PROCEEDINGS OF THE HAWAIIAN ACADEMY OF SCIENCE...

TWENTY-EIGHTH ANNUAL MEETING 1952–1953

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FOREWORD

The twenty-eighth year of the Hawaiian Academy of Science was marked by a threefold increase —in its membership, in the breadth of its organization, and in its outside contacts.

In May, 1952, the Academy had a membership of 343. Four old members were reinstated during the year, and 102 new members were elected, 30 in November, 1952, and 72 in April, 1953. Fourteen members resigned during or at the end of the year, 14 were dropped, and 6 were lost through death: E. C. Auchter, E. L. Caum, F. T. Dillingham, Louise S. Jessen, and J. J. Wolford. The membership at the beginning of the twenty-ninth year is 415, the largest in the history of the Academy. Thirty-six of the new members are teachers of science in the high schools of Hawaii, the first respondents to a drive to interest such teachers in the continuing contacts with research and applied science, and with other science teachers, that can be gained through the Academy.

Affiliation of the Academy with the American Association for the Advancement of Science was completed in July, 1952, and the Academy took its place with twenty-eight other state or regional academies in the Association's Academy Conference.

The Constitution of the Academy was revised in April, 1953, to recognize the affiliation with the AAAS, to allow for association of local scientific societies with restricted fields, to extend membership eligibility to nonresidents, to spread the responsibilities of the Academy government among more members, and to improve the method of electing officers.

The Annual Meeting comprised two sessions, totaling five evening meetings, November 13 and 14, 1952, and April 16, 17, and 18, 1953. Twenty-one individual scientific papers, including the presidential address, and a symposium on Hawaii's resources, conducted by a panel of six speakers, were presented at these meetings. The offering of papers was so great that three of these papers could be presented by title only. Attendance at the meetings ranged from 75 to 150, indicating an increased interest in both the membership and the public.

OFFICERS

1952–1953

President, Harry L. Arnold, Jr.
Vice-President, William B. Storey
Secretary-Treasurer, Doak C. Cox
Councilor (2 years), Donald Mitchell
Councilor (1 year), J. H. Beaumont
Councilor (1 year), L. D. Baver (ex officio)

1953–1954

President, William B. Storey
Vice-President, Colin G. Lennox
Secretary, Doak C. Cox
Treasurer, Beatrice Krauss
Councilor (2 years), Kiyoshi Ito
Councilor (1 year), Donald Mitchell
Councilor (1 year), Harry L. Arnold, Jr. (ex officio)

THE HAWAIIAN ACADEMY OF SCIENCE WAS ORGANIZED JULY 23, 1925. ITS OBJECTS ARE "THE PROMOTION OF SCIENTIFIC RESEARCH AND THE DIFFUSION OF SCIENTIFIC KNOWLEDGE, PARTICULARLY AS RELATED TO HAWAII AND THE PACIFIC AREA."

THE 28th ANNUAL MEETING 1952-53

Program

NOVEMBER 13, 1952

HAWAII'S RESOURCES—A SYMPOSIUM

Harold S. Palmer: Mineral Resources.
Vernon E. Brock: Marine and Fresh-Water Resources.
C. G. Lennox: Forest Resources.
Harry F. Clements: Prospects for Expansion of Crop Production.
Oliver Wayman: Animal Husbandry Potentials.
James H. Shoemaker, moderator: General Discussion.

NOVEMBER 14, 1952

Business Meeting and Election of New Members
David D. Bonnet: Filariasis in Recent Samoan Immigrants.
Sidney C. Hsiao: Reaction of Tunnies to Visual Stimuli.
Andrew W. Lind: Changing Racial Complexion of Hawaii's Children.
James Milne: Meto—Marshallese Navigation.
W. Edgar Vinacke: Some Factors Affecting Interracial Attitudes.
Robert W. Hiatt, John J. Naughton, and Donald C. Matthews: Effects of Chemicals on a Schooling Fish.
P. B. van Weel: Mechanical Properties of the Resting Holothurian Muscle.

APRIL 16, 1953

Wallace G. Sanford: Effect of Root Temperature and Cation Balance on Snap Beans.
C. E. Palmer: High-Level Tropical Cyclones.
Harvey A. Miller: Moss Societies on Oahu.
Joseph E. Alicata: Control of the Swine Kidney Worm, *Stephanurus dentatus.*
Vernon E. Brock: A Method of Estimating Reef Fish Populations.
John F. Mink and Kiyoshi J. Takasaki: The Tsunami (Tidal Wave) of November 4, 1952.
John S. Horan: A Possible Preventive Treatment for Baldness in Young Men.

APRIL 17, 1953

Leonora Neuffer Bilger, Gustav Ecke, and Claude Horan: A Simple Laboratory Process to Distinguish Genuine from Fake Hui-hsien Ceramic Specimens.
William A. Gosline: The Need for Taxonomic Work on Central Pacific Marine Organisms.
Alexander Spoehr: Oceanic Prehistory.
Robert W. Hiatt: Relation of the Ghyben-Herzberg Lens to Horizontal Zonation on Atoll Coral Reefs.
Grote Reber: Cosmic Static.
M. L. Lohman: A Locally Appearing Poisonous Mushroom, *Lepiota molybdites.*

APRIL 18, 1953

Annual Banquet
Business Meeting and Election of Officers
Address of the Retiring President, Harry L. Arnold, Jr.: Algeomorphic Diseases.

Abstracts

MINERAL RESOURCES

Two categories of mineral resources, metallic ores and mineral fuels, are lacking in Hawaii, but there are a few of the nonmetals other than fuels—water, building materials, and a few others.

That our water is derived from rainfall is shown when floods and rises of water levels follow heavy rains.

On Oahu we have withdrawn more water from underground than rainfall has replaced, as shown by the secular drop of artesian levels, originally 42 feet above sea level in central Honolulu but 9 to 19 feet lower since 1924. A marked rise of sea water, on which floats the lighter fresh water, has caused some wells to yield salty water. We can avoid salting of our water supply by using horizontal tunnels that skim the top of the fresh-water body. We must also avoid waste and low-grade uses of water.

Our narrow, steep valleys are unsuited to storing surface water. Water power has been developed in two situations—where rain falls abundantly all year and where water is dropped from higher to lower ditches of irrigation systems.

Few quarries yield dimension stone, but rock for road metal and concrete aggregate is fairly available. Much of what is quarried is too full of gas pores or too clinkery for such uses, but some is used for walls of dry masonry and some for fill.

Concrete also requires sand and cement. Beach sand varies greatly in abundance from island to island, with Oahu perhaps best supplied. Studies should be prosecuted to learn whether we are harvesting an annual crop of sand or mining an accumulation of the ages. Lava rock can be crushed to small sizes as a substitute for beach sand.

Portland cement is a mixture of silicates and aluminates of calcium. Beach sand and reef rock can supply plenty of calcium, and a few unusual bodies of lava rock have enough silica and alumina for cement making.

Lime is produced in a few plants by calcining beach rock.

Salt has been produced in varying amounts by evaporating sea water.

HAROLD S. PALMER

MARINE AND FRESH-WATER RESOURCES

Only the fishery resources are considered here. They may, for convenience, be considered in the following three categories: fresh-water fishery resources, reef, inshore, and bottom fishery resources, and pelagic fishery resources.

The fresh-water fishery resources are presently of greatest importance as a source of recreation. Aside from several species of native fresh-water gobies, the worth-while species are introductions such as trout,

bluegill sunfish, and large-mouth black bass. There are possibilities of profitable rearing of fresh-water pond fishes, but some research and developmental work is necessary, and it may be difficult to get a rapid acceptance of these species as food fishes by the public. The fresh-water fishery resources are, by the limited nature of fresh-water areas in Hawaii, of limited importance.

The reef, inshore, and bottom fish resources of Hawaii depend upon the presence of shallow to moderate depths of water for a suitable environment. Since the Hawaiian Islands are essentially the peaks of great submerged mountain masses, the shallow to moderate water depths represent relatively narrow encircling bands around each of the islands. Therefore, the limited available environment limits the production which may be obtained from this segment of the fishery resources. However, many of the species taken in shoal-water areas are excellent food fishes in substantial local demand and, therefore, command a high price in the markets. Reef fishes and reef areas are important also from a recreational standpoint.

The pelagic fishery resources are composed of relatively few species of active, wide-ranging fishes which are largely confined to the shallow isothermal waters of the open sea. They are not dependent upon the existence of land masses; in fact, recent work by Pacific Oceanic Fishery Investigations indicates that they are abundant in regions about as remote from land as it is possible to be. Also, their relative abundance may be influenced by abundance of food, which in turn is dependent upon the relative enrichment of water within the photosynthetic zone. Any interaction of ocean currents or other hydrographic mechanism which raises water from below into the photosynthetic zone may mark a concentration of pelagic fish.

Some 14 to 17 million pounds of tunas, spearfishes, and other pelagic species are landed annually in Hawaii at the present level of exploitation. Aside from a single species of tuna—the aku—this catch largely goes to the fresh-fish market, a market which, while not saturated, is capable of absorbing only a limited increase in catch. The aku is canned for sale in mainland as well as island markets, and the factors which limit a catch appear to be other than the supply of fish in the sea. An expansion of the local pelagic fisheries would, for species other than aku and moderate to small ahi, involve possibly some technological work and more efficient methods of fishing; for aku, only more efficient methods of fishing are needed.

The Japanese developed a productive offshore albacore tuna fishery to the immediate north of Hawaii (within 500 miles or less of Midway Island), and the investigations of P.O.F.I. have indicated the existence of a large yellowfin tuna resource in the equatorial area directly south of Hawaii. Hawaii is the closest center to both these areas; if certain problems in catching these fish efficiently and processing them economically can be solved, a major fish-processing industry for Hawaii is possible.

