PROCEEDINGS OF THE HAWAIIAN ACADEMY OF SCIENCE . . .

NINETEENTH AND TWENTIETH ANNUAL MEETINGS 1943-1945

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FOREWORD

This volume of the Proceedings of the Hawaiian Academy of Science covers the Nineteenth and Twentieth Annual Meetings. The publication schedule of the Academy is now brought up-to-date, and it is hoped that from now on each annual volume can be published within three or four months after the final session of the year. A cooperative agreement for publication has been made with the University of Hawaii. This arrangement offers prospect that the present form and editorial procedure can be continued.

Work is in progress on the compiling of an Academy mailing list based as far as possible on learned institutions active in 1945. Academy members are invited to suggest institutions for inclusion on this list.

This volume of the Proceedings carries for the first time since 1940 a list of Academy members. The list has been revised to May, 1945 in accordance with information available to the Secretary.

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1943 - 1944

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Vice-President, J. L. Collins
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THE HAWAIIAN ACADEMY OF SCIENCE WAS ORGANIZED JULY 23, 1925, FOR "THE PROMOTION OF RESEARCH AND THE DIFFUSION OF KNOWLEDGE."

THE NINETEENTH ANNUAL MEETING 1943-44

Program

DECEMBER 2, 1943

Harold S. Palmer: The Annual March of Daily Mean Temperature at Honolulu.

D. T. Fullaway: Are Insects and Diseases to be a Critical Factor in Year-round Food Crop Production?

F. G. Holdaway: Progress in the Control of Insects Attacking Vegetables.

Jane E. Howe: Some Observations on Atopic Conditions.

Bernard Witlin: The Avian Embryo in Research.

DECEMBER 3, 1943

Peter H. Buck: Native Crafts Have Gone to War.

Elwood C. Zimmerman: Human Filariasis in the Pacific.

Charles P. Lyman: Physiology and Military Aviation.

APRIL 27, 1944

Ruth Yoshida: A Chemical and Physiological Study of the Nature and Properties of *Leucaena glauca* (Koa Haole).

David D. Bonnet: Certain Biological Aspects of Mosquito Control in the Territory of Hawaii.

Christopher J. Hamre: Fishery Research in Hawaii.

APRIL 28, 1944

A. S. Ayres and C. K. Fujimoto: Exchangeable Potassium in Some Oahu Soil Profiles.

Chester K. Wentworth: Flow of Liquids Through Narrow Cracks.

Thomas A. Jaggar: Active Volcanoes in the War Zones.

APRIL 29, 1944

Annual Dinner

Business Meeting

Installation of Officers

Address by Retiring President
Carey D. Miller: Some Aspects of Growth and Food Needs.

Abstracts

THE ANNUAL MARCH OF DAILY MEAN TEMPERATURE AT HONOLULU

This is a statistical study of daily mean temperatures at Honolulu, for the 53-year period from 1890 to 1942, inclusive. The average values of the daily mean temperature for each of the 365 days of the year for the 41-year period from 1890 to 1930, inclusive, were supplied some years ago by J. F. Voorhees. Two years ago, Harry T. Tanaka tabulated the data for the 10-year period from 1931 to 1940, inclusive. To these have been added the data for 1941 and 1942. Thus averages are now in hand for the 53-year period from 1890 to 1942, inclusive.

The average date of the warmest day is September 6, which gives a lag of 77 days after the summer solstice. Among the causes for this long lag are (1) the great heat capacity of the surrounding ocean water, which makes it not only warm up slowly, but also cool off slowly, and continue to hold Honolulu's temperature rather high for a long period, and (2) the fact that in this latitude the noon sun is high in the heavens for many days after the solstice, so that we continue to get much insolation each day and cooling off is retarded.

February 12 and 13 tie for the average date of the coolest day, but in the following discussion February 12 will be used. The lag after the winter solstice is 53 days, and is rather long, but shorter than the lag of the warmest day.

The extreme temperatures are 78.5° F. and 70.8° F., giving a range of 7.7° F. The period during which the temperature rises is 206 days, and the period of falling temperature is 159 days. Honolulu takes 47 more days in warming up than in cooling off. The warming up period is 30 per cent longer than the cooling off period. The cooling period lasts for 43 per cent of the year, the warming period for 57 per cent.

From mid-January to the end of March there are several minor oscillations, for which no explanation comes to mind.

I am indebted to Stephen B. Jones for calling my attention to the importance of the ocean's heat capacity.

HAROLD S. PALMER

ARE INSECTS AND DISEASES TO BE A CRITICAL FACTOR IN YEAR-ROUND FOOD CROP PRODUCTION?

The successful growing of food crops in Hawaii requires knowledge and skill which can only be gained by experience. If year-round production is expected, adjustments must be made for certain crops to meet local pest conditions. Suggestions are based on the experience of the Victory Garden Committee which has been observing field and garden production for two years. While insects and diseases cannot be considered critical factors in year-round production, they do cur-

tail production and unless they are kept in control by the use of natural enemies, insecticides, etc., they will hamper the production program.

D. T. FULLAWAY

PROGRESS IN THE CONTROL OF INSECTS ATTACKING VEGETABLES

Progress in the control of insects attacking vegetables in Hawaii during the war comprises five main phases: (1) determining the insect problems; (2) the changing crop picture; (3) the occurrence of new insect problems; (4) experimental work on the control of major insects; and (5) changed importance of insect problems due to the changing agriculture.

Changes in Hawaiian agriculture have brought to light an increase in importance of some problems formerly of little account. One of these changes pertains to tomato production.

The introduction of the variety "Bounty" by W. A. Frazier of the University of Hawaii Agricultural Experiment Station in 1941 has led to increased growth of tomatoes during the summer months at low elevations. As a result tomato bug has become more important.

The introduction of "Bounty," control of corn earworm and other chewing insects by means of cryolite, and control of tomato bug by means of talc-nicotine dust have resulted in two years in an increase in commercial summer production of tomatoes of 79 per cent, and on Oahu in an increase of 264 per cent.

