGY

LUCY VROOMAN COOPER

Lucy Vrooman Cooper, a member of the Hawaiian Academy of Science for many years, died on September 23, 1947. Mrs. Cooper was born in Brisbane, Australia, in 1878, but grew up and spent her early life in San Francisco. She was a graduate nurse from the French Hospital of San Francisco and later studied medicine, receiving her degree as a physician from the Stanford University Medical College.

As Dr. Lucy Vrooman, she came to Hawaii shortly after receiving her degree. Here she met, and, in August, 1907, married William J. Cooper, a reporter on the *Hawaiian Star.*

Mrs. Cooper's interest in medicine and in scientific research continued during her more than 40 years' residence in Hawaii. For many years she and her husband lived on and farmed a homestead in the Kuiaha district on Maui. There she took an active part in community organizations and affairs. In more recent years she and her husband owned and operated the Cooper Ranch Inn at Hauula on this island. In her dual role of charming hostess and producer of delicious food she had a world-wide reputation.

Mrs. Cooper is perhaps best known for her love of flowers and plants and, with her husband, she is responsible for the propagation of many rare and exotic tropical plants. Primarily, she and her husband are famed for the thousands of new varieties of hibiscus which they developed on their Hauula ranch.

JOHN SHAPE DONAGHHO

John Shape Donaghho, charter member of the Academy and professor emeritus of mathematics at the University of Hawaii, died in Honolulu on July 11, 1947. He was born June 11, 1867, at Fredericktown, Pennsylvania. He received both his A.B. and A.M. degrees from Marietta College and later took graduate work at Cornell University, University of Chicago, and Stanford University.

Although he started as a law student and notary public, his interest in education soon lead him into the teaching profession. From 1892 to 1904, he held various teaching positions. During this time, he completed two years of graduate work at Stanford and also became a proficient photographer. Throughout the remainder of his life, photography was of value to him professionally and it also afforded him pleasure and diversion.

Professor Donaghho arrived in Honolulu in August, 1904, and taught mathematics at the Honolulu High School. Four years later, he became the first professor of mathematics at the College, later University, of Hawaii and occupied this position until he retired in 1934.

Professor Donaghho's interest in astronomy lead to the plan for an observatory at Kaimuki which was completed in time to be used by him and his co-workers during the passage of Halley's Comet.

Professor Donaghho's students admired and loved him because of his gentle, kindly spirit and his interest in their welfare and ability to help them understand and enjoy mathematics. The people of Honolulu remember Professor Donaghho for his willingness to open the Kaimuki Observatory and to give them an opportunity of learning something about the wonders of the heavens. Even after his retirement from the University, he maintained his interest in young people until, during the last few years of his life, failing health made it difficult for him to leave the home he had built and loved on the land he homesteaded on Alewa Heights.

INDEX