PROCEEDINGS OF THE HAWAIIAN ACADEMY OF SCIENCE . . .

THIRTY-FOURTH ANNUAL MEETING 1958-1959

Published by the University of Hawaii Honolulu, Hawaii, 1959

CONTENTS

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."

PRESIDENTIAL ADDRESS 1959

THE FIELD OF THE HAWAIIAN ACADEMY OF SCIENCE
A TRIENCENTENNIAL REVIEW

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With proper foresight, I might conceivably have arranged matters six and a half years ago so that the relinquishing of the figurative gavel would have meant the end of my Academy responsibilities. At that time there was under consideration, by a committee of which I was a member, a sweeping revision of the Academy Constitution. A number of constitutional provisions honored principally in the breach were about to be dropped, a number of innovations were about to be adopted, and, just possibly, the requirement for a Presidential address could quietly have been eliminated. Unfortunately, the original Constitution was most specific: The President "shall deliver an address at the annual meeting"; the practice in this respect had been consistently correct and further, frankly, it didn't occur to me to have a personal concern. That chance was lost, the Constitutional provision was retained in all its firmness, and the tradition has been made yet firmer by the regrettably conscientious observance of the six presidents since.

Unlike Presidents of the United States or Governors of Hawaii, Academy Presidents are not expected to make annual or biennial reviews of the state of the Academy. However, since the opportunities for such reviews at the end of the first decade and first quarter-century of the Academy were overlooked, the field of Academy history seems ripe. With the fortunate discovery that a third of a century of Academy existence had been completed just about the time of last fall's meetings, and with the appropriate word designating such a period successfully (I trust) juggled out of the Latin, I decided to run the risk inherent in attempting such a review. I have chosen for my title that of the first Presidential address, "The Field of the Hawaiian Academy of Science," merely appending the pertinent phrase designating the passage of time.

The risk, I might point out, stems from the fact that 17 of the original charter members are still members of the Academy, including six who were later Presidents. Indeed, 24 former Presidents are still members. With many of these persons present tonight, I cannot expect to get away with any errors, and am somewhat limited even with the truth.

ORIGIN

The first Proceedings of the Academy (5) refer to several already existent Hawaiian scientific societies of restricted field and, indeed, there had been some scientific or quasi-scientific societies born and deceased long before the advent of the oldest of these; for example, the Royal Hawaiian Agricultural Society (1850-1856) (14).

The Medical Association of Hawaii was organized in 1895 from a group that had already been meeting informally for five years, and it later slid over the charter and claimed the tradition of an older Hawaiian Medical Society dating from 1864 (4). This substantial association began the regular publication of annual Transactions in 1900.

The Hawaiian Entomological Society was organized in 1904, began the series of monthly meetings never since broken, and, in its first year, with the help of the Hawaiian Sugar Planters' Association, commenced the publication of its Proceedings (12).

The Hawaiian Chemists Association grew out of the Hawaii Sugar Chemists Association, organized in 1902, but it merged with the Hawaiian (earlier, Honolulu) Engineering Association and the Sugar Mill Engineers to form the Association of Hawaiian Sugar Technologists in 1922. The general chemists were not to be downed, however, and the next year they received a charter as the Hawaiian Section from the American Chemical Society (13).

The Hawaiian Botanical Society was organized in 1924 (3, 10).

The first action to lead in any direct way to the organization of the Academy began in 1921 when a group of local members of the Society of Sigma Xi met to discuss the organization of a local general science society of some sort, a Sigma Xi club, a Honolulu Academy of Science to be affiliated with the American Association for the Advancement of Science, or an informal science club. There was considerable correspondence with both Sigma Xi and the AAAS Pacific Division headquarters which indicated that the organization of a local branch of the Pacific Division had actually been approved the year before. A Natural Science Club of Hawaii was organized in June 1921 "as a center for informal discussion of scientific topics relating to Hawaii," since a less formal organization was preferred. Harold S. Palmer served as Secretary-Treasurer of this society for two years, during which 17 meetings were held. This informal organization became inactive thereafter, leaving the Hawaiian scientific community again without a society.

In April 1925, members of the American Associa-

tion for the Advancement of Science resident in Hawaii were called to a meeting at which a committee was appointed to formulate plans for a permanent organization, again possibly a local branch of the AAAS. The AAAS Council discouraged the local branch plan, but suggested the formation of an Academy of Science to be affiliated with the AAAS. The Academy organization was adopted at a meeting in June, and a constitutional committee was appointed which acted with noteworthy speed.

On July 23, 1925, the Constitution of the Hawaiian Academy of Science was adopted (5), officers were elected, and the Academy was in existence and functioning. It was voted that members of the AAAS, of its affiliated societies, and of the local botanical and entomological societies, were eligible for charter membership, and 79 charter members were recorded before the roll closed on October 1. An additional 42 candidates were elected to membership in the first year, giving a total membership of 121.

The expected field of the Academy was discussed by Frederick C. Newcombe, the first President of the Academy, in his retiring address on May 19, 1926 (11). Professor Newcombe's views may be considered fairly representative, because before his presidency he had served as chairman of the committee that drafted the Academy's constitution. He considered that the program of the Academy would be centered around the scheduled sessions for the presentation of individual papers. "In the meetings of the Academy," he said, "all scientists in Hawaii will have an opportunity to present the results of their studies to their fellows, to state their problems, to learn of the work and problems of their fellows in other sciences, and thus to contribute to the solidarity of science in Hawaii, to the good of Hawaii; and thus also to do all that can be done to overcome the scientific isolation which our geographical isolation necessarily entails." Newcombe emphasized that the Academy's field was science as a whole, not the specialties that were covered by the botanical, chemical, entomological, and medical societies, but he also pointed out that there were several scientific fields represented by workers in Hawaii who had no local specialized societies, and noted that half of the papers presented in the first year of the Academy were in these fields.

Newcombe explicitly assumed that in the Academy's program "only the so-called natural sciences, including medicine, [were] expected to participate." This is curious since at least eight of the members at the end of the first year, including several of the charter members, were social scientists. He also discounted any interest in science teaching. "The pedagogical side of science," he said, "is already looked after by teachers' organizations; and while the Academy might, at some time, wish to inquire into the adequacy of the equipment for teaching science, the methods, and so forth, would probably be best left to the teachers themselves."

The strangest specific omission from the Academy's program was "the presentation of popular addresses, in exposition of science," which, according to Newcombe, "should be but occasionally, if at all, attempted by the Academy. This very useful function," he continued, "is now exercised by other organizations and the Academy may well leave this service to them." Newcombe was certainly referring here to the weekly lectures that had been started two years before by the Pan-Pacific Science Council (11), one of the many subsidiary movements and offshoots from the Pan-Pacific Union. The omission over a decade in the Academy records of any specific reference to the Council, the Union, or the later established Pan-Pacific Research Institute (2), is a striking indication of the schism in the intellectual community, stemming from personal antagonisms, that must certainly have seriously hampered the development of many organizations, including the Academy.

Newcombe summarized his views concerning membership as follows: "The Academy offers its facilities and solicits the adherence of the young research worker, of the large body of amateurs, of the physicians doing research, of the scientific specialists in the industries and on the plantations, of the scientific staffs of the half-dozen research institutions of Honolulu, and of the investigators in government departments."

ADMINISTRATION

The 1925 Constitution (5) provided that the Academy would be governed by a Council, composed of a President, a Vice-President, and a Secretary-Treasurer, all elected annually, two other Councilors elected for staggered two-year terms, and the retiring President. The President could not serve two consecutive terms, but this restriction did not apply to the other officers. Only an Auditing Committee was specified, but as a rule a nominating committee and a resolutions committee were additionally appointed by the Council in the early years.

In 1936, the Constitution was modified slightly to permit scheduling a regular session in the fall and to make some minor changes in membership election procedures (6). By tradition, starting about 1939, the Vice-President came to be almost automatically nominated for the Presidency. Otherwise, the administrative policies remained unchanged for more than a quarter of a century.

I should have liked at least to identify the Presidents, Secretaries, and Treasurers in the Academy's history, and cannot adequately express my regret that time will not permit this. I cannot refrain from mentioning a few: E. L. Caum, who was the first Secretary-Treasurer, and who later served in the same post for six consecutive terms, and then as Councilor for a two-year term, making a total of nine years on the Council, an all-time record; Mabel Slattery, who served as Secretary-Treasurer for eight consecutive years; Edwin H. Bryan, Jr., who was Secretary-Treasurer for four years, Vice-President, President, Councilor, member of the Organizing Committee and of many committees since; and Chester K. Wentworth, who was Vice-President, President, Councilor, Secretary for five years, leader of an expedition, and

chairman of a vital publication committee.

Only two irregularities occurred in the first quarter-century: the 13th President, leaving the Territory, resigned and was replaced by an Acting President; the 17th President and the other officers were held over for a second term because the annual meeting could not be scheduled during the wartime conditions of 1942.

In 1952-1953, it seemed probable to the Council that the Academy could be more useful both to its members and to the community if some of its responsibilities were delegated to committees. There were several special committees appointed that year to try the practice out, and in the second half of the year a revised Constitution was drafted. It provided for standing committees on membership, affiliation, program, and nominations, as well as the original auditors. It split the office of Secretary-Treasurer. It called specifically for publication of the Proceedings of the Academy and affiliation of the Academy with the AAAS, permitted affiliation with local scientific societies of restricted interest, and modified the procedures of the Academy in a number of other ways.