F. G. HOLDAWAY

SOME OBSERVATIONS ON ATOPIC CONDITIONS

Allergic rhinitis, allergic dermatitis, allergic gastrointestinal symptoms, and many types of asthma are all conditions which are placed under the heading of atopy. These conditions all have a hereditary basis, although the specific sensitivity itself is not inherited.

Atopy, or hereditary hypersensitivity, is to be distinguished from anaphylaxis, or induced hypersensitivity. Anaphylactic cells can be desensitized—atopic cells cannot; atopy can be demonstrated in passive transfer—anaphylaxis cannot. When atopic conditions were first studied, they were thought to be anaphylactic reactions. But true anaphylactic reactions are probably very rare in man.

In the control of allergic symptoms, general physical health is all-important. A well-balanced diet with regular meals, plenty of rest, and good elimination are the first considerations. Drugs are administered to relieve symptoms, not as cures. However, by injections of small amounts of the specific antigen the patient can sometimes be kept symptom-free over long periods of time.

Climatic conditions seem important in many cases, although all these relationships are not known.

The atopic patient is taught that his condition is a study, not a disease; he must learn to understand it and avoid the atopens.

JANE E. HOWE

THE AVIAN EMBRYO IN RESEARCH

Significant recent developments in medical research have demonstrated the utilization of the avian embryo in the study of certain phases of disease.

On the 44th hour of incubation after fertilization of the avian egg, there is the onset of the embryo's heart beat. By the 8th day of incubation the extensive and highly vascular chorio-allantoic membrane completely envelops the embryo, its protective amniotic sac, and the yolk sac. This is the ideal embryo to employ in research.

Techniques Employing Avian Embryos

INJECTION METHODS	TISSUE CULTURE METHODS
Goodpasture	Carrel Flask
Brandly	Hanging Drop Slide
Burnett	Perfusion Technique
	Tissue—Agar Medium

The utilization of the developing egg in the study of disease emphasizes the possibilities and many uses of the avian embryo in research.

The established advantages are: (1) propagation and study of viruses in pure culture; (2) titration and detection of minute quantities of toxic agents and antiserum; (3) pathologic and serologic study and differentiation of various infectious agents and their products; (4) elucidation of the role of certain nutritional and physiologic factors in disease causation; (5) utilization of egg-cultured and tissue-cultured viruses in fields of immunization; (6) investigations of fundamentals of resistance and immunity; and (7) study of tissue growth.

There is a ready availability of and economy in using developing eggs as compared with the usual laboratory animals. There are savings in quarters, equipment, and feed, and reduction in the hazards of cross-infection, and dissemination of infection outside the laboratory.

BERNARD WITLIN

NATIVE CRAFTS HAVE GONE TO WAR

On February 16, 1943, the Bernice P. Bishop Museum inaugurated a course of instruction on survival in the South Seas for men of the armed forces. Kenneth P. Emory, ethnologist, was detached by Museum Trustees for full-time service as instructor and later he was assisted by Loring Hudson of the Kamehameha Schools. In December, the Army took over the instructors and supplied regular army personnel to assist in the lectures and in procuring and preparing material for demonstrations.

One of the exhibition halls was devoted entirely to exhibits from the Museum collections illustrating native foods and the native methods of procuring them. Specimens from the native crafts which would be useful were also shown and large photographs illustrated the types of islands and the people inhabiting them.

Practical instruction was given in an open courtyard between the Museum buildings, where huts and a lecture room of coconut leaves were built. Men were taught various native practices which might prove valuable in the jungles and atolls of the southwest Pacific. They were taught to recognize various edible plants and fruits, to husk and grate coconuts, to plait mats and baskets from green coconut leaves, to make shelters and sandals, to produce fire in coconut husk, and

to cook food in native ovens. During the year about 10,000 men passed through the school and by carrying the instruction to the war zone, the native crafts have literally gone to war.

PETER H. BUCK

HUMAN FILARIASIS IN THE PACIFIC

Filariasis is a disease caused by nematode filarioid worms. It is widespread in many tropical and subtropical regions of the world and is especially prevalent on Pacific islands. It is known better, perhaps, to the layman as elephantiasis; but elephantiasis is only one of its several ultimate manifestations.

The disease is transmitted from one person to another by several species of mosquitoes. The adult worms live in the lymphatic system and give rise to young called microfilaria which swarm into the blood and are in turn sucked up by the mosquito vectors. After undergoing asexual metamorphosis in the mosquito, the worms are capable of infecting human beings by entering through the skin when the mosquito host bites. The sexual cycle is passed in man.

In most places in the world, a peculiar periodicity is noted in the appearance of the larvae in the peripheral blood. None are found during the day, but at night they swarm into the blood to reach a peak of abundance between 10:00 P.M. and 2:00 A.M. In the Pacific from Fiji eastward, there is no periodicity, and larvae may be found in the blood at any time. These factors appear to be correlated with the habits of the vectors in the Pacific, some of which are nocturnal, others diurnal.

The blockage of the lymphatics and other conditions caused by the presence of the worms results in various pathological conditions such as lymph scrotum, varicose groin glands, chyluria, chylocele, and abdominal dropsy. Elephantiasis develops in a certain percentage of long-enduring cases. The lower extremities are affected in most of the cases of elephantiasis seen in the Pacific. In some Pacific islands as high as 75 per cent or more of a local population may be infected with the disease.

Although there are two mosquito vectors of the disease in Hawaii (*Culex fatigans* and *Aedes aegypti*), it is not known that the disease has ever been transmitted in the Territory.

ELWOOD C. ZIMMERMAN

PHYSIOLOGY AND MILITARY AVIATION

Many physiological changes encountered in flying are due to changes in atmospheric pressure. Sea level atmospheric pressure is 760 mm. of mercury. At 38,000 feet the pressure is 152 mm. of mercury.

Anoxia occurs as the partial pressure of oxygen in the lungs decreases with the total barometric pressure. The resulting decrease in the oxygen in the red blood cells causes a lack of oxygen in the tissues. Eyesight and the higher nerve centers of the brain are first affected.