VERNON E. BROCK

FOREST RESOURCES

The flora complex of Hawaii, which still dominates the "wet forest" regions, evolved in the absence of influences exerted by man or large animals and consequently died out in many instances where such influences upset the existing delicate ecological balances. Introduced insects, diseases, and plants have also exerted their full influence in hastening the change of the flora complex, so that today is witness to a forest complex which is undergoing constant change. Recognition of the need to maintain a forest complex on a large proportion of the land area in order to prevent serious losses of rainfall from surface runoff dates back to 1876, but not until 1903 were official steps taken to set aside forest areas for forest-cover protection. By 1906, 337,140 acres had been formally set apart as forest reserves. This work progressed with more areas being studied, surveyed, and proclaimed annually until by 1936 more than one million acres had been placed in the category of protected forest reserves.

This is a continuing study with new areas being added where watersheds become increasingly important with shifts of population and water demand. Government lands within forest reserves are placed under the control and custody of the Territorial Board of Agriculture and Forestry in accordance with the Hawaii Organic Act, and privately owned lands are exempt from property taxes if they are maintained as watersheds. There are over 700,000 acres of government lands and 360,000 acres of private lands in forest reserves. All forest reserves are managed as watersheds and are under the supervision of only one agency, the Board of Agriculture and Forestry.

Basic principles followed are the establishment and maintenance of a dense vegetative cover (consisting of an upper story of trees and an under story of ferns, shrubs, grasses, and vines) through exclusion of grazing animals and protection from fire. Such a cover promotes increased moisture from fog drip and decreased losses from runoff by maintaining a surface soil condition conducive to rapid infiltration. Recreation is a forest resource which is encouraged and developed in regions where it will not adversely affect the water resources.

Timber products have played a minor part as a forest resource in Hawaii during the past thirty years. Ohia lehua, *Metrosideros collina,* is in great abundance, and, although a hardwood of high value, it has not been able to compete in price with similar imported timber. Koa, *Acacia koa,* is in limited isolated stands of diminishing size, and there is no prospect of its being increased by replanting. The forestry planting program of the past forty years has utilized timber species from other parts of the world because of their more favorable vigor and growth rates. Many of these stands are reaching maturity for harvesting, and a timber cruise of 800 acres on the Island of Hawaii in 1952 revealed that more than thirty million board feet are now available from twenty-one species.

Stumps of giant tree fern, *Cibotium chamissoi,* is a forest product for which in recent years an export market has been found. A survey to estimate stocks available presented a figure of over three-quarters million cords of merchantable fern stump.

C. G. LENNOX

PROSPECTS FOR EXPANSION OF CROP PRODUCTION

Hawaii is confronted with an unfavorable balance of trade. In general it may be stated that the approach to a solution of the problem includes increasing the efficiency of our established crops, utilizing more of the crops for marketable products, and developing new crops and products not only for export but also for local consumption.

In developing new crops or products, several principles should be considered. First, it is desirable to produce things for which there is a definite local market. Second, new crops should be grown on lands not now used for major crop production. Third, productivity of lands already in use should not only be safeguarded but increased. Fourth, production of new products for the mainland market should meet the standards of highest quality. Fifth, production of new or additional products for the local market should follow normal, efficient methods of production and distribution.

HARRY F. CLEMENTS

ANIMAL HUSBANDRY POTENTIALS

The livestock industry in Hawaii has grown steadily from the time of Vancouver in 1793 until the present. There have been periods of fluctuation in this growth according to varying economic conditions. With the exception of sheep, the number of major farm animals has continued to increase gradually. Sheep reached a numerical peak in 1884 and have decreased continually since then.

Our beef cattle can continue to increase through expansion of pastures in favorable rainfall areas, extension of watering facilities into dry areas not now grazed but producing seasonal forage, more effective use of the by-product feeds now available, improvement of our present range through introduction of more nutritious forages, and improvement of the quality of animals produced by selection for economy and rapidity of gain. Dairy-cattle potential has the same limiting factors as beef, plus dependence upon imported protein feeds and localization in high-cost areas. It may be advisable some time in the future to move dairy cattle to the outlying islands and ship milk to Honolulu by barge. As sheep decrease, they are replaced by cattle. In many areas they can be grazed together to the benefit of the range because of their differential grazing habits. Swine and poultry are in the most precarious position of our livestock, yet they present a broad field for expansion and improvement. Both are dependent on a local preferential market for their continuance. In free competition with mainland supplies, unaided by a market willing to pay a large bonus for immediate freshness or specific product characteristics, both would decrease in importance to a minimum. However, our greatest advances in the use of local by-products for feed are being made with these animals because of their great ability to utilize carbohydrates.

Blackstrap molasses has been used for years in limited quantities in swine and poultry feed. Our recent studies have shown that B-grade molasses can replace barley in the swine ration, pound for pound, up to at least 40 per cent of the ration, with a similar use for poultry. Cane bagasse is an excellent absorbent for use in feeding molasses in a nonliquid form. Pineapple tops and syrup have proved excellent feeds in the past and are again being tested under new conditions. Additional pineapple by-products are being prepared for test. Much of our protein requirements could be met by utilizing fallow lands to raise protein feeds.

Through co-ordination of our industries and optimum utilization of our resources, our livestock industry has room for growth far beyond what it is today.

OLIVER WAYMAN

GENERAL DISCUSSION

An economy is the adaptation of a people to their resources. The man/land ratio, or, expressed another way, the labor/job-opportunity ratio, is the fundamental factor in an economy. Hawaii has had an unusual population history, consisting of a decline from pre-Cook times until 1872 when there was a population of only 56,000 people and, since, an increase to the present population of 465,000. Accompanying the increase, and in large measure causing it, there has been a rise in industry. Now there is a fundamental change. Instead of increasing production rates requiring increasing manpower as in the past, the manpower increase is now calling for increased production. Discussions of the nature, limitations, and potentialities of our resources, like those in this symposium, are basic steps in studying possibilities of expanding our economy.

The service industry, it should be noted, is not based particularly on the resources discussed, but on the geographic position of the Islands. Secondary or derivative industries, also, are not based directly on natural resources. However, an increase in the primary industries is reflected in an increase in the secondary industries and, thus, throughout the whole economy.

Cheaper power would assist the economy in many ways—for example, in the proposed nitrate production. The possibility of utilizing volcanic power is intriguing, but no economic mechanism for developing such power here is known. Gravity power possibilities (dropping cinders or clinkers from high levels to low on a belt) are also intriguing.

Some areas now in forest or grazing could be utilized for agriculture if markets could be developed for the kinds of crops that will grow on them. Orchards are already being developed on some of them. However, much of the land in forest reserves is either too dry or too wet even for cattle. The terms of leases, particularly their length, have an important effect on the amount of capital improvements that can be made and, thus, on the efficient use of the leasehold lands that constitute a large proportion of the total land.

One deterrent to both production and consumption of local minor crops is the large cost of marketing. However, some increases in production seem possible —for example, in tomatoes. For other minor crops, such as taro, a continuance of present production is all that can be expected.

It is conceivable that we can increase beef production to the point of self-sufficiency, or perhaps even to the point of exporting. By-product utilization in the major industries is one of the principal requirements for such an increase. It may some day be more efficient to restrict milk production to the outer islands, where land values are lower, and transport the milk to Oahu by barge. Protection of feed-importation schedules from shipping tie-ups is vital.

JAMES H. SHOEMAKER, MODERATOR, AND MEMBERS OF THE PANEL

FILARIASIS IN RECENT SAMOAN IMMIGRANTS

On July 28, 1952, a group of 928 individuals arrived at Honolulu by ship from American Samoa. This constituted a mass migration of approximately 6 per cent of the population of Samoa. Through the co-operation of the Navy, blood samples were obtained by veni-

puncture from 922 of the new arrivals. These samples were examined by the Department of Health, and 160, or 17.3 per cent, were found to be positive for filariasis. This constituted a hazard to the Territory inasmuch as work previously done in Hawaii by the author and by Dr. Stephen M. K. Hu has shown that our local *Culex* mosquito can develop the parasite microfilaria from a Samoan donor to the infectious state. The influx of a large infected reservoir, therefore, produced the possibility of establishing an endemic focus. To forestall such an eventuality, a survey of places of residence was made, *Culex* mosquito control was intensified in those areas, and a three-week course of medication with Hetrazan was initiated by the Health Department.

Repeat blood tests indicated that within a week medication markedly reduced the number of microfilaria. It is believed that as a result of the combined medical treatments and mosquito reduction, the possibility of secondary cases of filariasis occurring in Hawaii as a result of this migration has been eliminated.

DAVID D. BONNET

REACTION OF TUNNIES TO VISUAL STIMULI

The oceanic species of tunnies, *Euthynnus yaito* (Kishinouye), has been subjected to experimentation under controlled conditions for the first time. In this report the apparatus and the experimental methods employed are described, and the results obtained with the use of artificial lures are summarized.

When artificial lures were lowered into the pond, they increased (with one notable exception) the number of times groups of tunnies entered into the field of observation from 150 to 500 per cent that of the control. But, when both aqueous extract of fish meat and artificial lures were used, there was always an increase in the frequency of groups entering the field of observation, ranging from 186 to 572 per cent that of the control, during the first 15-minute observation period immediately after the addition of the fish meat extract. There is a high degree of variation in this increase during successive periods of observation in each day's experiment, as well as between observations made on different days. The swimming rate of the tunnies was doubled when both fish meat extract and lures were employed.

The tunnies reacted positively by either swimming toward the lures with increased speed (making a "pass" at the lure) or by attempting to bite the lure. There is indication that they reacted positively more often at the beginning of this study than they did later (this might be due to learning). Addition of aqueous extract of fish meat also excited the tunnies to run for the lures with a frequency increased by 95 to 500 per cent over that obtained by lowering lures alone. There was no sign of decrease in the number of positive reactions to the lures under the influence of fish meat extract as this study progressed.