The revised Constitution (8) was adopted by the Academy in the spring of 1953, after amendment to require at least two nominations for each elective position. There were some further amendments adopted during the next year, which changed the office of Vice-President to that of President-Elect, introduced a ballot by mail for officers, relaxed the requirement for two nominations for offices whose incumbents were willing to serve again, and provided for the establishment of Regional Divisions on the neighbor islands. This last provision was made in response to a petition from the Big Island and resulted in the organization of a Hawaii Division in 1954.

To ease the task of the Nominating Committee in 1957, when replacements had to be found for both the Secretary and the Treasurer, the Constitution was further amended to remove the requirement of dual nominations for those offices (9). Recognizing the load on the Secretary, the Council at its last meeting established the appointive position of Membership Secretary.

These administrative arrangements have been discussed primarily as a convenient historical framework on which to hang the make-up and program of the Academy.

MEETINGS

From the earliest organizational discussion, it was obvious that one of the basic needs to be supplied by the Academy was meetings at which papers could be presented by those who had done some piece of scientific work which they thought would be of interest to others, and heard by those who wanted to know what work was in progress both in their own disciplines and in others. Not only by Constitutional requirement, but to meet a continuing need, the essential part of the regular or "scheduled" sessions of the Academy has always consisted of these miscellaneous volunteered papers.

About 665 papers have been presented in the sessions, a yearly average of almost 20. Thirty-five volunteer papers were offered at the first annual meeting, a record never equalled since. Four of these were read by title only, but that still left eight to 12 for each of three evenings. Speakers at our recent sessions who may have been disappointed by the time limit set for their papers may contemplate the restrictions that must have been necessary during an evening of 12 papers.

Until the tenth year there was only one "scheduled" session, that in the spring. The custom of a two-session annual program started with a fall session in 1935 and has continued since, except in 1942, when the spring session had to be dropped due to wartime restrictions, and in 1957, when there was an extra "scheduled" session in the winter.

For 27 years the meetings were arranged by the Council, or to be more accurate, by the Secretary-Treasurer, who negotiated the reduction in number of papers in fat years, and pried up extra papers in lean years. The 1952-1953 Council appointed a Committee on Membership and Program, and since then there has been a standing Program Committee provided by the revised 1953-1954 Constitution.

Many of the Program Committees have arranged at the regular sessions for food for the eye as well as for the ear in the form of some 20 exhibits in all. It took this year's Program Committee, however, to come up with the provision of food for the palate at the regular sessions. Previously the members starved, so far as the Academy was concerned, until the Annual Dinner. The tradition of the dinner was begun at the second annual meeting, and has been followed uniformly except when evening functions could not be held for three years during World War II, and when an austerity program forced the substitution of a lunch in 1952.

For the first 15 years, and again since the 29th year of the Academy, special sessions, or "public meetings" as they were first termed, have generally been held to take advantage of visitors of scientific fame. These averaged better than two a year in the early period. Since 1954, there have been 22, an average of more than four per year, most of them sponsored jointly with one or more of the Associated Societies.

Symposia have been scheduled at both regular and special sessions, which in the course of time have involved a total of some 62 speakers. Many of these symposia have dealt with problems of local resources; three with Island natural resources in general, two with water resources, one with soils, one with food resources, and one with the rat problem. Others recently have dealt with education and will be discussed a little later.

PUBLICATIONS

The Academy was very fortunate in being able to have its Proceedings published from the very beginning. In 1926, the Bernice Pauahi Bishop Museum offered to publish them in its series of Special Publications without cost to the Academy. The first issue

contained a historical sketch of the organizing effort and the first active year, the Constitution, the list of members, the program of the meeting, and abstracts of the papers presented, including an extended summary of the Presidential address. The second issue, which set the pattern for subsequent issues through the fifteenth, contained a summary of the year's activities, a list of officers, the program, abstracts, and a list of members.

In the spring of 1941, the fortunate arrangement with the Bishop Museum had to be terminated owing to the limited finances of the Museum. The Council decided for the time being to file typewritten copies of the abstracts in four libraries in Honolulu. The war undoubtedly delayed consideration of better arrangements, but in the spring of 1943 negotiations were started with the University of Hawaii as a potential publisher. Finally, in August 1944, a plan was approved whereby the 1940-1943 Proceedings would be published by the University in a format similar to, though somewhat reduced from, that of the earlier issues, with the Academy paying three-fifths of the cost.

The Proceedings of the sixteenth through the eighteenth meetings, and those of the nineteenth and twentieth meetings, were publishd in two issues in 1945 and 1946, and the Proceedings have been issued annually since. With the 26th Proceedings were presented the Proceedings of the Symposium on Scientific Research in the Pacific sponsored by the Academy in March 1951. Beginning with the 29th Proceedings, an annual report containing abbreviated committee reports was added; beginning in the 32nd, the Presidential address was printed in full.

During the time that negotiations were under way with the University, a list was drawn up of institutions around the world with which exchanges would be desirable. This list has since been so expanded that our Proceedings now go to more than 200 institutions. The exchanges from this distribution are received by the University Library.

MEMBERSHIP

The most important element of the Academy is, of course, its membership. No matter has received such serious and repeated attention as membership policy. In the organizational meetings in 1925, it was agreed that some interest in science was an essential prerequisite to membership. There were proposals for both a single-class membership, and a dual-class membership with classification based on activity or professional scientific achievement. What was adopted, however, was a provision for two classes of members with the distinction based on residence, those not living in Hawaii being called Corresponding Members. The requisite degree of scientific interest to be required was vigorously debated; a proposed qualification, "actively interested," was amended in the final version of the Constitution by omitting the adverb.

In spite of the lack of stringency in the requirements for eligibility, the procedure of election was originally tightly prescribed. Three members had to nominate each applicant to the Council, the Council recommended to the Academy what nominees is approved, and the Academy voted by ballot—at least in theory. There is no record of any nominee failing of election, and after a few years the ballots were reduced to one cast by the Secretary by unanimous consent. These provisions were modified somewhat in the 1953-1954 revisions of the Constitution, and finally relaxed in 1957, so that only two sponsors are required, and election is by the Council upon the recommendation of the Membership Committee.

There were never more than four Corresponding Members, and administratively they were an inconvenience hardly compensated by the fact that they were exempt from the payment of dues! In 1936, the Constitution was amended by simply dropping the provision for Corresponding Members, but retaining residence in Hawaii and an interest in science as qualifications for membership. In succeeding years, several members who left the Territory were allowed to retain their membership, and in the 1953-1954 revised Constitution, eligibility was extended to nonresidents without special classification and without waiving dues.

The possible advantages of recognizing a class of the elite within the general Academy membership has been raised repeatedly, most recently three years ago. After thorough study, the 1956-1957 Membership Committee recommended the exemption from the payment of dues of the Academy's elder citizens and the creation of a category of contributors. These provisions were adopted by Constitutional amendments in February 1957. At the advice of the Committee, the single class of membership was retained with the simple "interest in science" criterion for eligibility.

The dues for members in the Academy were set at $1.00 in 1925, and remained unchanged for 32 years. The inflationary increases in publishing and general operating costs after World War II were met for several years by the increasing efficiencies arising from an increasing membership. By 1956, however, it was obvious that either the program would have to be cut, or the dues would have to be raised, and the Academy voted in 1957 to double the dues rate to $2.00.

The charter membership of 79 had increased rapidly at first, so that at the end of the second year the total membership stood at 157. Thereafter, for 26 years, it increased erratically, with frequent though temporary slumps, at an average rate of 7 per year, so that in April 1953, the total was 345. The next five years showed a phenomenal increase of over 100 per year, then during the year just past, there was some loss through the loss of delinquents unwilling to meet the higher dues established two years ago, and also through the dropping of those who had been drawn in during years of proselytization and whose interest was casual.

At the end of the year just closed, our membership stood at 838. It is worth noting that our Academy is about the tenth largest in size of those in all the states, with by far the largest membership per capita of state population.

AFFILIATION

Turning now to a consideration of the Academy's relationship with other societies, you will remember that affiliation with the American Association for the Advancement of Science was one of the aims of the foundation of the Academy. In the organization of the Academy itself, the AAAS affiliation was overlooked, and indeed it was hardly considered again for 26 years. In November 1951, the Academy voted to seek affiliation, and in June 1952, was accepted by the AAAS, thus finally bringing to actuality the relationship that had been considered more than 31 years previously in connection with the forming of the Natural Science Club.

As an affiliated society, we gained a seat on the AAAS Council, and, thus, full-scale citizenship status in the national scientific community seven years before we gained the political equivalent. Generally our delegate to the AAAS, or an alternate, has been in actual attendance at the annual meetings. In addition, our Academy is automatically a member of the Academy Conference which represents all of the 44 affiliated state academies of science. Through the AAAS we are in touch with national events that are of concern to us; for example, the proposal and eventual passage of the National Science Foundation appropriation for aid to science education through the state academies. Through the Academy Conference, we see what fields other academies attempt to cover, how they are organized, and how successful they are. From the AAAS we also receive annually a small grant for the support of research or science projects, based on our mutual membership.