When wearing an oxygen mask the partial pressure of oxygen in the lungs is increased by substituting oxygen for nitrogen. However, above 38,000 feet, even when breathing pure oxygen, the partial pressure of oxygen is so reduced that the flier will suffer from anoxia.

During the decrease of atmospheric pressure nitrogen, oxygen, and carbon dioxide are released as bubbles from solution in the body fluids. Nitrogen bubbles collect and cause aeroembolism. The other gases are picked up by the hemoglobin.

Aeroembolism is of three types: "bends," an aching pain in the joints or muscles; "chokes," a burning sensation in the lungs; and "itch," a variety of uncomfortable sensations in the skin. Presumably these sensations are caused by bubbles pressing on nervous tissue.

Expansion and contraction of gases can cause pain if the middle ear or the sinuses are improperly ventilated. In the former, the eardrum is forced inward on descent, with resulting inflammation and possible infection. In the latter, the membranes lining the sinuses can be partially torn.

The centrifugal force caused by sharp turns in flying will drain the blood in the direction of the force. If the blood is drained from the head, "blackout" or darkening of vision occurs. If in the opposite direction, "red out" and possible cerebral hemorrhage will take place.

Night vision is chiefly dependent on the rod cells of the retina. Sufficient oxygen and ample amounts of vitamins A and D are very important. Red goggles are worn before night flights to dark adapt the eyes, since red light does not affect the rod cells.

CHARLES P. LYMAN

A CHEMICAL AND PHYSIOLOGICAL STUDY OF THE NATURE AND PROPERTIES OF *LEUCAENA GLAUCA* (KOA HAOLE)

Presented by J. H. Beaumont.

Koa haole contains a toxic principle which causes alopecia, cataract, retardation of growth, and other symptoms of ill-health in rats. The toxic properties of koa haole are not attributable to selenium.

The toxic principle mimosine, which occurs in the water soluble fraction of seeds and leaves, was isolated, purified, and its properties determined. Mimosine is an alpha-amino acid possessing phenolic properties. On the basis that one half the nitrogen content is Van Slyke amino nitrogen, the minimum molecular weight of mimosine is 198 ($C_8H_{10}O_4N_2$).

The color reaction of mimosine with ferric chloride can be used as the basis for a spectrophotometric method of quantitative analysis for mimosine. The mimosine content of oven-dry koa haole seeds and leaves was found to be 4.87 per cent and 2.89 per cent respectively.

The addition of soluble iron compounds to koa haole diets or to synthetic diets containing mimosine renders these diets relatively non-toxic to rats. It is believed that the detoxifying action of soluble iron salts is due to the inactivation of mimosine through the formation of an iron-mimosine complex which is less readily absorbed from the digestive tract than uncombined mimosine.

RUTH YOSHIDA

CERTAIN BIOLOGIC ASPECTS OF MOSQUITO CONTROL IN THE TERRITORY OF HAWAII

The distribution of *Aedes aegypti* and *Aedes albopictus* in the Territory of Hawaii has been determined on the basis of 2,000 samples of larvae collected from

various types of water-holding containers. In the city of Honolulu *Aedes albopictus* appeared to be six times more abundant than *Aedes aegypti.* This figure depends upon the relative proportion of natural and artificial containers, since *Aedes albopictus* breeds in natural containers more frequently than does *Aedes aegypti.* Further, it was shown that *Aedes aegypti* is not found as widely distributed as *Aedes albopictus* and that the relative proportions in each inspection zone varies from 93 to 0 per cent *aegypti* in different zones (Smith St. and Manoa, respectively).

A preliminary survey of rural Oahu and the other islands has shown that *aegypti* is present in the following towns:

Oahu—Waianae, Waipahu, Ewa, Pearl City, Aiea, Honolulu

Kauai—Waimea, Kekaha

Maui—Lahaina

Hawaii—Hilo, Olaa, Pahoa, Honokaa, Kailua, Kealakekua

In view of the scattered distribution of *Aedes aegypti* and its preference for artificial containers, it is possible that *Aedes aegypti* might be eradicated from the Territory of Hawaii if vigorously attacked by trained men with unlimited supplies and with active, intelligent, and continuous cooperation by the populace.

DAVID D. BONNET

FISHERY RESEARCH IN HAWAII

Records of studies and investigations of Hawaiian fish and fisheries date from the time of early exploration of the Islands. The studies of Jenkins, Cobb, Jordan and Evermann, Gilbert, and of Fowler on our fish and fisheries and of Edmondson on our invertebrate fauna, constitute the background for present day fishery research. The later studies have been largely taxonomic studies and surveys of the fauna of our marine waters. Investigations of reproduction, spawning periods and spawning cycles, development and rate of growth, food, and feeding habits of our ichthyfauna are generally lacking.

The Department of Zoology of the University of Hawaii in 1939 began study of the biological problems of commercial fish ponds. The pond fisheries were selected for study because they appeared to be better suited to initial investigations of biological fishery problems than did the in-shore or open-sea fisheries. These studies have continued and the work has now grown into a program of cooperative fishery research between the Board of Agriculture and Forestry and the University of Hawaii.

Surveys of the fish, copepod and decapod crustacea, polychaetous annelids, and mollusc and insect fauna of the ponds have been carried out systematically. The algae and diatoms of the ponds have also been surveyed. It has been discovered that adult mullet are herbivorous and that their digestive system is morphologically modified to permit them to live on bottom material. Their food consists chiefly of diatoms and protozoa, particularly the former. The problem of pond management is chiefly one of supplying these foods in abundance.

CHRISTOPHER J. HAMRE

EXCHANGEABLE POTASSIUM IN SOME OAHU SOIL PROFILES

Published in full under title of "The Vertical Distribution of Available (Exchangeable) Potassium in Oahu Soils" in *Hawaiian Planters' Record,* 48 (4): (1944), 249-269.