For a comparative study of the reaction of tunnies to color, lures of different hues were presented in pairs to the fish. No striking preference was shown by the tunnies toward a particular hue, when the colored lures were lowered into the pond either when fish meat extract was diffusing through the water or when no extract was used. The effect of position of the lures in this type of choice experiment was counterbalanced by interchanging the position of the lures in each pair on consecutive trials. Aqueous extract of fish meat always increased the number of positive reactions of tunnies toward the lures lowered at them.

Further work on the movement of colored objects through the water as lures for tunnies is still in progress.

SIDNEY C. HSIAO

CHANGING RACIAL COMPLEXION OF HAWAII'S CHILDREN

Accepted for publication under the title "A Measure of Miscegenation in Hawaii" in the *American Sociological Review.*

Hawaii's reputation as an observatory of race relations depends largely upon its ability to provide an accurate and dependable record of the interaction between its various ethnic groups. The statistics of a mounting intermarriage rate among these groups have been used and abused as supporting evidence for the rapid amalgamation of racial stocks and of the consequent futility of attempting to keep further population records of the separate racial groups.

Actually, a more accurate index of Hawaii's racial fusion is found in the records of the births of the Territory according to the racial ancestry of the parents. An analysis of these records for the past twenty years provides the basis for judgment as to how and to what extent each of the major ethnic groups is contributing to the future population of Hawaii. In general, these statistics confirm the predictions regarding racial trends made by Romanzo Adams, but they have also revealed certain developments which he could not have anticipated.

Records of the racial ancestry of both parents are available for a total of 194,430 births which occurred in Hawaii between July 1, 1931, and December 31, 1950. Of this number, 134,272 or 31 per cent were of mixed racial ancestry, i.e., had known ancestors from two or more of the seven principal ethnic stocks recognized in Hawaii. The proportion of children whose ancestry was exclusively from one ethnic group has steadily declined during this period, from 77.6 per cent in the first two years to 69.5 per cent in the years 1938–42, and to 66.7 per cent in the last period, 1946–50.

Nearly half the children born between July 1, 1931, and June 30, 1933, had at least one parent, if not both parents, of Japanese, Chinese, or Korean ancestry. While the ratio of parents of Oriental ancestry declined steadily to 41.5 per cent in the last four-year period (1946–50), the ratio of parents of Caucasian ancestry increased from 16.7 per cent to 27.0 per cent. During the same time span, the ratio of parents of Hawaiian or part-Hawaiian ancestry remained substantially the same.

The ethnic combinations revealed among the children born in Hawaii have become progressively more complex. For example, twenty years ago the Japanese population contributed only slightly to the birth of mixed-blood children and that chiefly among the Hawaiians. Of a total of 8,592 children born to Japanese parents during the initial two-year period, only 458, or 5.3 per cent, had one non-Japanese parent. This ratio had increased to 14.2 per cent during the period of World War II and to 17.6 per cent in the postwar period. Moreover, the non-Japanese parents of the Japanese hybrids were noticeably more evenly distrib-

uted among the various ethnic groups then than in the early thirties. A similar trend, to a more marked degree, is evident among the Hawaiians, Puerto Ricans, Koreans, and Filipinos, whereas among the Caucasians and Chinese the trend is less marked or even reversed.

ANDREW W. LIND

METO—MARSHALLESE NAVIGATION

Marshallese navigators base their sailing instructions largely on the prevailing ocean-swell patterns. Four principal swells are recognized:

Swell from	General term	Navigational term	
		when traveling north or south	when traveling east or west
North	Non-en	Bontok-en	Drilep
East	Non-in-rear	Drilep	Bontok-rear
South	Non-rok	Bontok-rok	Kaelep
West	Non-kobiling	Kaelep	Bontok-lik

These swells are distinguished by differences in size and velocity. The drilep (backbone) is either the large swell from the north or that from the east, whichever has crests paralleling the desired direction of travel. Waves resulting from interference of opposing swells, either from north and south or from east and west, are kaileptok. As islands are approached, reflected or interference waves are encountered: jalotlot-ae, farthest from the island, jalot-ae next, and juk-ae closest. The types of waves discussed above are those diagrammed on elementary stick charts, the simplest type of a series of five types used by Marshallese navigators. The advanced charts show local complications of wave patterns.

In addition to the swell pattern, kōklol (signs) are used to determine position, their significance being recorded in chants. These signs include the appearance of birds, accumulations of floating trash, etc.

After "textbook" training from stick charts and by chant memorization, students are taken to sea and taught to recognize the features they have learned, first visually, then by the motion of the vessel on various headings.

Most skilled Marshallese navigators were employed during World War II by the Japanese navy and were lost during the Battle of Midway. Few survive, and their skill is not being adequately transmitted.

JAMES MILNE

SOME FACTORS AFFECTING INTERRACIAL ATTITUDES

Both sexes of seven national-racial groups characterized eight national-racial groups (including themselves). They also judged the favorableness or unfavorableness of the traits assigned. This report concerns uniformity (amount of agreement), intensity (degree of favorableness-unfavorableness of traits), direction (approval-disapproval of the group rated), and familiarity. Besides interrelations among these variables, self-characterizations were compared to characterizations of others. Analyses were conducted by means of chi-square and tests of significance of differences between percentages.

Uniformity, intensity, direction, and familiarity operate much as expected. Thus, "good" groups are characterized with many high uniformity-high intensity traits, "bad" groups with many high uniformity-low intensity traits. More familiar groups are characterized with more uniformity than are less familiar groups.

Self-characterizations consist of predominantly high intensity traits, though not to the degree typical of good groups. There is little difference in uniformity between self-characterizations and characterizations of others.

Two especially revealing tendencies were found. There is evidence that a group is influenced in its characterizations of others by the favorableness or unfavorableness with which it is characterized by them. Tentatively, it is hypothesized that bad groups are characterized more favorably by those they consider bad than by those they consider good, and that good groups are characterized more favorably by those they consider good than by those they consider bad. Each group also tends to rate more favorably traits considered typical of self than other groups rate those same traits. This difference is much greater in comparison to ratings by good groups than to those by bad groups. This tendency may be a function of projection.

In general, the results bear out the contention that stereotyping can best be understood as an intricate pattern of two-way processes.

W. EDGAR VINACKE

EFFECTS OF CHEMICALS ON A SCHOOLING FISH

Published in full under the title of "Effects of Chemicals on a Schooling Fish, *Kuhlia sandvicensis*" in *Biological Bulletin,* 104(1): (1953), 28–44.

The object of this research is to discover chemical substances which, in exceedingly dilute proportions, will induce blindness or will act as extreme irritants or repellents to effect rapid dispersion of schooling fish. Types of chemicals found most successful thus far in effecting the dispersal of the schooling fish, *Kuhlia sandvicensis,* are halogenated ketones, organic thiocyanates (particularly unsaturated, halogenated, and nitrated), organic isothiocyanates (particularly unsaturated, halogenated, and nitrated), nitrated olefins, and inorganic cyanides. In general, it has been found that sulphur and a high degree of halogenation in an organic molecule increase the desired irritant property. Chemicals possessing power as lacrymators and skin irritants are most likely to be effective as fish-dispersing agents, and the most effective compounds of a related series are usually those of lowest molecular weight, presumably because of their great solubility in sea water.

ROBERT W. HIATT, JOHN J. NAUGHTON, AND DONALD C. MATTHEWS

MECHANICAL PROPERTIES OF THE RESTING HOLOTHURIAN MUSCLE

The muscle, as an organ, has two functions to perform: (1) to contract and by so doing to cause a movement, and (2) to maintain a certain length or tension. Both these functions are performed by striated and by smooth muscle, but the second is usually more characteristic of the smooth muscle. Because this muscle maintains a certain tension practically indefinitely and (contrary to the striated one) apparently without an increased metabolism, it has been claimed that this muscle is physiologically fundamentally different from the striated muscle. Therefore, its tonus

would be fundamentally different from the tonus of the striated muscle which is based on a rotating tetanus of a certain number of muscle fibers, the other fibers remaining completely relaxed. An increase in metabolism goes hand in hand with this kind of tonus.

In Holothurians we have two different kinds of smooth muscle: (1) the longitudinal and circular muscles, especially used in the movements of the animal, and (2) the cutis muscles, which maintain the tone, or the turgor, of the animal. To study the tonus of the smooth muscle, the muscle must be at rest, as the rapid contractions are used only in motility.

Since the tonus (the maintenance of a certain tension in the muscle) is maintained without an appreciable increase in metabolism, the structure of the muscle must be (partially) responsible for it. When the muscle is stretched, it will yield to the stretching force in such a way that the tension does not change. This expresses itself in the peculiar stretching curve, a curve which can also be obtained in such lifeless matter as plasticized, nonvulcanized rubber: a perpendicular "free fall" which gradually curves out into a steady, straight decline (the Bingham curve). Rubber research has revealed the probability that such a curve is the result of (1) the stretching of elastic, submicroscopic micellae (free fall), and (2) their displacement through an intermicellar viscous fluid. As the stretching curve of the smooth muscle is actually of the same type, it might be possible that it has the same type of submicroscopic structure. The following experiments seem to confirm this hypothesis.

When the muscle is stretched for a certain period of time, after which the load is suddenly released, the muscle does not shorten to its original length (as the striated muscle will do), but achieves only partial recovery, remaining in a state of relaxation until it again contracts. Recovery must be the result of a shortening of the stretched elastic micellae, as the recovery is constant. Relaxation is, therefore, an expression of the displacement of the micellae as a result of the stretching.