Through the Academy Conference we were aware, when reorganization of the Academy was considered in 1953, that many state academies were organized by sections of restricted interest. There were in Hawaii strong and active local societies and local sections of national societies, of restricted scientific interests. It would have been absurd for the Academy to attempt either to compete with or to absorb these societies, but it did appear that a tie of some sort between the Academy and the specialized societies would be of value, and so there was written into the 1953 revised Constitution a provision for "Associated Societies," those in Hawaii "whose objects are in keeping with those of the Academy."

During the 1953-1954 year, seven of the specialized societies accepted the invitation of the Council to Associate status. These were the American Society of Agronomy, Hawaii Chapter; American Chemical Society, Hawaiian Section; Anthropological Society of Hawaii; Geophysical Society of Hawaii; Hawaii Medical Association; Hawaiian Entomological Society; Society of Sigma Xi, Hawaii Chapter. Three of these, the Chemical Society, the Entomological Society, and the Medical Association, have already been referred to as antecedents of the Academy.

The Anthropological Society of Hawaii had been organized in 1929, had held regular monthly meetings since, and had published its society "News" from 1937 through 1949, and "News from the Pacific" thereafter.

The Geophysical Society of Hawaii was organized in 1953 as a joint local section of the American Meteorological Society and the American Geophysical Union. It was formally an outgrowth of the Meteorological Society of Hawaii, dating from 1931, but it took over also some of the membership of the Hawaiian Dana Club, a geologic group started in 1935.

A local club of the Society of Sigma Xi had, you will remember, been considered here in 1921, when the Natural Science Club was organized. A Sigma Xi Club of Hawaii was finally founded in 1939. Two years later, a full charter was approved, but the action was postponed because of the war, and the installation did not actually occur until 1947.

Members of the American Society of Agronomy began meeting in Honolulu in 1950, and in 1952 a Hawaii Chapter of the Society was chartered.

In 1954-1955, two more societies became the eighth and ninth Associates. One was the Botanical Society, an antecedent of the Academy, which had been invited the previous year to become an associate, but which had delayed action to see how the Association principle was going to work. The other was the Hawaiian Psychological Association which had been started in 1949. This society is an affiliate of the American Psychological Association and a member of the Conference of State Psychological Associations.

In 1957, the American Statistical Society, Hawaii Chapter, which had been chartered in 1946, became the tenth Associate, and at the last Council meeting of the past year, an eleventh society was accepted as an Associate, the Hawaii Dietetic Association, a local chapter of the American Dietetic Association, chartered in 1939.

It is probable that the combined membership of the Academy and its various associated societies, eliminating overlaps, exceeds 1,600.

An affiliation committee was established by the 1953 revised Constitution to include the representatives of the associated societies, those of the Council, and the delegate to the AAAS. The Committee undertook immediately, on behalf of the Academy, the administration of the AAAS research grants, which were then used in support of postgraduate research. Between 1953 and 1957, six awards were made, totalling $300.

Three years ago, when the AAAS requested that its grants be used for support of science projects in schools, the Affiliation Committee, relieved of its responsibilities for administering them, turned in 1956-1957 to the organization of a science fair. I wish to cover this endeavor in more detail when considering the efforts in science education. It will suffice at the moment to call attention to the early joint effort in this field, and to the success that was reported back to the Affiliation Committee by a special Science Fair Executive Committee in the spring of 1958.

This year the Affiliation Committee has undertaken a review of notable activities in the scientific field

that might be undertaken during the first year of Hawaiian Statehood.

Through the connection with the Associated Societies, the Academy has thus found very useful means for studying its program and possible modifications in the light of their widest value.

SPECIAL ACTIVITIES

The number of "scheduled" sessions and of special sessions varied from year to year, as has been indicated, but they may still be considered the Academy's normal program. Three sizeable activities have, however, been distinctly non-normal.

One was the expedition made to the summit area of Mauna Kea in 1935. The Council named Chester Wentworth, who, incidentally, was President that year, as leader, and appropriated $100 to support it. To that magnificent sum was added a certain amount of cooperation by other agencies. An advance party was given transportation on the Coast Guard cutter *Itasca* to reconnoiter the area and set up camp. A detachment of 10 enlisted men from the Hawaiian Department, U. S. Army, under the command of H. A. Meyers, was responsible for logistics and communication. Parker Ranch provided truck transport on the Big Island and the CCC provided mules.

The total scientific staff numbered 16 and included botanists, entomologists, geographers, geologists, meteorologists, and zoologists. An informal report was made to the Pan-Pacific Research Institute afterward, the only evidence of cooperation recorded between the Academy and that institution, and several technical papers on the individual fields of effort were published.

The Academy appointed a new Expedition Committee in 1936, and appropriated $250 for an expedition to the Kokee area of Kauai, but this plan never materialized.

A second special activity was the Symposium on Scientific Research in the Pacific, held in March 1951, spark-plugged by Dr. Loring Hudson. L. D. Baver, Vice-President of the Academy, served as general chairman. After a general session, the more than 150 participants were separated into 11 committees which reviewed as many aspects of scientific research of interest in the Pacific. Current needs were discussed and recommendations prepared in the form of resolutions. The resolutions were then coordinated and presented at a final meeting of the whole group.

It is of interest to examine these resolutions in the light of subsequent action. Of the 10 prepared by the committee with which I am most familiar, that on geology, geophysics, and hydrology, six resolutions cover fields in which there has since been substantial action, including progress on deep-sea surveys, the establishment of a geophysical institute at the University of Hawaii (at least in nuclear form), and the initiation of quantitative hydrologic inventories in Hawaii. The other four resolutions still need implementation; for example, that concerning comprehensive work on beaches and sand supplies.

The Proceedings of the Symposium were published in the 26th Proceedings of the Academy (7), after abbreviation through the heroic efforts of the Academy Secretary, so that the printing cost would not break the Academy's treasury.

SCIENCE EDUCATION

The third special activity, science education, has grown to be larger than the whole of the rest of the program, so far as number of participants, demands in time, and probable importance of results are concerned.

The first discussion of science education as a possible interest of the Academy, or rather the first after President Newcombe disavowed interest in it, arose early in 1953, partly as a result of the offer to the Academy as a new affiliate by the American Association for the Advancement of Science of a couple of honorary junior memberships in the AAAS for high school students. The Council realized abruptly what an insignificant contact the Academy and its membership had with science education. An attempt was immediately launched to invite science teachers to membership in the Academy, and before the spring meetings, 36 responded. From this group a Science Teacher Committee was appointed the next year, and instructed not only to administer these AAAS awards, but to investigate the formation of a science teacher society that might become associated with the Academy, and the formation of science clubs.

This Committee was maintained for four successive years. The first two years' work was largely exploratory, but a break-through seemed to be scored in the third year when a Science and Mathematics Teachers Organization was launched at a meeting of 100 teachers and guests at Coconut Island in November 1955. The success was only temporary; in spite of the continuing support of the Committee, the organization foundered.

In the meantime, however, the concern of the Academy in the field of science education had born fruit in a number of other ways. Members of the Academy began to be called with increasing frequency for service as Career Day Councilors in the high schools, as participants in meetings organized by the Department of Public Instruction to acquaint elementary and intermediate teachers with the features of Hawaiian natural history, and as members of curriculum advisory groups.

In 1954-55, a program subcommittee headed by John Warner arranged two popular symposia intended especially to acquaint teachers with the activities and facilities of the research institutions in Honolulu.

Two years later, Sterling Wortman, then head of the Program Committee, arranged, in cooperation with the Department of Public Instruction, a series of six lectures by Academy members for the science teachers of Honolulu. So enthusiastic was the reception that the DPI insisted on a repeat performance the next year. Again Wortman handled the arrangements for the Academy, this time as Secretary and

ex-officio member of the Science Teachers Committee.

In 1956, the American Association for the Advancement of Science suggested strongly that the annual funds formerly used for postgraduate research grants be diverted to the support of high school science projects. The administration of these funds was transferred to the Science Teachers Committee, which arranged for a grant to the students of Radford High School for the construction of a botanical garden.

Through the stimulus of the Hawaii Chapter of the American Chemical Society, the affiliation committee in 1956-57 undertook serious consideration of a Science Fair. A special Science Fair Executive Committee was set up representing 8 of the 10 societies with the aim of organizing a fair for the spring of 1957. This timing proved too ambitious, but in the spring of 1958, under the leadership of Leon Rhodes, the First Annual Hawaiian Science Fair was held in Honolulu. About 2,000 students participated in schools throughout the Islands. Of the exhibits prepared, 157 were shown at the central fair, and the top boy and girl winners were sent to the National Science Fair in Flint, Michigan. This activity required a budget far beyond the Academy's norm, but the community responded well to an appeal for financial and material support and assistance. To receive the monetary contributions, the Academy filed as a tax-exempt institution and established a special Science Fair Fund.

At the recommendation of the First Science Fair Committee, an Inter-Society Science Education Committee was established by the Academy and its Associates in May 1958. At a meeting of the executive officers of the several associated societies with the Academy Council, it was instructed to organize the next Science Fair and to promote the extension and improvement in science education in other ways. The Academy Council transferred to the new committee all of its efforts in the field, changed its Science Fair Fund to a Science Education Fund under the new committee, and named A. J. Mangelsdorf the first chairman.

The results of the first year's activity have been far beyond most expectations. The Second Annual Hawaiian Science Fair was organized under the direction of Saul Price. This time 5,000 students participated in 75 schools, and the competence of local boys and girls in the field of science was demonstrated to some 15,000 persons at the central fair, plus uncounted others at local fairs. Two sizeable scholarships were added to the mainland trips for the boy and girl winners.