Determination of exchangeable potassium in the profiles of 30 virgin and cropped Oahu soils revealed the existence of essentially two distribution patterns. In soils exhibiting the first pattern, potassium was at a maximum in the 0- to 6-inch horizon and decreased with depth either to the bottom of the section (of the profile) or to a point within the section and thereafter remained constant. In soils exhibiting the second pattern, potassium decreased downward to a minimum value within the section (usually at a depth of 1½ to 2 feet) and then increased with greater depth. In some soils the increase was slight but in others it was very pronounced. The level of potassium at a depth of 3 to 4 feet was frequently many times the minimum value and sometimes even greater than in the surface 6 inches.

It was found that virgin soils subject to moderately high rainfall (90 to 100 inches) were not always low in potassium. Virgin soils in areas of very low rainfall (15 to 20 inches), on the other hand, were not always well supplied with potassium.

Virgin soils were found to contain from 375 to 1,600 pounds of exchangeable potassium (K_2O) per acre in the upper 3 feet. Agricultural soils contained from 335 to 2,150 pounds of potassium in the upper 3 feet, and from 450 to 2,350 pounds in the upper 4 feet. In an exceptional case, potassium in the upper 4 feet of soil amounted to more than 6,000 pounds per acre.

A. S. AYRES and C. K. FUJIMOTO

FLOW OF LIQUIDS THROUGH NARROW CRACKS

The flow of liquids through small tubes takes place at rates which are directly proportional to hydraulic head according to Darcy's law. The relationship to diameter of tube is expressed by the Hagen-Poiseuille law which states that the rate of flow is proportional to the 4th power of the radius. Flow of water through fine natural sediments or through most aquifer rocks is according to Darcy's law.

Experiments with flow of water, organic liquids, and solutions through narrow cracks between walls of stone, glass, and metal, show that Darcy's law holds here also but reveal a remarkable retardation of rate with time, under any given head, in cracks less than about 0.2 mm. across. Reduction of rate is commonly as much as 100 times, in some cases more than 1,000 times, in course of 10 to 100 hours of flow. Possibility of accumulation of air bubbles, solid foreign matter, and various electrolytic effects have been considered, but the most likely explanation is that molecules of the liquid immobilized progressively along the crack walls by adsorption serve to constrict the crack so that effective flow is greatly reduced. Stated in other words, the boundary effects, as in the surface tension film, pervade across the whole crack, so that the random, kinetic state on which liquid behavior is premised is modified and largely destroyed.

Rate of retardation is generally proportional to rate of flow and building of the molecular film seems to proceed by capture of molecules from the margin of a weakened field at rates determined statistically. Films

formed can be broken up by mechanical disturbance and rates restored to approximate the initial ones. Cracks so dealt with tend to retard more rapidly the second time.

CHESTER K. WENTWORTH

ACTIVE VOLCANOES IN THE WAR ZONES

The geological and engineering aspects of volcanic disaster are like war. Volcanoes go on the warpath also. Volcanology in crater observatories of Java, Japan, Hawaii, and Italy has grown because preparedness and defense were needed. By a freak of fortune the war and fiery volcanic outbursts broke out in Hawaii and the South Seas, at Rabaul, at Krakatoa, in Mexico, and at Vesuvius. Other volcanoes are doubtless active in the many Pacific fire mountains in the East Indies, the Philippines, Japan, Kamchatka, and the Aleutian Islands from whence all news has been suppressed.

Rabaul has a harbor flanked by two volcanoes that made a disaster in 1937. These, after a big earthquake, erupted again in 1941 and kept it up for nine months. Niuafoou volcano in Tonga, followed its lava eruption of 1936 with another in 1943 that exploded the salt water with lava flow and killed the crops. Mauna Loa in Hawaii followed its summit eruption of 1940 with a lava flow endangering Hilo in 1942, and another minor summit gush in 1943. Krakatoa was still building its new island between Java and Sumatra when the Japanese warships took over in 1942. Japan had a big earthquake on its west coast at Tottori September 6, 1943 killing 1,400 people.

Mexico has a notable lava-piling in progress, building a mountain 2,000 feet high over a cornfield. Starting in February, 1943, by September it had thrown up 2,000 million cubic yards of basalt in pulsations six seconds apart. The new fissure is 50 miles from Jorullo which built a similar mountain during seven months in 1759.

Now comes Vesuvius in the midst of occupation by American troops, just at the March equinox of 1944, and just 38 years after its disastrous climax of engulfment in April, 1906, with great lava flows in three directions and immense heaping of ashes all the way from Pompeii to Naples. The interval of a third of a century between great volcanic crises has many precedents.

THOMAS A. JAGGAR

SOME ASPECTS OF GROWTH AND FOOD NEEDS

Presidential address 1944.

The problem of growth is an exceedingly complex one but scientific evidence is accumulating to show that while heredity defines the potentialities of the individual, the quality of food eaten may determine whether the potentialities are fully achieved.

Height-weight measurements of a large number of high school students and their mothers were obtained through the courtesy of the principal and staff of one of the local high schools. The records of girls of Japanese ancestry were chosen for study because they represented the largest group. Similar data were obtained for 31 women students at the University and their mothers.

The mean height of the 15-year-old high school girls proved to be greater than that of the other three age groups. The mean height of the University girls exceeded that of the high school girls, but this is probably because they represented a more highly selected group rather than that they were older.

The students were from 4.3 to 5.0 cm. taller than their mothers. The mean heights of the mothers vary but little from those reported for Japanese women by other investigators. It appears therefore that young women of Japanese ancestry in Hawaii are increasing markedly in stature in one generation.

It was suggested that in addition to environmental factors such as climate and better medical care, food may be playing a part. An examination of the results of dietary studies made here and in Japan shows that the greatest difference seems to be an increase in the amount of animal protein.

Studies of family diets by Martha Potgieter of the Nutrition Department of the University of Hawaii Agricultural Experiment Station have shown that in comparison with the Bureau of Home Economics standards used in 1941, the diets of rural Japanese families living in Hawaii are markedly deficient in calcium, vitamin A, and thiamine.

Many Japanese girls have short and/or crooked legs which must be due to a disturbed calcium-phosphorus metabolism and perhaps to a lack of vitamin D at some stage of growth.