When the micellae are pulled through a viscous medium, a resistance will be built up in front of them proportional to the pulling force, just like the resistance in front of a moving snow plough. The snow "wave" has a height more or less proportional to the force which builds it. When, in a smooth muscle, the pulling force ceases, it will take some time for this wave of resistance to flow off. This snow-plough effect really exists in the smooth muscle. When a high wave is built by a pulling force, the micellae will not move any further; when this force is suddenly weakened, when enough of the wave has flowed off, the weaker stretching force can pull the micellae through the remaining resistance. The result is that, instead of a continuously sloping stretching curve, there is a horizontal one for some time. The snow-plough effect is also well demonstrated in the so-called paradoxon of the decrescent (Jordan).

If a viscous intermicellar fluid exists, a change in temperature will markedly affect the velocity of micellar displacement (the stretching of the muscle). The lower the temperature, the slower the stretching, when the same weight is used. Therefore, this hypothesis must be accepted as a very real possibility. Although the physical properties do not take care of the maintenance of the tonus (the continuous slight positive pressure exerted by the muscle), it no doubt helps. Consequently, only a very small amount of energy is needed for this purpose. As the entire muscle takes part in this process, and not only a few muscle fibers as in the striated muscle, it is possible that the increase in metabolism is so small that it escapes our methods of determining it. In this respect the smooth muscle indeed differs fundamentally from the striated one. There is no tetanus, as recording of action currents shows. The cutis muscle shows exactly the same phenomena, except that the wave effect is much more pronounced because the intermicellar fluid is apparently much more viscous.

P. B. VAN WEEL

EFFECT OF ROOT TEMPERATURE AND CATION BALANCE ON SNAP BEANS

In this study, snap beans were grown in solution cultures supplied with varying ratios and concentrations of the cations K, Ca, and Mg, with anions remaining constant in all treatments. The total concentration of cations in the nutrient solutions was 25.5 m.e./L. The plants were subjected to controlled root temperatures, but the top environment was that which prevailed in the greenhouse during the experiment. The controlled root temperatures were 80°F. and 60°F. There were a total of 96 temperature-nutrient treatments in the experiment.

The following significant results were obtained.

1. Variations in growth as measured by total dry weight of the plants were obtained with variations in the nutrient substrate and the root temperature.
2. Under an environment presumably favorable to maximum photosynthesis, a root temperature of 80°F. resulted in twice the growth produced at 60°F.
3. Good vegetative growth was obtained over a wide range of cation concentrations in the substrate. Growth was decreased when one cation overwhelmingly dominated both of the other cations in the substrate. Under these conditions, high Ca produced the best growth, high K less growth, and high Mg the least growth. When Ca exceeded K in the substrate, the toxic effect of high Mg in the substrate was greatly reduced. At low levels of any one of the cations, i.e., 3 m.e./L. or less, much better growth was obtained when the remaining two cations were nearly in balance. Under these conditions, the greatest reduction occurred when Ca was at a low concentration in the substrate.
4. Vegetative growth was little affected by extreme variations in leaf concentrations of K or Mg, whereas low levels of Ca were associated with reduced growth.
5. The concentration of a cation in the leaf tissue increased as the cation increased in the substrate.
6. At a given level of K in the substrate, K concentration of the leaf tissue increased as the ratio of Mg:Ca increased; at a given level of Mg in the substrate, Mg concentration of the leaf tissue remained constant regardless of the K:Mg ratio.
7. Analyses of leaf tissue grown in any nutrient treatment containing 8.5 m.e./L. or more of Ca in the substrate indicated that K concentration in the tissue decreased with increases in root temperature while Mg and Ca increased.
8. Under the conditions of this study, Ca had the greatest influence on growth and ultimate concentration of both K and Mg in the leaves.
9. The effect of temperature on the concentration of cations in the leaf tissue differed depending on the cation balance of the nutrient solution.

WALLACE G. SANFORD

HIGH-LEVEL TROPICAL CYCLONES

Published in full under the title of "Impulsive Generation of Certain Changes in the Tropospheric Circulation" in *Journal of Meteorology,* 10:(1953), 1–9.

An article in the October, 1951, issue of the Transactions of the American Geophysical Union entitled "On High-Level Cyclones Originating in the Tropics" suggested, as a result of the study of two weather situations, one in June, 1946, and another in March, 1949, that cyclonic circulations may originate in the high troposphere above 30,000 feet and between 15°N and 10°N in the longitudes of the Marshalls. The cyclones, originating in a region normally showing anticyclonic zonal wind shear, may remain stationary over the Marshall Islands for as long as two weeks, extending downward to 20,000 feet or less. After the initial period of genesis they usually move toward higher latitudes.

Since the publication of the A.G.U. article more evidence, chiefly derived from data acquired during the nuclear weapon tests of 1951 and 1952, has accumulated to confirm and amplify the original hypothesis. This paper is devoted to a discussion of this evidence, with special reference to the weather situation over the Marshalls in mid-April, 1951. The situation yields new data concerning the cloud distribution that develops during the cyclogenesis, the precipitation regime, and the distribution of the vertical component of vorticity. These new data are then used in discussing the relation of upper level tropical cyclones to the cold lows of higher latitudes, described by Palmén. It appears that the present practice of ascribing all tropical cold lows, that are cut off from high-level pressure troughs, to the dynamical processes first advanced by Palmén may be erroneous.

C. E. PALMER

MOSS SOCIETIES ON OAHU

The study of the societies, or associations, of Hawaiian mosses has been given little attention by previous bryologists who have been acquainted with the local flora. There are two reasons for this—no earlier worker has been a permanent resident in Hawaii, and the primary concern has been with the taxonomy of the mosses. Some of the associations have been selected from the forests on Oahu and briefly described within rather broad limits. These communities have been grouped within the life forms proposed by Gams (1932), a European bryocenologist with experience in Java.

NEREIDIA. *Limbella tricostata,* known on Oahu from Punaluu, Kipapa, and Makaleha streams, is our only aquatic moss.

AMPHI-NEREIDIA. Some Hawaiian mosses undergo periodic submerging (i.e., *Baldwinella kealeensis, Philonotis, Ctenidium*), but none are restricted to this particular habitat.

EPIPETRIA. *Rhacopilum cuspidigerum* is the most common moss on rocks in mesophytic forests. *Thuidium* and *Homaliodendron* occur together on moist stones. Deep humid gulches contain rocks covered with *Ctenidium, Ectropothecium, Thuidium, Hookeriopsis,* and *Mnium rostratum. Fissidens* and *Homaliodendron* occur on the sides and *Baldwinella* at the base of these rocks. *Philonotis* is almost restricted to dripping rocks or banks, but *Campylopus introflexus* and *Macromitrium brevisetum* are found on exposed rocks subject to frequent desiccation.

EPIPHYTIA. Epiphytes are abundant in the rainforests, with *Macromitrium piliferum, M. owahiense,* and *Acroporium fusco-flavum* the most common. Other species of *Macromitrium,* Dicranaceae, Sematophyllaceae, and Meteoriaceae, are found growing on bark or hanging in pendant masses on limbs.

XEROGEOPHYTIA. Mosses which grow on soil and which are annuals or have a dry "resting period" are relatively rare in Hawaii. *Weisia ovalis, W. viridula,* and *Bryum argenteum* var. *lanatum* have been collected by the author on Koko Head and on the dry flats at Kealia and should be included here.

HELOPHYTIA. The major peat-forming mosses on Oahu are species of *Leucobryum, Rhizogonium,* and *Campylopus.* Liverworts play a vital role in peat formation, but *Rhacomitrium,* which is so abundant in the bogs of Kauai, Molokai, Maui, and Hawaii (along with *Sphagnum* on the latter two), is unknown on Oahu.

BRYOCHAMAEPHYTIA. Humus soil, including decaying logs, is the substratum for many Hawaiian mosses. The more conspicuous of these are *Leucobryum, Rhizogonium, Plagiothecium,* and members of the families Hookeriaceae, Dicranaceae, and Sematophyllaceae.

EXOCHOMOPHYTIA. *Dicranella, Pogonatum, Funaria, Bryum, Trematodon, Campylopus,* and *Anoectangium* are found in dense tufts on exposed mineral soil.

Detailed descriptions of *coenosia* could be employed by foresters and others interested in developing natural resources.

HARVEY A. MILLER

CONTROL OF THE SWINE KIDNEY WORM, *STEPHANURUS DENTATUS* (NEMATODA, STRONGYLOIDEA)

To be published in full under the same title in *American Journal of Veterinary Research.*

Stephanuriasis is one of the most important parasitic diseases of swine in many areas, including Hawaii and other Pacific islands. Economic losses are sustained from emaciated carcasses and condemnation of parasitized livers and kidneys at slaughter. Of 16,323 hogs slaughtered in Honolulu during a part of 1952, 3,466 or 21.2 per cent showed kidney worms.

Because of the need for improved methods of kidney worm control, observations have been conducted on the value of Polybor-3 (Pacific Coast Borax Co.), a combination of sodium pentaborate tetrahydrate and sodium tetraborate pentahydrate, for the destruction of the larvae in soil. In these experiments the soil was artificially infected with infective larvae, and the chemical was applied dry or as a spray at the rate of 5 pounds to 100 square feet. The treated soils and the corresponding untreated controls were then examined for viable larvae ten and twenty days later.

In experiments carried out in small outdoor plots, the percentage of viable larvae recovered from treated soils in contrast with corresponding untreated controls was 9.7 to 15.1 per cent at ten days after treatment and 0.1 to 0.2 per cent at twenty days after treatment.

Further observations on the viability of the infective larvae in the above experiments revealed that rabbits fed larvae taken from soils ten days after chemical

treatment showed only a few liver lesions at necropsy one month later; a rabbit fed larvae recovered from soil twenty days after treatment showed no liver lesions. In contrast, all the corresponding control rabbits fed larvae from untreated soils developed extensive liver lesions. In addition, a pig fed infected soil twenty days after treatment showed no liver lesions at necropsy, whereas the corresponding control pig fed untreated infected soil exhibited many liver lesions.