The AAAS traveling science library of 2,000 key books, which had been obtained during the previous year by a committee headed by Robert Clopton and circulated in schools on Hawaii, was moved to Maui County schools, arrangements were made for obtaining two additional sets of books, and individual schools were stimulated to add a substantial number of the books to their own libraries.

The Science Teachers Seminars were again organized by Sterling Wortman, this time in two series, one for elementary and one for high school teachers.

A thorough survey of science clubs and their needs was made by a committee headed by Donald McGuire. Assistance to them was started, and definite plans were made for additional and very substantial future support.

A series of seminars for especially talented students was started by Albert Carr, a token initial contribution was made toward the preparation of a series of elementary science text supplements by Sister Mary St. Lawrence, and a number of other studies and activities were commenced.

Endeavors of these kinds take considerable money, but money has not yet proved a limitation. The annual grants from the AAAS, local contributions of $4,700, and a $5,000 grant from the Alfred P. Sloan, Jr., Foundation, have carried on the activities to date, and the Academy has requests before the National Science Foundation for grants under its new State Academies of Science Program for some $60,000 worth of projects, including publication of the series of elementary science text supplements, preparation and use of a series of miniature museum-type displays, organization of a science club service, continuation of the students science seminar series, and expansion of the Teachers Science Seminars Program to the neighbor islands. We have recently received word that some $7,000 has been allotted for the Teachers Seminars and the museums, and we are anxiously awaiting word on the rest.

THE FUTURE

It is obvious from the foregoing discussion that the Academy has had a role to play, and to a substantial degree has played it successfully. Before speculating about its future role, it would be wise to identify the factors in the Academy that have led to its successes.

I believe there is one predominant, essential element, and that is that the Academy has served and represented the whole Hawaiian scientific community. Both this specialized community and the community in general recognize that there are functions in which an agent acting for the Hawaiian scientific community as a whole can exercise a special competence.

Now the interest of this Hawaiian scientific community cannot be described in terms of definite boundaries. Let me attempt an analogy in the terms of physics. Imagine a three-dimensional field in which science grades to metaphysics in the first and grades to technology in a second of three mutually perpendicular directions, and in which the third direction is a composite geographic one. The field of interest of the community which the Academy serves and represents is a force field whose intensity decreases asymptotically toward zero in all directions in this field.

If this concept is essentially correct, it is futile to argue about the limiting criteria of Academy membership eligibility, or the exact measure of scientific content that an Academy program must have, but it remains important to keep the scientific as well as the geographic criteria in mind in weighing the intensity

of membership proselytization and in budgeting the energy devoted to various elements of the program. Otherwise, the Academy might conceivably lose the very competence that makes its participation in the kind of enterprises I have named worthwhile, or might find itself spreading over programs that other agencies are better qualified to undertake.

With this background, the logical continuation and extension of the Academy program may be projected, at least in the broad outlines and at least for a limited future.

The regular sessions of papers presented by members primarily for the benefit of other members must remain the essential heart of the Academy program, no matter how much else is added. These programs are what maintain the community of interest in the Hawaiian scientific community.

There is a continuing problem with the offering of specialized papers to the Academy. It is highly important for members to discuss their specialties with others not in their fields, but only if it is in language understood by the others. Program Committees in the past have met this problem either by ignoring it, by scheduling the specialized papers for presentation by title only, or by refusing to schedule them. None of these procedures can be as satisfactory as channeling such papers to the societies of more specialized interests. Unfortunately, as in Newcombe's day, there are still gaps in the array of these societies. For specialized papers in marine biology, for example, there is no place to go except to the Academy. The number of marine biologists is great, and sometimes, though certainly not always, the things they wish to say are understood only by other marine biologists. I have not infrequently wondered whether there was anything the Academy might do to encourage the establishment of an independent but associated society in this general field; and perhaps with a marine biologist as president, the next year might seem an appropriate one for exploration of the possibilities.

The continued publication of Proceedings also seems an essential. The printing of abstracts not only suitably records the substance of the communication at the meetings, but serves as feedback to stimulate the offering of other papers. There is a possibility, investigated in the past but not conclusively, that some of our Associated Societies that do not have publications of their own might be interested in having some record of their proceedings published with ours. There has also been thought given to fuller publication. So far, other outlets seem adequate for the full papers that deserve wide circulation. It might well, however, seem desirable to file full manuscripts of papers presented, so that copies could be made available on demand—a scheme seriously proposed as a substitute for journal publication in general.

We need no longer claim, as Newcombe did, that the Academy will refrain from the sponsorship of special public meetings for topics of general interest. Many scheduled in the past have been highly successful in public education and public relations, as well as in educating and entertaining our members. Here, again, our associates are important in providing speakers and topics, and in sharing with us the responsibility and honor of sponsorship.

Our large and growing program in science education has frequently been justified explicitly on the ground of the Academy's interest in the training of future scientists and, of course, implicitly on the assumption of the competence of the Hawaiian scientific community to judge what constitutes the proper training. This is a perfectly logical justification, but I think it is at least as important to promote the production of a future citizenry which understands more fully what science is, what it can and cannot do, and what it needs. From such a citizenry, the scientific profession will arise with greater spontaneity.

It would be hazardous indeed to predict the details of the future programs in the promotion of science education. To an extent which already makes an important dent in the scientific manpower, we are committed to several lines of attack, each of which has its own advantages. A very few of these may fail; some will run a useful course and peter out; most will, I believe, continue in one form or another. Some other lines of attack are already under study—scholarship assistance, counselling, and evaluation of teaching aids. Still others are suggested by successes experienced by other state academies—Junior Academies, Collegiate Academies. Nothing but additional careful consideration can determine which lines are expedient for us.

The Academy is likely to run into some limitations in the extension of its program in the near future. One possible limitation, of course, is financial, but I am inclined to discount this likelihood. Another is the limitation of manpower, but if the cataloging of Academy membership that has been considered for several years is accomplished, I am inclined to think this may be postponed.

Still other limitations may be set by those inherent in the Academy's volunteer and amateur administration. For a time these can be by-passed by mechanization and office-splitting, but there is a limit to the amount of splitting that can efficiently be done.

If and when the limit is reached, there will have to be some soul-searching. Should the limit simply be accepted, or should the Academy turn to professional or semi-professional administration. If the latter, can the expenses be recovered by increased dues or by contributions, or should the Academy accept state aid as do several other academies?

I have at several points emphasized the importance of maintaining our scientific rather than technologic make-up and attitude. This is not because I do not regard technology as important, even as the principal activity of Academy members. But technology has its own supporters, and that most creative part of science which is not technology, that part which is most basically essential, may expect to find its most intelligent support almost exclusively from the scientific community.

I trust that from this scientific community will come the realization that though the major ills that

beset mankind are not in essence, perhaps, a matter of science, they are amenable to a great deal more scientific understanding, and thereby treatment, than is generally recognized. The due support of the social sciences is likely to come only with the expression of faith by the rest of the scientific community, that scientific methods have their place in the social field, expression through organizations such as the Academy.

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ANNUAL REPORT 1958-59

The Hawaiian Academy of Science ended its thirty-fourth year with a membership of 838. Thirteen persons were elected to membership during the year, while 61 were lost through nonpayment of dues and 21 resigned.

Sterling Wortman, Secretary

FINANCES

Balance on hand April 30, 1958		
Bank of Hawaii deposits	$ 410.59	
First Federal Savings & Loan	554.87	$ 965.46
Less checks outstanding		50.33
		$ 915.13
Receipts		
Dues	$1,336.00	
Annual Dinner—		
131 reservations	425.75	
Reprints sold	62.11	
Donations	5.48	
Dividends, First Federal Savings & Loan	19.56	1,848.90
		$2,764.03
Disbursements		
AAAS donation to operational fund	$ 16.00	
Annual Dinner—		
132 reservations	429.00	
Complimentary membership (15)	30.00	
HAS-Hawaii Division, 1956/57 & 1957/58	67.50	
Mailing operations	32.84	
Postage	213.94	
Printing of Proceedings 1957/58	475.07	
Printing of Programs (2 times)	76.26	
Projector service	10.00	
Reprints of abstracts of Proceedings	117.83	
Science Education Fund	200.00	
Science Fair project assistance	6.77	
Supplies	124.50	1,799.71
Balance March 31, 1959		$ 964.32
Balance on hand March 31, 1959		
Bank of Hawaii	$ 864.96	
Cash not deposited	6.00	
First Federal Savings & Loan	574.43	
	$1,445.39	
Less checks outstanding	481.07	$ 964.32

Status of Dues Payments:

	April, 1958	March, 1959
Advance	$370.00	$233.00
Arrears	377.00	367.00

Audited and found correct April 8, 1959.