Numerous studies have shown that dental caries are closely associated with the adequacy of the diet. Figures on students of Japanese ancestry were available for 60 University girls of Japanese ancestry. All had dental caries and the average DMF (decayed, missing, filled) teeth per student was 17.3.

It was pointed out that with increased quantities of almost all the vitamins there is not only increased growth, but also better general well-being, longer life span, a delay of the onset of senility, and a prolonged period of active healthy adult life.

Heights of Young Women of Japanese Ancestry Compared with Their Mothers and Others

RACIAL ANCESTRY, SOURCE, AND DATE	AGE	NUMBER OF CASES	MEAN HEIGHTS (CM.)	
			Daughters	Mothers
Japanese				
McKinley High School 1944	15	102	155.7	151.4
McKinley High School 1944	16	173	154.9	150.6
McKinley High School 1944	17	129	155.2	150.1
McKinley High School 1944	18	42	154.0	149.8
University of Hawaii 1944	18-27	31	157.0	152.0
Japan (Matsumura) 1925	Adults	1,200	149.9	.....
Shapiro 1931	20-49	91	150.2	.....
Caucasian-Americans				
University of Iowa 1936	15-18	666	161.1	.....
Bowles 1932	18-19	500+	164.5	161.6

CAREY D. MILLER

THE TWENTIETH ANNUAL MEETING 1944-45

Program

NOVEMBER 16, 1944

Walter Carter: D-D Mixture: A New Soil Fumigant.

Carl T. Schmidt: Time-Mortality Relationships of D-D Mixture.

Peter H. Buck: Niihau Mats.

H. H. Warner: Some Aspects of the Foreign Economic Administration Agricultural Program.

NOVEMBER 17, 1944

Christopher J. Hamre: A Survey of Nine Commercial Fish Ponds.

Robert C. Brasted: The Role of Cellulose Acetate Artificial Silks and Plastics in the War.

Harry L. Arnold, Jr.: The Two Varieties of Leprosy: Lepromatous and Tuberculoid.

MAY 3, 1945

Joseph E. Alicata and Elwin L. Willett: Sulfaguanidine Therapy in Experimental Swine Coccidiosis.

Robert W. Hiatt: Food and Feeding Habits of Mullet, Milkfish, and the "Ten-Pounder."

Bernhard L. Hörmann: War-Time Research in Public Opinion and Morale.

John A. Rademaker: Methods in Psycho-Social Studies of West Coast Evacuation of Japanese-Americans.

MAY 4, 1945

C. P. Sideris, H. Y. Young, and H. H. Q. Chun: Growth of *Ananas comosus* in Relation to Soil Fumigation and Diurnal Change.

Robert B. Dean: Pink Hibiscus: A Universal *p*H Indicator.

Eugene C. Auchter: Federal Organization of Agricultural Research.

MAY 5, 1945

Annual Meeting

Installation of Officers

Address by Retiring President

J. L. Collins: Interspecific Hybrids in Pineapples.

Abstracts

D-D MIXTURE: A NEW SOIL FUMIGANT

A number of chlorinated compounds were tested as soil fumigants and one of these, a mixture of 1.3 dichloropropene and 1.2 dichloropropane, proved to be the equal of chloropicrin without any of the disadvantages.

D-D mixture, as this compound is designated, can be used effectively without soil cover, and is especially effective in nematode infested soils. In an area where *Anomala* larvae are important factors in a complex which includes *Heterodera* and *Pythium* species, the treatment with D-D resulted in especially significant gains. When drought is a serious factor, the response to D-D mixture is very much accentuated.

The 1.3 dichloropropene fraction of the mixture is evidently the most toxic but there is synergism between that compound and other fractions of the mixture which suggests that the combination of 1.3 dichloropropene with other chlorinated compounds might be a basis for additional research on soil fumigants.

Plant growth is the best criterion of the value of a soil fumigant. It is believed that whatever the effect of the fumigant may be on individual species of the soil complex, the development of good root systems follows effective fumigation.

WALTER CARTER

TIME-MORTALITY RELATIONSHIPS OF D-D MIXTURE

A biological assay method for detecting and estimating concentrations of lethal vapors from small samples is described where the percentage mortality of the rice weevil, *Sitophilus oryzae* (L.), is used as the indicator of concentration.

Mortality of the rice weevil follows a typical sigmoid curve when time is kept constant and concentration is varied. A similar sigmoid relationship holds if concentration is kept constant and exposure time is varied. When both time and concentration are varied, the effect of dosage increase greatly exceeds that of a proportionate increase in time.

CARL T. SCHMIDT

NIIHAU MATS

The Hawaiians made two classes of mats from pandanus leaves: floor mats with coarse wefts, and bed mats with finer wefts and more complicated technique, in which long twists to form the lower and upper edges are peculiar to Hawaii.

On Niihau, the bed mats were made of makaloa sedge with the same technique as pandanus. Colored motifs were added by overlaying strips of the brown sheaths from the base of the sedge. Sedge is soft, and

the neat plaiting with colored decoration made the Niihau mats the best bed mats in the Pacific area.

Why did the small island of Niihau produce the best mats in the group? The answer lies in the statement that the paper mulberry did not flourish on Niihau, hence the making of tapa was dropped. The women found a substitute craft in plaiting with sedge and so developed the Niihau mats to their high degree of excellence.

The development in plaiting technique established new styles, including the long bend at the upper and lower edges. The long bend was established first in Niihau mats, in which the softer, rounder sedge took the long bends smoothly. The later application of the style to pandanus wefts did not work smoothly until the flat, thin wefts were twisted into rolls to conform more closely with the qualities of the sedge wefts. Thus, loss in one direction stimulated extra development in another.

PETER H. BUCK

SOME ASPECTS OF THE FOREIGN ECONOMIC ADMINISTRATION AGRICULTURAL PROGRAM

H. H. WARNER

[The arrangement under which this talk was given precluded the possibility of publishing an abstract.]