In experiments where kidney worm eggs were superficially mixed with soil recently sprayed with Polybor-3, no live larvae were recovered when the soil was examined five days later. Many active infective larvae, however, were recovered from the corresponding untreated control soils.

No ill effects were noted in a young pig kept for one month in a small enclosed area which was treated twice with Polybor-3.

It is concluded that Polybor-3 can be utilized to good advantage by hog raisers in (1) rendering an already infected hog lot comparatively free of kidney worm larvae, and (2) in maintaining, by frequent application, a low level of kidney worm larvae in soil where infected animals are kept. Polybor-3 is injurious to plants and should not be used where vegetation is to be maintained.

JOSEPH E. ALICATA

A METHOD OF ESTIMATING REEF FISH POPULATION

There is a need to obtain a measure of abundance of reef and inshore fish populations in Hawaii which does not depend upon a study of fluctuations in the fishermen's catch. Although a considerable quantity of table fish from reef and inshore areas is taken by commercial fishermen and statistics of the landings from this source are routinely obtained, the unrecorded catch of those who fish for sport or food may be of greater magnitude, and satisfactory statistics of the catch of this group are most difficult to obtain. However, if these fisheries are to be managed, methods of measuring abundance are necessary, because, if the effects of management cannot be discerned, justification of management or regulation disappears.

During the last year an attempt was made to develop a method of visually estimating abundance of reef and inshore fish populations. Advantage was taken of the clear warm waters of Hawaii and the availability of a self-contained compressed air diving apparatus to make counts of fishes along a 1,500-foot guide line laid across the sea floor. Two divers, together for safety's sake, would count all fish within a band 40 feet in width along the guide line and also estimate the lengths of the fish counted. The area covered in counting was 60,000 square feet.

Some seventeen transect fish counts have been made in nine different localities. Variations in numbers of fish enumerated among areas and in weights computed from those numbers and length estimates has been great, from a high count of 6,417 and computed total weight of 2,917 pounds for Keahole Point, Kona, Hawaii, to a low count of 77 and a computed weight of 9 pounds for Rabbit Island, Oahu. The replicate counts within localities gave a much lower range of variation. Counts were made in both windward and leeward areas and in depths from 3 to 80 feet.

VERNON E. BROCK

THE TSUNAMI (TIDAL WAVE) OF NOVEMBER 4, 1952

On November 4, 1952, a major displacement of the earth's crust off the southeast coast of the Kamchatka Peninsula gave rise to a tsunami that struck Hawaiian shores approximately six hours later in the early afternoon. No casualties were suffered, largely because of the effectiveness of the Pacific Seismic Sea Wave Warning System for which the Magnetic Observatory of the U. S. Coast and Geodetic Survey at Barbers Point, Oahu, acts as the operation center. This warning system embraces the co-operation and facilities of many military and civilian organizations of the United States, as well as the Peruvian and Japanese governments. The damage caused by the tsunami amounted to somewhat over $800,000.

The Hawaiian archipelago is particularly vulnerable to tsunamis from the seismic rim of the Pacific because of its central location. Large tsunamis are not common phenomena, but many minor waves of this type occur and escape notice except on tide-gauge records. Over a reasonable period of time an average of about one tsunami per year is recorded on gauges in the Hawaiian Islands, but since 1835 only fifteen have caused measurable damage. The most common sources of the tsunamis recorded in Hawaii are off the Pacific coasts of the Japan-Kuriles arc, the Kamchatka Peninsula, the Aleutian Islands, and South America.

The first wave of the recent tsunami struck Hawaii during a period of low tide after traversing the North Pacific at a velocity of approximately 500 mph. About four major waves occurred, but minor oscillations affected tide gauges until November 10. The waves approached shore as gentle swells. Damage was greatest and waves were reported highest in the Waialua Bay area of Oahu, the Kahului-Spreckelsville region of Maui, and Hilo Bay on Hawaii. On Oahu the highest wave reached 20 feet above mean lower low water, but on unexposed coasts heights averaged only 5 to 10 feet or less. In Hilo Bay a maximum high-water mark of 12 feet was recorded. In general, the coasts exposed to the unrefracted wave path of the tsunami experienced the highest waves. Coral reefs and other offshore barriers, submarine topography, and shore-line configuration also influenced the magnitude of the wave as it struck land.

The period of the tsunami as determined from tide gauges showed great variations between stations. It ranged from as little as 8 minutes at Midway to 48 minutes at Guam and Eniwetok. The period at Honolulu was 38 minutes, at Port Allen 30 minutes, and at Hilo 20 minutes. It is probable that the natural period of the harbors where the tide gauges are located and perhaps the periods of large ocean troughs influenced the recorded periods. For island stations throughout the Pacific, periods ranging between 30 and 40 minutes were most common.

JOHN F. MINK AND KIYOSHI J. TAKASAKI

A POSSIBLE PREVENTIVE TREATMENT FOR BALDNESS IN YOUNG MEN

Two relatively new drugs, beta pyridyl carbinol tartrate and benzazoline hydrochloride, used in the treatment of nerve diseases, seem to have the effect of increasing hair growth in males. The first two patients were men in their late twenties being treated with ben-

zazoline hydrochloride for nerve disorders. They reported that where their hair had been thinning it was becoming much thicker following treatment. Their statements were ignored. The third patient was a man of twenty-five under treatment with beta pyridyl carbinol tartrate who said that his beginning bald spot began to show a regrowth of hair after a month of treatment. With this evidence in mind, each drug was tried on a different man with beginning baldness. After about a month the balding tendency appeared to be arrested and hair to be growing back. About ten months have passed, and both of these men have hair in the former bald spot.

Apparently the drugs act principally by stimulating the circulation to the hair follicles. They produce a warm, tingling sensation and a visible flush to the scalp when taken. It may be that a hair follicle degenerates slowly over a period of time to produce baldness and if the drug is given before the follicle is dead, regeneration may occur. It would probably have no effect on baldness in spots where the hair is completely gone. All five subjects in whom the effects were noted were males with beginning baldness or balding spots. It is too early to say whether these drugs can definitely prevent baldness, but they are safe and fairly inexpensive, and the results thus far suggest that further trial in men who are beginning to lose their hair is justified.

JOHN S. HORAN

A SIMPLE LABORATORY PROCESS TO DISTINGUISH GENUINE FROM FAKE HUI-HSIEN CERAMIC SPECIMENS

Accepted for publication in full under the title of "Chemistry and Art Work Together" in *Journal of Chemical Education.*

The simple laboratory process referred to is the extraction of a material, by means of organic ester-alcohol mixtures, which manifests the properties usually attributed to natural and synthetic lacquers. The paper presents a brief review of the origin of natural lacquers and their properties and the desirable characteristics of lacquers in general.

A brief account is given of a long-existing controversy as to whether or not the gloss of genuine Hui-hsien ceramic ware, a black pottery produced in China in the fifth pre-Christian century, was produced by burnishing or by treatment with lacquer. In this paper the proof of lacquering was established by an extraction process applied to a Chan-Kuo 17 pottery bell.

The paper is illustrated by photographs of genuine and fake objects and by a photograph of lacquer deposit obtained from a presumably genuine article.

LEONORA NEUFFER BILGER, GUSTAV ECKE, AND CLAUDE HORAN

THE NEED FOR TAXONOMIC WORK ON CENTRAL PACIFIC MARINE ORGANISMS

One of the primary prerequisites of all biological work is that we know and can make known to others the organisms with which we are working. The foundation for such knowledge is provided by taxonomy. Today taxonomic work on Central Pacific marine organisms has not progressed far enough to permit most identifications to be made with any degree of certainty or unanimity. Until a firmer taxonomic foundation has been laid, this situation will continue to handicap all marine biological work in the area. The need for further taxonomic work on Central Pacific marine organisms is therefore stressed, and the point is made that the proper place to carry on such work is in the Central Pacific.

WILLIAM A. GOSLINE

OCEANIC PREHISTORY

See "Time Perspective in Micronesia and Polynesia" in *Southwestern Journal of Anthropology*, 8: (1952), 457–465, and "A Program for Micronesian Archeology" in *American Anthropologist*, 53: (1951), 594–597.

The reconstruction of Oceanic prehistory has been based primarily on contemporary evidence drawn from linguistic, ethnographic, and physical anthropological studies. Though much significant work remains to be done in these fields, greater attention to archaeology is a necessity if the prehistory of Oceania is to be unraveled. Successful archaeological work, in turn, demands (1) a sound strategy in the planning of field research, (2) a review of previous conceptions as to the spacial classification of Oceanic cultures and peoples, and (3) the development of a framework of Carbon 14 dates to establish temporal sequences linked to the spacial relationships of past cultures. Oceanic archaeology must begin with excavations in a series of key island groups, whereby local chronologies of culture change are established. One such set of excavations was conducted in 1950 in the Mariana Islands by the Chicago Natural History Museum. Here a cultural sequence, running from 1527 B.C. to approximately A.D. 1700, was found. The past relationships of the Marianas probably lay with the Palau Islands to the south and with the Philippines. The Marianas Carbon 14 dates suggest that by 1500-2000 B.C. a developed form of water transport had been invented in Malaysian–Southeast Asian regions and that the movement of the Malayo-Polynesian peoples into Micronesia had commenced. If Micronesia is coupled with Polynesia as lying within the area encompassed by the great eastward movement of Malayo-Polynesian peoples, then the time span between the earliest Oceanic Carbon 14 date of 1527 B.C. on Saipan and Emory's date of A.D. 1005 for Oahu is a critical 2,500-year period, the events of which form a focus of interest for students of Oceanic prehistory.