/s/ W. M. Bush
/s/ Chester A. Wismer

SCIENCE EDUCATION FUND

Balance November 14, 1958 (Science Fair Fund)			$ 500.10
Receipts			
Alfred P. Sloan Foundation	$5,000.00		
McInerny	1,000.00		
Charles M. & Anna C. Cooke Trust	500.00		
Juliette M. Atherton Trust	500.00		
Contributions	2,375.00	9,375.00	
			$9,875.10
Disbursements			
Postage & supplies	$100.90		
Grant—Sister Mary St. Lawrence	100.00		
Science Fair			
Supplies	$59.25		
Awards	70.61		
Entry fee—10th National Science Fair	100.00		
Luau chairs & tables	165.60		
Insurance	87.50		
Miscellaneous	149.07	632.03	832.93
			$9,042.17

Eleanor S. Anderson, Treasurer

MEMBERSHIP

Over 20 prospective members were screened by the Membership Committee and recommendations were made to the Board. An attempt was made to acquaint delinquent members with the fact that they were in arrears in dues.

Notification of acceptance to membership was prepared by the Committee chairman for transmittal to new members.

Membership Committee

W. Harold Civin, Chairman

Amy Greenwell	Dorothy Wendt
Christopher Gregory	Edward Y. Hosaka
Richard K. C. Lee	Doak C. Cox, ex officio
Hugo Kortschak	Sterling Wortman, ex officio
H. Ivan Rainwater	

AFFILIATION

The Committee recommended that the application of the Hawaii Dietetic Association for affiliation with the Academy be approved. The Council subsequently passed favorably upon this recommendation, thereby adding one more affiliated society to the Academy.

The Committee recommended that a suitable award or awards be presented annually at the banquet of the Academy for outstanding contributions to the teaching of science in the secondary schools. It was further recommended that the mechanics of selecting the person or persons to whom the award would be made and its nature be determined by a suitable sub-

committee of the Inter-Society Science Education Committee.

The Committee, recognizing the need to contribute to events scheduled for the Year of the Aloha or Island State by scientific societies, has recommended that societies encourage scientific meetings in Hawaii during this period and that they disseminate information concerning the existence of unique opportunities for scientific work in many fields in Hawaii.

The Committee suggests that the Academy sponsor a television series on Hawaiian science through the use of suitable films and other materials available through members or through affiliated societies. Such a program would have, as a theme, scientific developments which were pioneered in Hawaii or in which Hawaii was a center.

Affiliation Committee

Vernon E. Brock, Chairman

John J. Naughton, Amer. Chem. Soc., Hawaii Sec.
Yoshinori Kanehiro, Amer. Soc. Agron., Hawaii Chap.
Richard Takasaki, Amer. Stat. Assoc., Hawaii Chap.
Saul Price, Geophys. Soc. Hawaii
Harold W. Civin, Hawaii Med. Assoc.
Leonard Diamond, Hawaii Psych. Assoc.
Charles F. Poole, Hawaii. Bot. Soc.
Wayne Boyle, Hawaii. Ent. Soc.
Willis A. Gortner, Soc. Sigma Xi, Hawaii Chap.
Robert Jay, Anthro. Soc. Hawaii
Kimiko Higa, Hawaii Diet. Assoc.

AAAS FELLOWS

The AAAS Fellows Committee nominated six members of the Academy and of the AAAS for elevation to Fellowship in the AAAS. Members and Fellows are designated by special symbols on the membership list in the Proceedings of the Academy. The individuals nominated were: H. L. Arnold, Sr., Albert H. Banner, John Digman, Jerry P. Eaton, Saul Price, Norman R. Sloan.

J. Linsley Gressitt, Chairman

H. L. Arnold, Jr. — Gordon A. Macdonald
Maxwell S. Doty — Toshiyuki Nishida

AAAS REPRESENTATION

The Academy was represented at the 1958 AAAS meeting, Washington, D. C., by Dr. Laurence Snyder, President of the University of Hawaii.

George O. Burr, Chairman

CONSERVATION COUNCIL FOR HAWAII

The senior representative attended six meetings of the Executive Committee on which she sat as treasurer as well. She also served on the Flora Committee.

The junior representative has written a letter to the Honorable Stanley Hara, Chairman of the House of Representatives Finance Committee, endorsing the plan to create a system of parks throughout the Territory. This was in the capacity of HAS representative to the Conservation Council.

An expanded report will be filed with the Secretary.

Beatrice H. Krauss,
Senior Representative
Doak C. Cox

INTER-SOCIETY SCIENCE EDUCATION

At a joint meeting of the Council of the Academy with the presiding officers of its ten associated societies, held on May 29, 1958, an Inter-Society Science Education Committee was established "to assure the holding of annual science fairs in Hawaii and to co-ordinate and undertake such other activities in the field of science education as the Academy and its associated societies might deem desirable." The following is an abbreviated report of the activities of ISSEC during the past year.

Organization. The initial ISSEC membership included one representative from each of the associated societies plus the chairman appointed by the Academy. The committee thus formed subsequently augmented its membership by adding representatives from the D.P.I., the private schools, the Engineering Association, and the armed forces. Subcommittees were appointed to undertake certain functions; the subcommittee chairmen were asked to serve also as ex officio members of ISSEC.

Meetings. Each of the subcommittees organized to undertake specific projects met at the call of its chairman. Monthly meetings of ISSEC were held throughout the year to consider the initiate projects, to review the status of projects under way, and to receive the progress reports of the subcommittee chairmen.

Activities. A mere enumeration of the activities undertaken by ISSEC must inevitably fall far short of doing justice to the effective and dedicated efforts of the chairmen and members of the various subcommittees by whom the work is being carried out. It is regrettable that the present report must confine itself to a brief mention of the projects under way.

1. Science Fair.

The Second Annual Hawaiian Science Fair was held at Fort deRussy on March 13 to 15. Attendance during the three days of the Fair is estimated at more than 15,000. The 147 exhibits were selected from some 3,000 projects undertaken by 5,000 secondary and high school students at 75 public and private schools throughout the Islands. The two finalists, Christiana Robbins and Jack Semura, will take their exhibits to the National Science Fair which is being held at Hartford, Connecticut, on May 6 to 9. They will be accompanied by Saul Price, Fair Director, and Mrs. H. Ivan Rainwater, Chairman of the Exhibits Committee.

2. Science Library Resources

This subcommittee arranged for the circulation of the 200-volume AAAS travelling High School Science Library among the Lanai, Molokai, Maui, and Lahainaluna high schools. Arrangements were also completed for two additional sets, one to be circulated among the smaller Catholic high schools, and the other among three high schools on Kauai. The set now on Maui will circulate next year among the high schools in rural Oahu.

The AAAS Travelling High School Science Library project is aimed at augmenting the limited library resources of the smaller schools, and at stimulating them to develop their own science libraries.

Annotated bibliographies listing selected science reference texts were distributed to all high schools, public and private.

The Travelling High School Science Library was displayed at the Second Annual Hawaiian Science Fair together with selected paperback editions furnished through the courtesy of Hawaiian Magazine Distributors.

3. Teachers' Science Seminars

This subcommittee organized two series of six lectures each, the first for elementary school teachers, the second for high school instructors. Attendance at the meetings ranged from 125 to 175.

An application submitted to the National Science Foundation for support next year to extend the program to rural Oahu and to the neighboring Islands has received favorable action.

4. Counseling and Scholarships

This subcommittee is in process of organization.

5. Science Teaching Aids

This subcommittee has assembled and circulated brochures and other pertinent material among interested high school teachers. It also organized a field trip for science teachers during the Easter holiday period.

6. Science Clubs

A questionnaire circulated by this subcommittee revealed that as of November, 1958, only 26 of the 64 schools reporting had, or were starting science clubs.

The subcommittee has formulated plans for a program to be called "Hawaiian Science Clubs Service" which contemplates a weekly television program as a medium of communication. The television program would show science films, report science club news, and provide talks and demonstrations by professional scientists.

The Science Clubs Service would also provide assistance to science club advisers, arrange for guest speakers and field trips, and advise on projects and experiments.

Support for the program is being sought from the National Foundation. Certain aspects will be carried out even in the absence of NSF support.

7. Budget Subcommittee

This subcommittee has approved the following budget estimates:

Science Fair	$5,700.00
Science Library Resources	200.00

8. Community Participation

This subcommittee has publicized ISSEC projects and objectives through editorials, radio talks, and letters to individuals and organizations. Through the cooperation of the Honolulu Academy of Arts the subcommittee also arranged for the preparation of a poster publicizing the Second Annual Hawaiian Science Fair.

The community is responding generously to the subcommittee's appeal for contributions in support of ISSEC projects. Local contributions as of April 6 amounted to $4,712.50, which together with $72.50 from AAAS and the $5,000 donation from the Alfred P. Sloan, Jr., Foundation bring the total contributions for the year to $9,785.

9. Student Science Seminars

This subcommittee has organized a series of eleven weekly evening seminars for a group of fifteen highly selected high school students. This limited program is in the nature of an exploratory effort, to be expanded as experience develops.

10. Legislation

This subcommittee was established in February to maintain contact with proposed legislation that might affect science and mathematics education, and to acquaint legislators with the science education objectives of the Academy and its associated societies. The subcommittee suggests that the best insurance of desirable legislative action will come from widespread public appreciation of the value of science education.

AAAS Grant. A small fund becomes available each year from AAAS for the support of science projects. The 1958 grant was awarded to Sister Mary St. Lawrence in support of her elementary science texts project. The AAAS contribution of $72.50 was increased by $27.50 from ISSEC funds to bring the total amount to $100.

National Science Foundation. The National Science Foundation has invited proposals from state Academies of Science requesting support of projects planned to improve the status of science and mathematics education in their respective areas. It is anticipated that most proposals under this program will fall under one of two headings.