A SURVEY OF NINE COMMERCIAL FISH PONDS

Eight ponds on Molokai and one on Oahu were particularly examined for flora, plankton, temperature, and salinity and, more generally, for turbidity, depth, and character of bottom. The ponds were examined within a period of two weeks in August and September and, therefore, were subject to the same seasonal influences. The observations were made cooperatively by Isabella A. Abbott, Charles J. Engard, Christopher J. Hamre, and Yoshinori Tanada. The data supplied by these workers were combined by the writer in an effort to construct a picture of the chemical, physical, and biological conditions of our local commercial fish ponds.

The ponds examined varied in area from 4 to approximately 135 acres. All had broad, shallow shore areas and the average maximum depth was about 4 feet. Seven ponds had complete mud bottoms, part of the bottom of one was of sand, and of another, hard coral. The bottoms were devoid of attached plants except for two ponds, one having *Ruppia maritima* and the other *Halophila ovalis*. The temperature of the water varied from place to place in the ponds and from pond to pond, the range observed being 29.9° to 32.4° C. The shallower isolated areas had the highest temperatures. The chlorinity varied from pond to pond, seven showing a range from 10 to 18 parts chloride per thousand parts water, one was uniformly 18 and 19 parts per thousand, and another uniformly at or near 5 parts per thousand.

The total volume of plankton per 25 gallons of water was extremely variable and ranged from 0.01 cc. to 1.2 cc. Total plankton values showed no direct relation to the observed physical and chemical conditions. Diatoms were found to be very abundant in the shallow areas of four ponds, present and fairly abundant in three, and scarce in one.

Fish populations were found to be small and the ponds to be understocked. It was recommended that the ponds be stocked more regularly and heavily since diatoms, which form the greater part of the diet of common pond fish, were abundant.

CHRISTOPHER J. HAMRE

THE ROLE OF CELLULOSE ACETATE ARTIFICIAL SILKS AND PLASTICS IN THE WAR

The cellulose acetate industry contributes approximately 15 per cent of all synthetic textiles and a slightly smaller percentage of plastic materials in the present industrial scheme.

The important structural group of cellulose is cellobiose, which can be hydrolized to the glucose unit. The latter is characterized by its three active hydroxyl groups. Raw cellulose for cellulose acetate is derived from southern pine wood pulp and cotton linters. Cellulose may be dissolved in a mixture of acetone and water after it has been subjected to an acetic acid-acetic anhydride treatment. After solution it can be filtered and extruded through a spinaret to form an end which is subsequently used for weaving. The acetate may be blended with a plasticizer or with cellulose acetobutyrate and used as a molding powder.

The cellulose acetate fiber is used in making Fortisan, the strongest fiber known in the synthetic field. This finds extensive use in weaving parachute cord, tire cord, parachute fabric, balloon fabric, as a diluent or extender for wool in uniforms, and as insulation for Signal Corps wire.

The plastic is made into transparent sheeting for propellers and mechanisms to be guarded from moisture and salt spray during overseas shipment, and is formed into instrument panels, wheels, gears, bomber blisters, and glider noses.

ROBERT C. BRASTED

THE TWO VARIETIES OF LEPROSY: LEPROMATOUS AND TUBERCULOID

The terminology of leprosy has long been an index to the current knowledge of the disease. Among the Greeks it was known under two separate headings: (1) elephantiasis (or leontiasis, or satyriasis), a fearful disorder with a bad prognosis, and (2) leuce, a disease characterized by anesthetic white spots and not much feared.

In the Middle Ages the word "leprosy" appeared, derived from the Greek "lepra," a scaly disease, wrongly translated from the Arabian "juzam."

In the nineteenth century the two forms were again distinguished under the names "tubercular" leprosy, meaning not "tuberculous" but "characterized by tubercles or nodules," and "macular" (spotty), or "anesthetic," or "maculoanesthetic" leprosy.

In 1931 the world's leprologists conferred and renamed these two forms in a most confusing way. They called them "cutaneous" and "neural" respectively. These words meant, to them, "characterized by abundant bacilli and a poor prognosis," and "characterized by scanty bacilli and a good prognosis," respectively. But they continued to be used, at times, to mean "per-

taining to the skin" and "pertaining to the nerves." This latter use was frequently most misleading—for a "cutaneous" type of case might involve nerves more extensively than skin, while a "neural" type of case might do the opposite. The change of "cutaneous" to "lepromatous" in 1938 did not undo all this damage by any means.

In Europe, the study of cases by microscopic methods had already led to the establishment of two types of leprosy which had been named "lepromatous" and "tuberculoid." The latter corresponded exactly to so-called "neural" leprosy of skin or of nerves. This classification has been adopted by clinical students of leprosy in South America, and it should be generally adopted in order to clear up the confusion inherent in the now official classification.

HARRY L. ARNOLD, JR.

SULFAGUANIDINE THERAPY IN EXPERIMENTAL SWINE COCCIDIOSIS

Investigations by Mainland workers have shown that sulfaguanidine therapy is of prophylactic value in the control of certain forms of coccidia in poultry, sheep, and cattle. Preliminary observations by the writers, based on the three experiments summarized, indicate that this drug is similarly effective in the control of mixed infections of coccidia (*Eimeria deblieckí,* and *Eimeria scabra*) in swine.

EXPERIMENT I

Two young pigs, weighing 28 and 30 pounds, respectively, were each fed about 20 million sporulated coccidial oocysts. One of the pigs, No. 3, received three grams of powdered sulfaguanidine daily with the feed. After the infection, the following observations were made:

Pig 3. This animal showed no diarrhea or loss of appetite. Only occasional oocysts were found in the feces between the tenth and thirteenth days.

Pig 4. Diarrhea started on the third day. Coccidial oocysts were found in the feces beginning with the sixth day. At this time the animal showed loss of appetite, a condition which persisted for about two weeks. The highest oocyst output, about 132,000 per gram of feces, occurred on the eighth day. After the twelfth day, only occasional oocysts were found in the feces. Since the diarrhea persisted, beginning with the fourteenth day the animal was given three grams of sulfaguanidine for three consecutive days. Following this treatment the diarrhea ended.