ALEXANDER SPOEHR

RELATION OF THE GHYBEN-HERZBERG LENS TO HORIZONTAL ZONATION ON ATOLL CORAL REEFS

Horizontal zonation of coral species on well-developed seaward reefs has been described in several accounts. Those authors who attempt to discern the underlying physical factors related to this zonation consider exposure to air and silt deposition as most salient. At Arno Atoll, where comparative zonation studies were made on the sea and lagoon reefs, these factors were found to play only a partial role at most, with silt deposition being a factor only on the lagoon reefs. Transect studies on salinity, temperature, and exposure disclosed very sharp gradients of salinity and temperature on the sea reef and a near lack of such gradients on the lagoon reef flat. Such experimental evidence as is available indicates that coral growth over a long period is profoundly influenced by lowered salinity, particularly salinities as low as 60 per cent of normal oceanic water. Dilutions of this order were very

common during ebb tides on the shoreward section of the sea reef. This fact pointed to the Ghyben-Herzberg fresh-water lens as a probable new and highly important factor influencing horizontal zonation on coral reefs.

The predominance of boulders, cobbles, and coarse sand on the ocean beach as compared to the fine sand on the lagoon beach suggests strongly a greater permeability to fresh-water outflow on the seaward side. This idea is borne out by the characteristic shape of the lens as seen in vertical section across an atoll island. Since the maximum water-table elevation at Ine Island is about 1 foot above mean sea level, the saline ocean water at flood tide effectively prevents fresh-water outflow at the beach, but at ebb tide the outflow onto the reef flat is extensive. Lagoonward, the outflow is much smaller at low water because of the impermeability of the fine sandy deposits.

The species density of both corals and fish show a remarkable correlation to the salinity gradients on the sea reef, whereas the lack of sharp zonation on the lagoon reef is attributable to the more uniform physical conditions characteristic of the entire reef flat. As the species density is usually very great under optimum conditions but decreases as the environment becomes less favorable, the rather precise zonation of both corals and fish on the seaward reef indicates that fluctuations in salinity, temperature, and exposure limit the number of inshore species, while the invariable physical factors at the sea reef edge favors a plethora of animal types.

ROBERT W. HIATT

COSMIC STATIC

Cosmic static is the name applied to long electromagnetic waves of natural origin which arrive from the sky similar to starlight. As the wave lengths cover the range from a few centimeters to many meters, the apparatus necessary for detection is quite similar to radio equipment. These radiations were postulated theoretically and experiments made for their detection around the turn of the century. Because the equipment of that day was quite crude, nothing could be found, and the subject seems to have been forgotten.

The discovery of the phenomenon was made in 1931 by K. G. Jansky as a by-product of some investigations of terrestrial atmospherics. However, the subject did not receive approbation in the scientific world, and few advances were made until after World War II. Now these studies of long-wave celestial radiation are being actively prosecuted, especially in England and Australia, under the title of radio astronomy.

The earth's atmosphere acts as a shield, preventing the arrival at the earth's surface of most celestial radiations and particles. There are, however, two windows in the range of wave lengths where the atmosphere is reasonably transparent. The first is from approximately 0.4 to 1.0 micron wave length, in which region the eye over a long period of time had developed its ability to detect electromagnetic waves. Until recently, practically all our knowledge of the universe had been secured through this window. The second window is from approximately 1 centimeter to 30 meters wave length, in which region the new subject of radio astronomy is being developed.

The ability of any optical device to select one direction in preference to another is directly proportional to its aperture in terms of wave lengths. Cosmic static radiations follow all the laws of optics. However, since their wave length is several million times as long as visible light, conventional optical apparatus cannot be directly applied. In spite of this handicap, these radiations have been shown to arrive from a variety of directions which approximate the plane of the Milky Way. Particular intense regions are located in the constellations of Sagittarius, Cygnus, Cassiopeiae, Canis Major, and Puppis. Recent work in Australia has shown some of these sources to be quite small in size and perhaps approaching stellar dimensions. Such objects have been termed radio stars although there is no evidence that any such physical object exists. In fact none of the bright naked-eye stars such as Vega, Antares, Sirius, etc., produce any detectable cosmic static.

The origin of this energy is one of the fundamental problems of modern astronomy and physics. The sources must be of frequent occurrence because of the concentration within the Milky Way, which is our galaxy. Their plentiful distribution throughout the universe seems certain because of the recent measurement in England of cosmic static from the Andromeda nebula, which is a neighboring galaxy. The known magnitude of intensity and the distribution of intensity with wave length absolutely preclude any possible thermal origin. This is in agreement with the above statement that the sources are not photogenic. Whatever the source of this energy, it is probably something which converts mechanical energy of motion directly into electromagnetic energy without the need of any type of furnace; literally, dynamos in the sky.

The experiments atop Haleakala on Maui are attempts to learn more of this subject. The particular setup is known in optics as a Lloyd's mirror experiment. Since the wave lengths are very long, the size of the apparatus must be scaled up proportionately. In this case the sea is the mirror which extends to the horizon over 140 miles away. Initial results show the sky to contain a multitude of these sources. However, it will be some time before enough data has been gathered and analyzed to provide much new knowledge. Hawaii is quite suitable for this type of study because the low latitude makes it possible to observe all the Milky Way from one station.

GROTE REBER

A LOCALLY APPEARING POISONOUS MUSHROOM, *LEPIOTA MOLYBDITES*

Lepiota molybdites (G. Meyer ex Fr.) Saccardo, for taxonomic reasons sometimes treated as *Chlorophyllum,* is a large, attractive agaric of wide distribution in Oceania and tropical America, ranging extratropically to Minnesota, Michigan, and New York, and southward to Argentina. In North America it is commonly referred to as Morgan's Lepiota (*L. Morgani* Sacc.), is sometimes mistaken for the edible parasol mushroom (*L. procera* (Fr.) S. F. Gray), and no doubt occasionally avoided by mushroom gatherers when mistaken for the edible *Lepiota rachodes* (Vitt.) Quélet. Fresh spore deposits of the two latter species are white, whereas those of *L. molybdites* are some shade of green. Throughout its range, this mushroom is usually seen in loose, irregular clusters, or in fairy rings, quite conspicuous in open grassy plots, forest clearings, fields, and gardens.

In October and November, 1952, the species appeared in a garden clearing off Tantalus Drive at an elevation of about 850 feet in such quantity that it was possible

to make a careful study and photographic record of various developmental stages. On November 12, fifty-three mushrooms were counted in an area approximately 20 feet in diameter. The largest specimens had caps 16 centimeters broad and conspicuously annulate stalks 14 centimeters tall, 4 to 6 centimeters in diameter at the swollen base, and 2 centimeters at the apex.

Expanding caps of intermediate size were used for spore deposits. Diagnostic staining reactions were noted for the same caps. Fresh deposits on white paper are greenish gray to slate color; on gray or black papers, pale ochraceous. The spores are 10–12 x 7 microns, smooth, somewhat ovoid but in one view with unequal sides, subtruncate by a lens-shaped area, thick-walled, and with a conspicuous germ pore at the end of attachment; the wall is hyaline, grayish, or greenish in 5 per cent KOH but, after washing, reddish brown with Melzer's chloral hydrate-iodine and yellowish brown with aqueous iodine-potassium iodide (thus definitely pseudoamyloid). After hasty treatment with ammonium hydroxide, careful washing, and addition of faintly bluish aqueous cresyl blue, both the wall and the content of the spore are immediately distinctly bluish. Clamp connections are lacking in these caps and basidia and hyphae are nonamyloid. All the above characteristics are in agreement with the present concept of the species. Without the spore print and the microscopic study, the most reliable feature suggestive of this species is the progressive coloration of the gills which at first are nearly white, then become grayish green, and finally brownish. There are no pinkish, rusty brown, or purple-brown states.

Cases revealing various degrees of poisoning are known for North America and the Philippines; likewise, there are records of no ill effects.

M. L. LOHMAN

ALGEOMORPHIC DISEASES

Presidential Address, 1953

The concept of cause before effect has long been firmly entrenched in man's thinking about disease. A disease must have a cause, even if the cause be little more than a name.

Physical injuries are from obvious causes, but in early times most diseases were attributed to the displeasure of the gods. This explanation may have, on close inspection, a great deal more philosophic merit than appears at first glance.

During the past century certain organisms have been found to produce specific symptoms. The typhoid bacillus causes typhoid fever and nothing else. There is belief that every disease has a particular cause, if it can be found. The same belief holds true of the allergic diseases. We believe that if we eat certain foods we get hives, and therefore we think the food causes hives.

Many diseases are without constant causes. Some forms of cancer, for example, have resisted all efforts to find their cause. Many allergic diseases seem to result from different causes at different times, from many simultaneous causes, or from emotional disturbances.

It has been found that certain symptoms are present in a wide variety of diseases. Increased excretion of certain hormones by the adrenal cortex seems to relieve such symptoms. Some of these hormones have been isolated and can be used to relieve patients in various conditions such as rheumatic arthritis.

One such hormone is cortisone. Some facts learned about cortisone are (1) it does not cure anything, it merely supresses symptoms as long as it remains in the body; (2) it does not accomplish this of itself by relieving any deficiency in the body; (3) many diseases of unknown cause, but associated with allergic or psychogenic mechanisms, can be controlled quite successfully by the administration of the hormone. Numerous examples may be cited.

There are certain limitations on its use. It aggravates tuberculosis, internal ulcers, high blood pressure, and some other conditions.

Not only does cortisone bring relief to victims of diseases; it also brings relief to the minds of researchers and practicing physicians who must cope with these diseases.

These diseases may be brought on chiefly by the patient's own inherent tendencies to disease. Some individuals may have colic in infancy, asthma in childhood, and hay fever, hives, or migraine headaches when they grow up. It seems to make little difference whether these patients are insulted by strawberries, milk protein, egg albumen, streptococcus toxin, aspirin, or an intolerable life situation.