1. Development of collaborative efforts by professional scientists and high school science teachers to improve science instruction;

2. Development of coordinated programs for stimulating interest in science among young people, principally at the precollege level, and providing them with opportunities for science experience.

"Novel ideas designed to accomplish the objectives indicated above are encouraged so long as they reflect the general spirit of the program outlined above."

In response to this invitation the following proposals have been submitted to NSF.

1. Preparation under the guidance of Sister Mary St. Lawrence of a series of elementary science texts entitled "Exploring Nature in Hawaii." This series, which is already well under way, would involve the cooperation of the University of Hawaii Press and the Catholic School Department.

2. Preparation of a series of teaching aids in science for elementary and secondary schools under the title "Museums in Miniature." This project would involve the cooperation of Dr. Alexander Spoehr, the Bishop Museum Association, and the Academy through ISSEC.

3. Organization of a Science Clubs Service (described above) under the direction of Dr. Donald McGuire with the cooperation of the University of Hawaii.

4. Expansion of the Students' Science Seminar program (described above) under the direction of Dr. Albert Carr.

5. Expansion of the Teachers' Science Seminar program (described above) under the direction of Dr. Sterling Wortman.

Notification has been received from NSF of its approval of the Teachers' Science Seminar program. The other four proposals are still under consideration.

The Future. The magnitude of the contribution that the Fiftieth State will be able to make toward enhancing the strength and well-being of the nation will depend in large measure upon its efficacy in developing its most valuable resource, namely, the intellectual endowment of its youth. While the strengthening of science education is but one facet of the over-all problem, it is one of growing importance.

The magnitude of the contribution that ISSEC can make toward the furtherance of science education will continue to depend in large measure upon the extent of interest among the Academy membership and the membership of the Associated Societies, and upon the willingness of each of us to participate in the tasks which we, as members, have assigned to ISSEC.

A. J. Mangelsdorf, Chairman

INTER-SCIENCE EDUCATION COMMITTEE

Amer. Chem. Soc., Hawaii Sec., L. J. Rhodes, J. H. Payne (alternate)
Amer. Soc. Agron., Hawaii Sec., Edward J. Britten, Wallace E. Holmes (alternate)
Amer. Stat. Soc., Hawaii Sec., Gordon Frazier, Richard Takasaki (alternate)
Anthro. Soc. Hawaii, Dorothy Rainwater
Geophys. Soc. Hawaii, Saul Price, Thomas Austin (alternate)
Hawaii Med. Assoc., Harold Civin
Hawaii Psych. Assoc., Leonard Diamond, Edgar Vinacke (alternate)
Hawaii. Acad. Sci., A. J. Mangelsdorf
Hawaii. Bot. Soc., Gerald Dull
Hawaii. Ent. Soc., Wallace C. Mitchell
Soc. Sigma Xi, Hawaii Chap., John H. Payne

Subcommittee Chairmen and Associate Members, ISSEC

Saul Price, Science Fair Director
H. Wayne Hilton, Associate Director
Robert Clopton, Chairman, Science Library Resources Subcommittee
Sterling Wortman, Chairman, Teachers' Science Seminar Series
Shosuke Goto, Chairman, Counseling and Scholarships Subcommittee
Y. Baron Goto, Chairman, Subcommittee on Science Teaching Aids
Donald C. McGuire, Chairman, Subcommittee on Science Clubs
J. H. Payne, Chairman, Budget Subcommittee
Nils P. Larsen, Chairman, Community Participation Subcommittee
Albert B. Carr, Chairman, Student Science Seminars Subcommittee
Wilfred Greenwell, Chairman, Legislation Subcommittee
Kenneth Chapson, Engineering Association of Hawaii
Teruo Masatsugu, Department of Public Instruction
John J. Naughton, University of Hawaii
Col. Carl K. Warren, Jr., Lt. Col. Travis A. Gerrells (alternate), Armed Forces Representative
Doak C. Cox
Ralph Heinicke
E. H. Bryan
Mrs. H. Ivan Rainwater, Secretary

PROGRAM

The Thirty-fourth Annual Meeting of the Academy was programmed in two sessions, the first time being held November 25-26, 1958, and the second April 23-25, 1959. Sixteen professional papers were presented in the first session, thirteen in the latter. In addition, for the first time, two outstanding scientific papers written by high school students were presented in the spring session. Another innovation was the serving of refreshments at intermission time for both sessions. The Annual Banquet was held April 25 in the Gold Room, Hawaiian Village Hotel, with Governor William F. Quinn and Dr. Charles E. Kellogg as special guests.

Two special sessions were presented involving reports by scientists of the Russian scientific ship, "Vitjaz," and an address by Dr. H. Kihara, eminent scientist from Japan.

The Academy also cooperated with the Anthropological Society in presenting Dr. Samuel Elbert and with the Geophysics Institute in presenting Dr. Seth Nicholson.

Jimmie B. Smith, Chairman

Agatin Abbott	Garth Murphy
Leonard Mason	Thomas Austin
Alfred Hartwell	Doak Cox (ex officio)
Shosuke Goto	Sterling Wortman (ex officio)

NOMINATIONS

The Committee submitted the following recommendations for the year 1959-1960: President-elect, Dr. Fred I. Gilbert and Miss Beatrice Krauss; Councilor, Gordon Macdonald and Kenichi Watanabe; Secretary, Sterling Wortman; Treasurer, Mrs. Eleanor Anderson.

Andrew W. Lind, Chairman

Harry Arnold, Jr.	Robert W. Hiatt
Willis Gortner	Beatrice H. Krauss

HAWAII DIVISION

The Hawaii Division held one meeting in Hilo and one in Kealakekua since the last report. It has not proved feasible to hold an election of officers, so the present officers will continue to serve until further notice. The Hawaii Division is represented on the Planning Committee of the newly formed Community Program for Arts and Sciences by its Chairman, John A. Easley, Jr., and by an appointed representative, James Noda. Mr. Noda served as chairman for the Big Island Science Fair, which was jointly sponsored by the Hawaii Division and the CPAS.

John A. Easley, Jr., Chairman
Chester Wentworth, Council Representative

THE 34th ANNUAL MEETING 1958-59

Program

SPECIAL SESSION I

September 25, 1958, Experiment Station, HSPA, Honolulu

H. Kihara: On the Origin of Common Wheat

FIRST SESSION

November 25, 1958, Experiment Station, HSPA, Honolulu

1. Sea Weed Dermatitis Apparently Caused by a Marine Alga
   Harry L. Arnold, Jr.: Clinical Observations
   Franklin Grauer: Clinical Investigative Procedures
   George Chu: Laboratory Observations
2. Albert H. Banner: Preliminary Observations on Toxic Fish
3. Maxwell S. Doty: Phytoplankton Photosynthetic Periodicity as a Function of Latitude
4. Donald W. Strasburg: Underwater Observations on the Behavior of Hawaiian Tuna
5. Thomas W. Austin: Secular Warming in Sea Surface Temperatures, Equatorial Pacific, 1955-58
6. Philip Helfrich: Observations on the Reproductive Behavior of the Maomao, an Hawaiian Damsel Fish
7. P. B. van Weel: The Effect of Special Diets on the Utilization of the Food by the African Giant Snail*

November 26, 1958, Experiment Station, HSPA, Honolulu

8. Abe Arkoff: Personality Patterns in Several Generations of Japanese Americans
9. John Digman: A Reappraisal of the Ebbinghaus Curve of Retention
10. Leonard Diamond: A Theory of Visual Facilitation
11. Leonard Mason: Space, the Scarce Commodity in Atoll Living
12. Richard T. Wootton: Origins of American Scientists by States of Birth: Relevance to Scientist Production
13. A. H. Lange: Studies of Factors Affecting the Floral Development of *Carica papaya* L.
14. Walter S. Lang: Satellite Tracking at the Haleakala Observatory
15. Walter R. Steiger and Harold Krivoy: Some Ionospheric Phenomena Associated with Nuclear Explosions
16. Gladys S. King: Correlative Phenomena with Auxin and Adenine Sulfate Demonstrated by Simple Tests with Etiolated Pea Seedlings

* Presented by title only.

SPECIAL SESSION II

Sponsored jointly with the Hawaii Chapter, Society of Sigma Xi

February 5, 1959, University of Hawaii

Zinaida Filatova: Exploration of the Pacific Ocean and Its Deep-Sea Fauna by the "Vitjaz"

FINAL SESSION

April 23, 1959, Experiment Station, HSPA, Honolulu

1. Robert Hiatt: Report on Upcoming Pacific Science Congress
2. Marshall Eto: Corrosion Studies (High School Paper)
3. Haruyoshi Ikawa and G. Donald Sherman: The Gibbsite Concretions of Cape York, Australia
4. Donald H. Smith: Volatilization Losses of Soil and Fertilizer Nitrogen
5. William J. Holmes: The Battle Against Blindness in Asia
6. E. J. Britten: Genetic-Environmental Control of Flowering in *Trifolium repens*
7. Estel Cobb, K. K. Otagaki, and I. I. Iwanaga: Relationship Between Slaughter Weight and Carcass Characteristics in Swine
8. Albert B. Carr, Jr.: Air Pollution: An Educational Problem

April 24, 1959, Experiment Station, HSPA, Honolulu

9. Jack Semura: One Phase of Liesegang Ring Research (High School Paper)
10. Saul Price: Observations of Surface Ozone at the Mauna Loa Observatory
11. Della F. Reid, Sidney J. Townsley, and Winifred T. Ego: Uptake of Sr^{85} and Ca^{45} Through the Epithelia of Fresh-Water and Sea-Water Adapted *Tilapia mossambica*
12. Vernon E. Brock and Robert H. Riffenburgh: Fish Schooling: A Possible Factor in Reducing Predation
13. Robert E. Grinder: A Report on the Development of Conscience in 140 Sixth-grade Children
14. Robert Kiessling and Richard A. Kalish: Leaderless Group Discussion as a Selection Technique
15. Caroline F. Will and Arthur A. Dole: A Survey of Freshman Values and Educational Choices I.
16. David H. Crowell: Neonatal Maturity and Responsiveness
17. Bernard I. Bloom and Abe Arkoff: On the Ability of Schizophrenics to Play "Normal"*

* Presented by title only.