EXPERIMENT II

Two young pigs, weighing 47 and 55 pounds, respectively, were each fed about 20 million sporulated oocysts. Pig 5 was given 4.5 grams of sulfaguanidine daily with the feed. The drug was given beginning two days before infection and continued for seven more days. After the experimental infection the following observations were made on each of the pigs:

Pig 5. This animal showed no diarrhea or loss of appetite. Coccidial oocysts, ranging from 800 to 11,200 per gram of feces, were found between the fifteenth and eighteenth day. Thereafter, only occasional oocysts were found.

Pig 6. Diarrhea started on the fourth day and continued up to the ninth day. Coccidial oocysts were found in the feces beginning with the fifth day. The highest oocyst output, 804,000 per gram of feces, occurred on the tenth day. After the twentieth day only occasional oocysts were found in the feces.

EXPERIMENT III

Two pigs, weighing 67 and 65 pounds, respectively, were each fed about 20 million oocysts. Pig 7 was given 6.5 grams of sulfaguanidine daily with the feed for nine days. The following observations were made on each of the pigs:

Pig 7. This animal showed no diarrhea or loss of appetite. Oocysts, ranging from 1,000 to 16,000 per gram of feces, were found between the thirteenth and seventeenth day. Thereafter, only occasional oocysts were found.

Pig 8. Diarrhea started on the fifth day and continued up to the tenth day. The highest oocyst output, 582,800 per gram of feces, occurred on the eighth day. After the seventeenth day only occasional oocysts were found.

The above results point out that sulfaguanidine therapy was effective in three pigs in preventing the normal development of two species of coccidia and in preventing the production of dysentery, a condition frequently noted in coccidial infections in young pigs.

JOSEPH E. ALICATA and ELWIN L. WILLETT

FOOD AND FEEDING HABITS OF MULLET, MILKFISH, AND THE "TEN-POUNDER"

The food and feeding habits of the three most important market fish in Hawaiian ponds—mullet *(Mugil cephalus),* milkfish *(Chanos chanos),* and the "ten-pounder" *(Elops machnata)*—were analyzed to ascertain the position of these fish in the food-chains and the food cycle occurring within the ponds.

Mullet subsist primarily on littoral, benthonic diatoms and blue-green algae, the presence of a unique pharyngeal filtering device prohibiting them from swallowing larger forms. No variation in food because of season or size of fish was found.

Milkfish are also herbivores. Juveniles consume minute algae while larger fish take an increasing amount of filamentous algae. Competition for food between mullet and milkfish is greater than hitherto supposed and cannot be diminished under present operational procedures. An increased food supply for both species probably could be achieved by the application of inorganic fertilizers together with the construction of additional shallow areas in the ponds.

"Ten-pounders" subsist largely on mosquito fish and shrimps. No juvenile mullet or milkfish were found in 164 specimens of various sizes taken throughout the year. This species apparently damages pond fisheries less than is commonly supposed; in fact, it may prove an asset to the industry.

ROBERT W. HIATT

WAR-TIME RESEARCH IN PUBLIC OPINION AND MORALE

The problem of measuring and controlling the traits which guide organized groups to a successful or unsuccessful completion of their task is one engaging many social scientists. The War Research Laboratory of the University of Hawaii has felt that Hawaii offered exceptional opportunities for studying this problem.

This paper describes the way the Laboratory has studied morale and public opinion. One piece of research involved a gas mask count taken at first inter-

mittently, then regularly over a period of about a year. The percentage of persons carrying masks dropped from about 70 to about 10, and in May, 1943, when the military stopped carrying their masks, to zero. The reasons why people did or did not carry their masks were also collected and indicated that people could be divided into several types. Some carried their masks to indicate their contribution to the war effort and were thus showing high morale. A second group showed tension or "the jitters" when they carried their masks. A third group of carriers, mainly school children and defense workers, indicated good institutional discipline. Finally, an increasing number took a commonsense view of the situation as it might affect them if they did or did not have their masks. These people increasingly left theirs at home. This attempt to measure morale showed that several things besides morale were being measured also. The measurement of morale may turn out to be impossible.

The public opinion poll based on the representative sample is not adapted for the measurement of morale, but can apparently measure public opinion. An attempt to measure public opinion on the issue of martial law indicates the feasibility of this technique in Hawaii.

BERNHARD L. HÖRMANN

METHODS IN PSYCHO-SOCIAL STUDIES OF WEST COAST EVACUATION OF JAPANESE-AMERICANS

The study selected as a sample demonstration of methods used by sociologists and social anthropologists in observing, recording, and analyzing the behavior of human beings in certain types of situations, was entitled *Evacuee Attitudes on Relocation,* Granada Community Analysis Report No. 2, July, 1943.

The methods used included: (1) training the staff; (2) examination of available information, such as previous efforts to examine the problem, newspaper files, interviews, and discussion of the problem by the staff; (3) determination to use a questionnaire for measurement of attitudes involved and construction of the questionnaire which included (a) selection of questions, (b) phrasing the questions, determining their order, preparing equivalent versions in English and Japanese, (c) setting up tables for the compilation of answers, and (d) determination of set-up and instructions incorporated in the questionnaire; (4) field testing the completed questionnaire by having a representative sample of 120 residents fill out questionnaires, then interviewing these persons to find what they understood by the questions, how the words stimulated them to react, how closely the reactions they gave expressed their real feelings on the matter; (5) revising the questionnaire in the light of this examination; (6) launching the questionnaire, securing the support of the administration and of the residents; (7) editing and tabulating the returns; (8) computing percentages of returns on some questions, testing for errors; (9) analysis of the returns as tabulated and computed; (10) presentation of the results, writing up the analysis by several members of the staff, pooling results, criticizing, revising, consolidating, determining, and executing the methods of presentation in charts; and (11) distribution of the study to responsible administrators and interested people.