An outstanding feature of these diseases is their relative incurability, except by identification and removal or avoidance of the "cause." Many of these conditions are known to be caused or aggravated by allergic or psychosomatic factors. The majority are greatly benefited by cortisone or related hormones. Regardless of the immediate apparent cause, the particular symptoms are, in most instances, the result of the sick person's own inherent predilection to be ill in this particular way.

An unbearable, and therefore repressed, sense of anger or guilt may cause one man to develop high blood pressure, another merely to suffer intermittent eczema or asthma. It is as though the patterns of diseases were latent within the sick person before he felt ill, and were only released by the causative agent.

Thus, there is a large group of diseases which may be called "algeomorphic," meaning "formed by the patient," as distinct from the many diseases whose patterns are determined by their causative agents.

HARRY L. ARNOLD, JR.

NECROLOGY

EUGENE C. AUCHTER

Eugene C. Auchter was the director of the Pineapple Research Institute from 1945 until May, 1952. His death on July 8, 1952, ended a long and productive career in horticulture.

Dr. Auchter was born in Elmgrove, New York, in September, 1889. In his boyhood he gained a practical knowledge of horticulture through work on family farms. He capped this practical knowledge with studies at Cornell University leading to a B.S.A. degree in 1912, an M.S. in 1918, and a Ph.D. in plant physiology in 1923. His scholastic work was interspersed with both teaching and research. He was assistant pomologist at Cornell in 1911, held various positions in horticulture at the University of West Virginia from 1914 to 1918, and was head of the Department of Horticulture of the University of Maryland from 1918 to 1928. During this period he wrote a number of papers on his researches and, with H. B. Knapp, two texts published in 1929: *Orchard and Small Fruit Tree Culture* and *Growing Trees and Small Fruit.*

In 1928 he was brought to the U. S. Department of Agriculture to head a consolidated Division of Horticultural Crops and Diseases in the Bureau of Plant Industry. He became assistant chief of the Bureau in 1935 and chief in 1938. In 1942 he was appointed the first administrator of the Agricultural Research Administration, thus co-ordinating all the research activities of the Department. While in the Department of Agriculture, he was active in the organization of a number of special laboratories scattered over the country, most notably the Plant Industry Station at Beltsville, Maryland.

Dr. Auchter was brought to Hawaii in 1945 to head the Pineapple Research Institute. Under his leadership, the Institute expanded its personnel, its physical equipment, and its service to the pineapple industry. At the urging of its board of trustees, Dr. Auchter continued his association with the Institute as consulting scientist when illness forced his retirement as director.

Gene Auchter's career in horticulture started parallel to one in baseball, which ended with a broken finger while a semipro at college. He always held a great interest in the game, as well as in hunting and fishing.

Dr. Auchter belonged to a number of scientific societies, including the Royal Horticultural Society of London of which he was an honorary fellow, the American Association for the Advancement of Science of which he was a fellow, the American Society of Plant Physiologists of which he was president in 1926, the American Phytopathological Society, the American Genetics Association, the Botanical Society of Hawaii, and several honorary societies. He was an officer of the Pacific Science Council. He became a member of the Hawaiian Academy of Science in 1945, served as vice-president in 1949–50, and as president in 1950–51. The American Pomological Society awarded him the Wilder Medal in 1952 for outstanding achievement in horticultural science.

EDWARD L. CAUM

Edward L. Caum, a charter member of the Hawaiian Academy of Science, died on August 17, 1952. Mr. Caum was the first secretary-treasurer of the Academy in 1925–26 and served again in that capacity from 1929 to 1935. He was a councilor of the Academy from 1936 to 1938. He was also a charter member of the Hawaiian Botanical Society and served that society as its secretary-treasurer in 1928 and as its president in 1936. He was a graduate of Punahou School and of Swarthmore College and took postgraduate work at George Washington University. He held degrees of B.A. and M.A. and was elected to membership in the Honorary Scientific Society of the Sigma Xi.

Mr. Caum was born in Philadelphia on April 3, 1893. He came to Hawaii in July, 1908. He joined the staff of the H.S.P.A. Experiment Station on February 8, 1916, as assistant plant pathologist but a few years later was named associate botanist and superintendent of the Manoa Arboretum, both of which positions he filled efficiently and enthusiastically until stricken with his last illness.

Although primarily a botanist, Mr. Caum was an all-around naturalist and gained recognition as an authority on the birds which inhabit or visit this far-flung archipelago.

FRANK T. DILLINGHAM

Frank T. Dillingham, emeritus professor of chemistry, University of Hawaii, was born in Honolulu on February 11, 1878. He attended the public schools of Worcester, Massachusetts, and received a B.S. degree from Worcester Polytechnic Institute in 1901.

In 1916 he received the M.A. degree from Yale University and was a fellow in plant nutrition at the University of California in 1922–23. Professor Dillingham was assistant instructor in chemistry at the Bussy Institute of Harvard University from 1901 to 1905 and instructor in agricultural chemistry from 1905 to 1908.

He returned to Hawaii in 1908 and joined the Experiment Station of the Hawaiian Sugar Planters' Association as assistant chemist. The following year Professor Dillingham was appointed professor of chemistry at the College of Hawaii, remaining with the college which later became the University of Hawaii until his retirement in 1943.

Under his leadership the Department of Chemistry grew to be one of the largest departments of the University, with an enrollment of over 1,000 students.

Professor Dillingham was active in the affairs of the American Chemical Society and the Hawaiian Sugar Technologists, as well as the Hawaiian Academy of Science, of which he was a charter member. During his long career as a teacher he contributed numerous scientific papers in the fields of sugar technology and biochemistry.

Professor Dillingham died on July 6, 1952.

THOMAS AUGUSTUS JAGGAR

Thomas Augustus Jaggar, Jr., was born in Philadelphia on January 24, 1871. He received the B.A. degree in geology from Harvard University in 1893 and the M.A. degree in 1894. During the next two years he studied at Munich and Heidelberg, returning to Harvard in 1897 to take his Ph.D. degree with a thesis including methods for determining the hardness of minerals, a subject to which he returned years later after his retirement.

From 1895 to 1903, Jaggar was instructor in geology at Harvard, and in 1903 he was made an assistant professor. In 1906 he became professor and head of the Department of Geology at Massachusetts Institute of Technology. During the summers he worked for the U. S. Geological Survey in the Black Hills region, in the Yellowstone region, and in Arizona. His first major publication was on the laccoliths of the Black Hills.

In 1902, after study of the results of the catastrophic eruptions of the volcanoes Mont Pelée and Soufrière in the Antilles, Dr. Jaggar decided to adopt the field study of geophysics, especially volcanology and seismology, as his life work.

On a succession of expeditions to Italy, the Aleutian Islands, Japan, and Central America, he studied volcanoes and earthquakes, geophysical methods, and the work being done to mitigate the effects of natural disasters in those countries. He became convinced that the only satisfactory way to study volcanoes was with permanent observatory stations, keeping constant record of all detectable changes. When, therefore, in 1911, money became available through a grant from the Whitney Estate to Massachusetts Institute of Technology to set up a permanent station for the study of volcanoes, preferably in Hawaii, Professor Jaggar was enthusiastic. Preliminary work began immediately, and in 1912 Jaggar established the Hawaiian Volcano Observatory on the rim of Kilauea Crater. From the beginning, his work received the wholehearted support of the people of Hawaii, and more than half the money for the establishment of the Observatory came from the Hawaiian Volcano Research Association and from public subscription.

Though the struggle was often difficult, Dr. Jaggar labored for the next twenty-eight years to strengthen the science of volcanology in general and the Observatory in particular. The pre-eminence of the Hawaiian Volcano Observatory may be attributed to his enterprise. When he retired as director of the Observatory in 1940, he became research associate in geophysics at the University of Hawaii. He continued in that position until his death.

Dr. Jaggar's contributions to the literature of volcanology were great. His scientific bibliography contains more than 250 titles in addition to the journal of activity of Kilauea and Mauna Loa that continued for many years in the Bulletin of the Hawaiian Volcano Observatory and the Volcano Letter. Still other essays are in the fields of philosophy and religion. The amazing diversity of his interests and abilities is illustrated by his invention of the amphibian boat, the lineal predecessor of the military amphibian vehicles that played so important a part in World War II.

Dr. Jaggar was a Fellow of the American Academy of Arts and Sciences, a Fellow of the Washington Academy of Sciences, a member of the Seismological Society of America and of the American Geophysical Union, and a corresponding member of the Geological Society of Belgium. From 1912 until his death, he was the scientific director of the Hawaiian Volcano Research Association. Dr. Jaggar's membership in the Hawaiian Academy of Science dated from its first year (1925–26). He served as councilor in 1943–45 and 1947–48, as vice president in 1945–46, and as president for the year 1946–47.

With his death on January 17, 1953, Hawaii lost one of its outstanding scientists and best-known citizens.

LOUISE S. JESSEN

Louise Stevens Jessen, outstanding agricultural writer and untiring community worker, a member of the Academy since 1946, was born in Larned, Kansas, on May 6, 1888; she came to Hawaii in 1937 and died in Honolulu on May 13, 1952.

Mrs. Jessen attended the University of Chicago as a young woman but was forced by circumstances to leave before graduation. Her determination to complete her education brought her back to Tulane University in New Orleans twenty-six years later; she received the B.A. degree in sociology from that institution in 1936. In 1941 she enrolled at the University of Hawaii for graduate study, and had nearly completed requirements for the M.A. degree at the time of her death. Because of her belief in the importance of an education, she spent much time in teaching and arranging further study for others whose educational opportunities had also been limited.

She was also recognized for her work in the field of agricultural news publication. Gaining her basic knowledge of agriculture as a farm wife in Mississippi during her earlier years, she served as extension editor of the University of Hawaii College of Agriculture from June 1, 1942, to January 31, 1951. During that time an enormous volume of agricultural news and feature stories as well as articles on other subjects were published under her byline in island and national newspapers and periodicals. Before her retirement from the University of Hawaii in 1951 because of ill health, she was the recipient of a special award from the American Association of Agricultural College Editors.