April 25, 1959, Gold Room, Hawaiian Village

Banquet

18. Charles E. Kellogg: Soils and the Food Problem

Introduction of New Officers

Presidential Address

Doak C. Cox: Field of the Hawaiian Academy of Science: A Triencentennial Review

HAWAII DIVISION

SPECIAL SESSION I

February 27, 1959, University of Hawaii, Hilo Campus

Seth B. Nicholson: Where Do We Live?

SPECIAL SESSION I-A

February 28, 1959, Konawaena High School

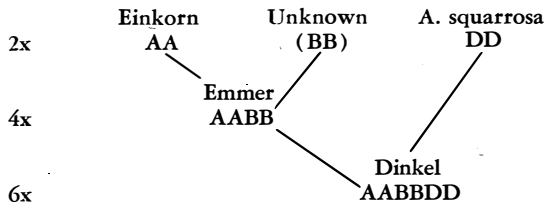
Seth B. Nicholson: Where Do We Live?

Abstracts

SPECIAL SESSION I

On the Origin of Common Wheat

The genealogical relationship of wheats and the related genus *Aegilops* is given in the following diagram.



This relationship was established by morphological and genomeanalytical investigations. Its final evidence was obtained by the synthesis of 6x-wheat by means of hybridization between its two ancestors. The artificial 6x-wheat was crossed with natural 6x-wheat and the F_1 was proved to have normal chromosome conjugation and also to be normal in seed- and pollen-fertility.

It is beyond doubt that our common wheat was originated from a hybrid between tetraploid wheat and a wild grass, *Aegilops squarrosa.* As to the tetraploid parent, there is a wide choice among wild and cultivated varieties.

If we assume that 6x-wheat was once originated from a cross between a wild growing 4x species of wheat and *A. squarrosa,* then we must further assume that wild 6x-wheats should be found, most probably in Armenia, Syria, and western Iran. They were not yet discovered, or have become extinct. Both assumptions seem to be scarcely plausible in my opinion. Evidences so far obtained are in accord with our tentative hypothesis that 6x-wheat arose as the result of hybridization between cultivated 4x-wheat and *A. squarrosa.*

From the information obtained by many other geneticists and also from our own experiences, 6x-wheat should be included in a collective species, *T. aestivum.* Accordingly, five species of *Triticum,* namely *vulgare, compactum, spelta, macha,* and *sphaerococcum,* should be treated as five respective subspecies of *T. aestivum.*

Among these five subspecies we know that four, except *T. sphaerococcum,* are found in Transcaucasus, including Armenia, Azerbaijan, and adjacent regions of Iran. *T. macha* or a species similar to *T. macha* seems to the progenitor of all 6x-wheats.

The supposed progenitor of 6x-wheat, which arose by hybridization most probably in Armenia, Azerbaijan, and adjacent regions, might have had two dominant genes, S and C, if we only take ear forms into consideration. Then two types, *spelta* (*SScc*) and *compactum* (*ssCC*), would be each separated only by one gene difference from this progenitor. Hybridization between these two would produce *T. vulgare* (*sscc*). In this way 3 species of *Triticum* could have been obtained. The fourth, *T. sphaerococcum,* which differs from *T. vulgare* by one recessive gene, might have arisen in Pakistan.

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FIRST SESSION

1. Sea Weed Dermatitis Apparently Caused by a Marine Alga

Clinical Observations

Dermatitis (inflammation of skin) due to external causes is of two principal types: dermatitis venenata and dermatitis escharotica. Dermatitis venenata is caused by a wide variety of substances which have the ability to induce sensitivity in the skins of cer-

tain more or less specifically susceptible persons, and which, after having induced this susceptibility by one or more preliminary episodes of contact, produce an inflammatory reaction following each subsequent exposure. Dermatitis due to plants (aside from actual mechanical irritation due to fine hairs or spicules) is almost always of this variety.

Dermatitis escharotica, on the other hand, is caused by a wide variety of substances which have the capacity to irritate or injure the skin of all normal persons, not merely susceptible ones; and they require no prior episodes of contact in order to induce this effect. Concentration and duration of exposure are the only important limiting factors.

In the summer of 1958, cases came to the attention of many local physicians, including the author, of acute dermatitis of either the most dependent portion of the scrotum, or the perianal area, of persons who had very recently been swimming off the beaches of Laie, Kailua, or points between. The water had in each instance been turbid with finely broken up floating seaweed; burning sensations or itchiness had been noted within a few minutes to a few hours after leaving the water; and within 8 to 24 hours, redness, blisters, and open erosions (caused by breaking of blisters) appeared in the involved areas. Colonel Grauer at Tripler Hospital found fragments of a filamentous marine plant, a blue-green alga subsequently identified as *Lyngbya majuscula,* in the bathing garments of two patients so afflicted.

It seems probable that allowing *limu* to accumulate on the beaches, as has been done this year so extensively, results in its being washed back into the ocean, thus contaminating it with this alga.

It is noteworthy that although there are many well-known stinging animals in the ocean, skin irritation produced by marine plants has not, to my knowledge, been reported by any observer. Moreover, when any plant produces dermatitis by contact (without the agency of spines or spicules), it is usually dermatitis venenata rather than escharotica that is produced. The latex of *Euphorbia tirucalli* (pencil plant) is a notable exception.

Why so very widespread an alga as *Lyngbya majuscula* should suddenly produce so many cases of dermatitis in so limited an area remains unexplained.

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Clinical Investigative Procedures

Employing the patch test, one of us (F.H.G.) was the first to ever demonstrate that a marine, blue-green alga was the cause of this previously unreported contact dermatitis. This variety of alga subsequently was identified as *Lyngbya majuscula* Gomont by one of us (G.W.C.).

More than 40 volunteers were tested with over 75 patch tests. Of 29 tested with a pure culture of *Lyngbya,* all gave strongly positive vesicular reactions (4 plus) after 24 hours. Diatomes, a yellow and a brown alga from Kailua were excluded as a cause.

The reactions of 5 volunteers to *Lyngbya* were further studied with 22 serial patch tests, which were removed after 1, 2, 3, 4, 6, and 8 hours. The immediate reactions were read upon removal of the tests. It was observed that the longer the tests remained in contact with the skin, the more positive were the immediate reactions and the more intense the resultant inflammatory processes. With reference to delayed reactions, read approximately 24 hours after removal of the patches, it was observed that the reactions had increased in intensity during these 24 hours, even 1-hour applications becoming positive.

Soap and water bathing as a preventive measure was evaluated. The investigation described above was repeated in 5 additional subjects, the only difference being that each skin site upon removal of the patch was immediately cleansed. Delayed reactions in the cleansed group were compared with the uncleansed control group. These results suggested conclusively the value of bathing. Although the series were not large, they suggested that if washing is done up to 1 hour after contact, there is a good chance of avoiding the dermatitis entirely; if performed sometime after 1 hour but within 3 hours after exposure, bathing will decrease appreciably the severity of the symptoms, but if it is not done until 3 hours or longer after exposure, bathing probably will be of little value.

In 8 subjects small segments of skin from positive patch test sites were removed for histopathologic examination. The patches were allowed to remain on the skin for approximately 24 hours in 4 cases, 6 hours in 2, 2 hours in 1, and 1 hour in 1. All biopsies were removed approximately 24 hours after application of the patches. Microscopic studies uniformly corroborated the clinical reactions and revealed findings of acute, vesicular dermatitis consistent with contact dermatitis.

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Laboratory Observations

On July 19, 1958, a strain of the common blue-green alga, *Lyngbya majuscula* Gomont, was collected from Kailua, Oahu, and proven by patch tests on man and guinea pigs to be very toxic. (The alga was identified by Benito Vergara and Jan Newhouse, both formerly of the Department of Botany, U. H.) This finding seemed to support the premise that toxic *L. majuscula* was the etiological agent for the epidemic of swimmer's itch that occurred in Kailua at that time. Although beach boys have recognized for some time a relationship between these hair-like algae and swimmer's itch, a blooming of this species of alga during and after a storm in July led to an epidemic of dermatitis (vesicular type) which

brought the relationship into sharper focus and to the attention of medical authorities. Further collections of toxic *L. majuscula* have been made at Kailua as recently as October 18th of this year.

Although Schwimmer and Schwimmer (1955, The Role of Algae and Plankton in Medicine) list several fresh-water and marine algae as causative agents of dermatitis in man, *L. majuscula* is believed to be unreported until now as a dermatonecrotic agent for man. However, Halstead *et al.* (1955, J. Wash. Acad. Sci. 45:101) have reported its toxicity for mice.