JOHN A. RADEMAKER

GROWTH OF *ANANAS COMOSUS* IN RELATION TO SOIL FUMIGATION AND DIURNAL CHANGE

Ananas comosus grown in soil fumigated with chloropicrin at the rate of 90, 180, and 360 pounds per acre or with ethide at 100, 200, and 400 pounds per acre grew better at the higher than at the lower levels of fumigants and the concentrations of certain metabolic products in the leaf tissues correlated with the rate of growth and diurnal changes. In plots with 150, 300, or 450 pounds per acre of D-D mixture, the growth obtained was almost equally good for all three levels of the fumigant and the concentrations of the products of metabolism in the leaf tissues were approximately the same.

The longest leaves of approximately ten-month-old plants were collected September 6, 1944 at 8:00 A.M. and 4:00 P.M., Hawaiian War Time. Sections about eight inches in length of the chlorophyllose region were cut off, measuring from a point five inches below the tip towards the base. Fifty grams of leaf tissue were mixed with 200 ml. of water in a Waring mixer and ground for ten minutes. The mixture was strained and the residue was washed repeatedly with water until the final volume was 500 ml. The residue was analyzed for insoluble nitrogen and the filtrate for acidity, sugars, proteinaceous nitrogen, and crystalloid organic nitrogen.

Leaf weights were greater in the plots with higher levels of either chloropicrin or ethide but those in the D-D mixture, although almost as great as those in the high level plots of chloropicrin or ethide, varied very little between different levels. Titrable acidity values were higher and sugar values lower in the plants from plots with greater amount of chloropicrin or ethide and with a high rate of growth. Titrable acidity values of the 8:00 A.M. samples were considerably higher than those of the 4:00 P.M. samples, while sugar values in the same samples were reversed. These inter-relationships between titrable acidity and sugar values indicate that the sugar was partially oxidized at night or in darkness to organic carboxylic acids, but not completely to carbon dioxide and water. During the day or in light, the carboxylic acids were converted to other more complex metabolic products.

Proteinaceous nitrogen and crystalloid leaf nitrogen were affected less by the different levels of fumigants than by diurnal changes. Proteinaceous nitrogen was lower and crystalloid nitrogen higher in the 8:00 A.M. than in the 4:00 P.M. samples.

Total nitrogen values being smaller in the plants from the plots with none or low than from those with high amounts of fumigants may indicate a reduced rate of nitrogen absorption from the soil on account of root injuries caused by pathogenic and predatory soil flora and fauna.

C. P. SIDERIS, H. Y. YOUNG, and H. H. Q. CHUN

PINK HIBISCUS: A UNIVERSAL *p*H INDICATOR

The coloring matter extracted from common pink hibiscus flowers by boiling water can be used as an indicator over a range of *p*H values from 2 to 14. The colors resulting are approximately as follows: *p*H 2 or less, bright pink; *p*H 4, purple; *p*H 6, grey; *p*H 8,

yellow; *p*H 10, olive; *p*H 12, green; *p*H 14, bright green fading rapidly to yellow. If tap water is used to extract the pigments, it should first be boiled and acidified with hydrochloric acid as chlorine in the water bleaches the red anthocyanin pigment which, in its basic blue form, also accounts for the green shades at high *p*H values.

Hot water extracts develop mold in a few days and both water and alcohol extracts fade fairly rapidly. The coloring matter can be absorbed on test papers but these also fade in storage. The indicator is recommended for demonstration purposes and for field use where special indicators are not available. It can be used to detect free alkali in soaps and cleansers which should give a dull olive green and not a rapidly fading bright green.

ROBERT B. DEAN

FEDERAL ORGANIZATION OF AGRICULTURAL RESEARCH

EUGENE C. AUCHTER

[The arrangement under which this talk was given precluded the possibility of publishing an abstract.]

INTERSPECIFIC HYBRIDS IN PINEAPPLES

Presidential address 1945.

The five species of pineapples presently recognized are: *Ananas comosus,* which includes the cultivated varieties, and the wild species *A. bracteatus, A. ananassoides, A. erectifolius,* and *Pseudananas macrodontes.* The four wild species are believed to be native to South America. Varieties of *A. comosus* include three distinct leaf types classified on the character of the leaf margin into piping, spiny tips, and spiny. These types are represented in the germ plasm by two pairs of hereditary genes producing typical mono- and modified di-hybrid Mendelian ratios when intercrossed.

A. bracteatus, a spiny-leaved species, contains a hereditary gene for spines which is different from that contained in *A. comosus. A. erectifolius* contains a modification of the spiny-tip gene of *A. comosus* which prevents the production of spines at the tip of the leaf. *A. ananassoides* has identical genes for spiny leaves, as does *A. comosus,* but also possesses genes for acid and sugar production in the fruit which are more potent than those in the other species.

The crosses between species of *Ananas* produce viable seeds and the hybrids are fertile. The generic cross between *Ananas* and *Pseudananas* produces only about 5 per cent viable seeds. The hybrid plants developed from these viable seeds are fully fertile, with seed viability around 90 per cent. When crossed with Cayenne, a spiny-tip variety of *Ananas,* the F_1 hybrids exhibit much variation in leaf type, with many plants inconstant during development. This is interpreted as due to a threshold condition existing among the potencies of the genes for leaf type, so that they may be tripped one way or the other by different environmental forces during growth.

The species of *Ananas* have 50 chromosomes as the diploid number, but *Pseudananas* has 100 chromosomes. The low percentage viability of the hybrid seeds is associated with this difference in chromosome number. All of the F_1 plants have 100 chromosomes, except a rare few which have 75 chromosomes.

Genetic studies of species relationships supply information for use in the new biological science known as "biosystematics."

J. L. COLLINS

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Swezey, O. H.

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Takazawa, Futoshi
Tam, Richard K.
Tanada, Yoshinori
Tanimoto, Tyrus T.
Thomas, Jane Howe
Titcomb, Margaret

Urata, Rokuro

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Van Zwaluwenburg, R. H
Vernon, Mabel D.
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Vollrath, Harvey

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Wallace, Milton
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Yamasaki, Yoshio
Yanagihara, Iichi
Yee, Phillip K. H.
Young, H. Y.

Zimmerman, Elwood C.

INDEX