JOHN J. WOLFORD

John J. Wolford died on February 19, 1953. He had been a member of the Academy for a number of years since a period spent in Hawaii as an officer in the U. S. Air Force during World War II. At the time of his death, Dr. Wolford was professor of geology at Miami University, Oxford, Ohio. He had previously assisted the U. S. Army Engineers in the original geological examinations of dam sites of the Tennessee Valley area and carried on field surveys for the Kentucky Geological Survey. During his service in Hawaii he found time to make observations on local geology and marine phenomena.

MEMBERSHIP

MAY 1953

Akamine, Ernest K.
Akana, Theodore K.
Akers, Ernestine
Alicata, J. E.
Anderson, Earl J.
Appleton, Vivia B.
Arkoff, Abe
Arnold, Harry L.
Arnold, Harry L., Jr.
Atherton, Ballard
Aust, Ruth
Austin, Thomas
Ayers, Arthur S.

Baker, R. J.
Ballard, Stanley S.
Balock, J. W.
Banner, Albert H.
Bartling, Wray B.
Baver, L. D.
Beaumont, J. H.
Berk, Morton
Bess, Henry A.
Bianchi, Fred A.
Bice, Charles M.
Bilger, Earl M.
Bilger, Leonora N.
Bishop, Brenda
Bolles, Elmer Richard
Bonk, William J.
Bonnet, David D.
Borden, Ralph J.
Bowers, Neal M.
Bowers, Mrs. Neal M.
Bowles, Herbert E.
Britton, John R.
Branthoover, Barbara Jean
Brock, Vernon E.
Brown, Elizabeth D. W.
Brown, Forest B. H.
Bryan, Edwin H., Jr.
Bryan, L. W.
Bryson, L. T.
Burr, George O.
Burr, Mildred
Burton, Otto L.
Bush, Wm. M.
Bushnell, O. A.

Carson, Max H.
Carter, Walter
Cartwright, Gordon D.
Chong, Mabel
Christian, Eloise
Chu, George W.
Chun, Edwin Y.
Clay, Horace F.
Clements, Harry F.
Clopton, Robert W.
Collins, J. L.
Connor, Mary R.
Cooil, Bruce J.
Corboy, Philip M.
Cornelison, A. H.
Cox, Doak C.
Cox, Joel B.
Crosby, William
Cross, Robert F.
Crowell, David
Cushing, Robert L.

Danielsson, Bengt
Davis, Clifton J.
Davis, Dan A.
Defibaugh, Betty Lou
Degener, Otto
Deibert, Austin
Deming, Horace G.
Denison, Harry L.
Digman, John
Doi, Mitsugi
Doty, Maxwell S.
Doty, R. E.
Duncan, Richard A.

Eber, Laurence
Edmondson, C. H.
Eguchi, George
Ehret, William F.
Eller, W. H.
Emory, Kenneth P.
Enright, James R.

Feldwisch, W. F.
Felton, George
Fennel, E. A.
Finch, Ruy H.
Fong, Francis
Forbes, Theo. W.
Fosberg, F. R.
Foster, Zera C.
Fujimoto, Giichi
Fukuda, Mitsuno
Fullaway, David T.

George, Clarence A.
George, David
Giacometti, G.
Gilbert, Fred I.
Gladding, Elizabeth
Gortner, Willis A.
Gosline, W. H.
Gowing, Donald P.
Gray, Reed A.
Greenwell, Amy B. H.
Gregory, Christopher

Hagihara, Harold H.
Halperin, Sidney L.
Hamilton, Roland K.
Hamre, Christopher J.
Handy, E. S. C.
Hanson, Noel S.
Harada, M. B.
Hardy, D. Elmo
Harris, Anna E.
Harris, Wray
Harry, J. V.
Hartt, Constance E.
Hartwell, Alfred S.
Heinicke, Ralph M.
Henke, Louis A.
Herrick, Colin J.
Hiatt, Robert W.
Holmes, Wilfred J.
Horan, John S.
Hosaka, E. Y.
Hosoi, Kiyoshi
Howe, Guy L., Jr.
Hsiao, Sidney C.
Hu, Stephen M. K.
Hudson, Loring G.
Humbert, Roger P.

Ihrig, Judson L.
Ikeda, Warren
Ikehara, Isaac I.
Ito, Kiyoshi

Jackson, Dean C.
Jermann, Fred
Johnson, David
Jones, Thomas A.
Jones, Thomas S.
Jorgensen, J. Paul
Jorgensen, Margaret K.
Joyce, Charles R.

Kamemoto, Haruyuki
Kanehiro, Yoshinori
Kask, John Laurence
Katsuki, I.
Kaulukukui, Felice W.
Kawano, Henry
Keller, Arthur R.
Kenda, William
Kerns, Kenneth R.
King, Joseph E.
King, Maurice V.

King, Will Norman
Kingsbury, Joe W.
Klinkman, Helena M.
Koike, Hideo
Kondo, Yoshio
Kopf, Kenneth
Kortschak, Hugo P.
Krauss, Beatrice
Krauss, F. G.
Krauss, Noel H.

Lam, Margaret M.
Lam, Robert L.
Lamb, Alvin R.
Larrabee, L. M.
Larsen, Nils P.
Larsen, Norma
Larson, Harry W.
Lau, Howard K. S.
Lee, Hyun Moo
Leeper, Robert W.
Lennox, Colin G.
Levine, Max
Levine, Melvin L.
Lind, Andrew W.
Livesay, T. M.
Lohman, Marion L.
Look, Wm. C.
Lord, Edith
Loucks, Burton J.
Loucks, Ruth Baker
Louis, James L.
Louis, Lucille
Lum, C. K.
Lyon, Harold L.

McCleery, Walter L.
Macdonald, Gordon A.
McGuire, Thos. R. L.
McKernan, David L.
McMorrow, B. J.
Magistad, O. C.
Manchester, Curtis A.
Mangelsdorf, A. J.
Martin, Joseph P.
Maruoka, Rose M.
Mason, Leonard
Matsumoto, Walter M.
Matthews, Donald C.
Mau, Kong Tong
Midkiff, Frank E.
Miller, Carey D.
Miller, Robert C.
Mink, John F.
Mitchell, Donald
Mitchell, Wallace
Moe, Clayton R.
Mordy, Wendell A.
Morgan, Edward J.
Mottl, Joseph R.
Moir, Wm. W. G.
Mumaw, Charles
Murphy, Garth I.
Murray, Hazel C.

Naiditch, Sam
Nakamoto, Goichi
Nakao, Harry
Naughton, John J.
Neal, Marie C.
Newell, Irwin
Newhouse, Jan
Nickerson, Thomas
Nishida, Toshiyuki
Nordfeldt, Sam
Nutter, Ben E.

Okimoto, Marion
Okubo, Shigeo
Orr, Kathryn J.
Otsu, Tamio

Palafox, A. L.
Palmer, Harold S.

Payne, John H.
Pemberton, C. E.
Pen, Florence
Pinkerton, F. J.
Poole, Charles F.
Porter, H. Paul
Potter, Colin
Powers, Howard A.
Price, Samuel
Price, Saul
Puth, Maybelle J.

Reber, Grote
Rhead, Clifton C.
Riesenberg, Saul
Ripperton, J. C.
Rose, Stanley J.
Royce, William F.
Rusch, Kenneth H.

St. John, Harold
Sakimura, Kay
Sanford, Wallace G.
Scheuer, Paul J.
Schmidt, Carl T.
Schmidt, Helen D.
Scott, Arlen M.
Seeley, Delos O.
Sekiguchi, Nao
Sette, Oscar E.
Sher, S. A.
Sherk, Kenneth W.
Sherman, G. Donald
Shigeura, Gordon T.
Shomura, Richard S.
Sideris, C. P.
Simpson, Robert H.
Sinclair, Gregg M.
Slattery, Mabel
Slipp, John W.
Smith, Elbert G.
Smith, Madorah
Smith, R. Q.
Spalding, P. E.
Spiegelberg, Carl H.
Spitzer, Blanche H.
Spoehr, Alexander
Springer, Doris
Stacey, Mary
Sterns, Marjorie
Stewart, William S.
Stokes, J. F. G.
Storey, W. B.
Suehiro, Amy
Suzuki, F. T.
Sykes, Walter E.

Takahashi, David
Takahashi, Makoto
Takasaki, Kiyoshi J.
Takazawa, Futoshi
Tanimoto, Ralph H.
Tanimoto, Tyrus T.
Taylor, A. R.
Taylor, Keith L.
Tester, Albert L.
Thorne, M. D.
Titcomb, Margaret
Trouse, Albert C., Jr.
Tuthill, Leonard D.

Urata, Rokuro

Vaksvik, K. N.
Van Campen, Wilvan
van Weel, Pieter
Van Zwaluwenburg, R. H.
Vernon, Mabel D.
Vinacke, W. Edgar
Vinacke, Winifred R.
Voorhees, George

Wadsworth, Harold A.
Wakai, Ted Y.
Wallace, George C.
Wallace, Keith K.
Warner, H. H.
Warner, John N.
Watson, Leslie J.
Wayman, Oliver
Weatherbee, Carl
Weaver, Herbert
Weight, Leslie
Weller, D. M.
Wentworth, C. K.
Wentworth, Juliette
White, J. Warren
Wilbar, Chas. L.
Wismer, Chester A.
Withington, Paul
Woffinden, Charles M.
Wong, Arthur G. H.

Yamashita, Daniel T.
Yanagihara, Iichi
Yee, Florence
Yoshioka, Tad T.
Young, Hong Yap
Yuen, Heeny
Yuen, Quan Hong

Zeitlin, Harry
Zimmerman, E. C.
Zoebisch, Oscar C.