With reference to toxicity, the most striking fact is that not all strains of *L. majuscula* are toxic. Specimens collected from Waikiki, Hanauma Bay, and Waianae were not dermatitis-producing. Also, both toxic and nontoxic strains have been found at Kailua at various times. Thus far, morphological differentiation between strains has been observed, but no definite conclusion can be made. The toxic substance or substances associated with this species of alga are fairly stable in that after two months' culture of specimens in sea water the toxicity was unabated as shown by patch tests of man and guinea pigs. In addition, boiling for thirty minutes only mildly reduced the toxicity. Positive patch tests also were obtained with ground-up preparation of *L. majuscula.*

Since toxic bacteria have been found by Canadian workers as being partners of certain toxic fresh-water algae, the marine bacteria associated with *L. majuscula* are being investigated. The most predominant bacterium isolated has been a gram negative pigment-producing bacillus which forms a gel in algal extract broth after two weeks' incubation. However, preliminary studies indicated that it or its gel product was nontoxic by patch tests.

As long as the exact source of the toxic substance (or substances) and its chemical nature are unknown, the question of strain differences in *L. majuscula* remains a challenge in the field of medical microbiology.

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2. Preliminary Observations on Toxic Fish

Toxicities from eating tropical Pacific fish may be divided into several types, the most well-defined being known as puffer or *Tetraodon* poisoning, and *Ciguatera* poisoning. The latter type of toxicity has been subject to preliminary studies at the Hawaii Marine Laboratory. *Ciguatera* is a regional or geographic type of toxicity found most notably in the snappers (*Lutjanidae*), the groupers (*Serranidae*), and the ulua (*Carangidae*); these are esteemed as food fish in most areas, while in adjacent areas, perhaps only a few miles away, they may be found to be highly toxic. A person eating the toxic fish first shows gastrointestinal disturbances, followed by sensory aberrations and neuromuscular malfunction with locomotory paralysis; in extreme cases the poisoning may lead to coma and death. Preliminary investigations confirmed that some fish are lethally toxic; that the smaller specimens of one species from a particular area are less toxic than the larger specimens; and that the native accounts were correct in stating that the fish were regionally toxic. The majority of typical laboratory animals, like the rat, mouse, and chicken, did not respond when fed on toxic fish, but cats and mongooses exhibited symptoms similar to those in humans and would die when fed sufficient amounts of toxic fish. Preliminary chemical studies showed that the toxicity of the fish did not decrease when held for two years in cold storage, nor when heated to 105° C. for a day; that the toxin is not soluble in distilled water, but soluble in 90 per cent alcohol. Attempts to purify the toxin from the alcoholic solution lead to detoxification unless the procedure was carried out under a nitrogen atmosphere. After a separation of the alcoholic extract with diethyl or petrol ether under nitrogen the toxin was found in the fat solvent. Finally, the published technique for assay of the toxin, wherein an aqueous extract of the fish was injected intraperitoneally into mice, was found to be unreliable. Work continues at the laboratory on the chemistry and on the biological origin of the toxin.

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3. Phytoplankton Photosynthetic Periodicity as a Function of Latitude

It was found that the ability of oceanic phytoplankton populations to photosynthesize under uniform conditions of light varied with the time of the day when the measurement was made. Other workers, in seeking to substantiate this phenomenon, found the ratio between the maximum and minimum values to be less than those originally observed. These ratios reported by our colleagues and obtained more recently by ourselves were plotted as a function of latitude, for those obtained nearer the equator seemed progressively larger. In the plot made an inverse relationship was suggested by the distribution of the plotted points.

We explain this relationship at present on the assumption that the rhythmic variation is pulsed into the population by light variations in conjunction with the growth of the phytoplankters in the relatively fertilizer-poor oceanic medium. The regular pulsing effect of uniform day lengths near the equator could be expected to induce a more pronounced rhythm than the changes in day lengths of temperate regions or their lack during some parts of the year at more polar latitudes. This variation with latitude in pulsing by alternating periods of darkness and

light we postulate to be the cause of the variation in photosynthesizing ability, the magnitude of which is observed to be correlated with latitude.

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4. Underwater Observations on the Behavior of Hawaiian Tuna

The oceanic skipjack or aku (*Katsuwonus pelamis*) is subject to a considerable fishery in Hawaii, Japan, and the continental United States. Because this tuna is caught by chumming with live bait, and because bait is delicate and in short supply, the yield and profit of the fishery are not as great as warranted by world demands. The Pacific Oceanic Fishery Investigations is attempting to increase the efficiency, and hence the yield and profit, of live-bait fishing by studying skipjack behavior as it is related to several fishing variables.

This study has been conducted from the research vessel "Charles H. Gilbert," which is equipped with an underwater observation chamber. Through this chamber movies were taken of skipjack behavior under normal and experimental fishing conditions. As a supplement to the movies, comments of underwater and surface observers were recorded, along with recorded bell tones denoting catch rate. The observation chamber had three months of use during 1958, a poor year for the Hawaiian fishery, during which observational techniques were developed while experiments were conducted. The experimental results, although encouraging, are only tentative.

Several experiments involved the effects of variations in chumming on skipjack behavior. When live and dead nehu (*Stolephorus purpureus*) were chummed alternately, the use of dead bait resulted in skipjack decreasing their swimming speed and number of surface dashes, and also in falling so far astern that fishing ceased. When the rate of chumming was doubled, more nehu accumulated than could be eaten by a small tuna school, again causing the tuna to fall behind. This did not apply to large schools, for these consumed the bait as rapidly as it was thrown. With the chumming rate halved, the tuna slowed their swimming and tended to scatter, no doubt as a result of an insufficient feeding stimulus. When water sprays were turned on and off at intervals, the "off" condition resulted in speed-slackening, reduction in the number of surface dashes, and deeper swimming, again reflecting inadequate feeding stimulation. Experiments in which nehu were replaced by threadfin shad (*Dorosoma petenensis*) showed that a too-conspicuous or too-active bait also resulted in a reduced catch.

Four other experiments dealt with rather extrinsic fishing variables. Noise produced by hammering on the ship's hull had no effects on behavior, nor did blood sprayed in the water or allowed to drain from the deck. Skipjack skin extracts thought to contain fright-producing purines or pterines similarly produced no visible response. When red food coloring was sprayed into the sea in dense concentrations, skipjack avoided any deeply stained masses of water, suggesting that perhaps they can be corralled by walls of sufficiently dark dye.

As more is learned about bait-skipjack interactions it becomes easier to select better bait species and lures and to modify existing fishing practices. The results of such tests as the dye experiments may lead to entirely new fishing methods.

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5. Secular Warming in Sea Surface Temperatures, Equatorial Pacific, 1955-1958

During the months of November, 1955, through January, 1956, sea surface temperatures in the eastern and central equatorial Pacific were from 0.5 to 2.5° F. cooler than normal. Subsequently, mean monthly sea surface temperatures in these areas, although exhibiting comparatively normal seasonal variation, were increasingly warmer than normal. The upper limit of the trend was reached in January, 1958, when these temperatures in the eastern central equatorial Pacific were 4°–6° F. above normal. The trend, as measured at the Christmas Island station, then reversed and by August, 1958, the temperatures were approaching the normal. A comparable reversal was not as apparent in equatorial waters to the north and south of Christmas Island.

Daily temperatures from Christmas Island in the Line Islands group, and temperatures at frequent intervals measured by Matson vessels between Honolulu and Samoa and by POFI vessels in oceanic areas near the Marquesas Islands were the principal data used for the analyses. Consideration of similar data from the north central and northeastern Pacific indicates that the higher than normal temperatures observed in the eastern and central equatorial Pacific during 1957 and early 1958 were characteristic of a large segment of the Pacific Ocean.

Although available data are as yet inadequate to confirm the hypothesis, consideration of both the surface and the subsurface temperatures (to 900 feet below the surface) near the Christmas Island station and in the Marquesan waters suggests that the above-described higher than normal temperatures during 1957 and early 1958 resulted primarily from advection and not from localized heating.

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6. Observations on the Reproductive Behavior of the Maomao, a Hawaiian Damsel Fish

Observations on the reproductive behavior of a common Hawaiian Damsel fish, the "maomao" (*Abudefduf abdominalis*), were made in its natural habitat near Coconut Island, Kaneohe Bay, over a three year period. This investigation afforded an unusual opportunity to observe various aspects of the behavior of this species which appear to create a favorable environment for the early survival of the progeny.

The "maomao" spawns throughout the year, although reproductive activity is greatly increased during the spring and early summer. Mating is initiated by the male. He choses a suitable site on the substrate and establishes a territory in the surrounding area which he defends while preparing a "nest" for egg deposition. During this period of preparation, the male assumes a pale blue nuptial hue, which is in striking contrast to its normal brassy-green and black coloration. The male then attempts to attract a suitable female by executing a sequence of displays and maneuvers which include swimming in a characteristic zig-zag and looping manner. The male's courting maneuvers are coupled with territorial defensive activities and therefore often take on aggressive overtones. The male eventually orientates a suitable female, and she follows him to the "nest" where her final acceptance or rejection follows a rapid circular tail-on-tail chasing. When stimulated to spawn by the male's nudging, the female attaches her eggs to the prepared surface in a single layer by means of adhesive filaments and the male fertilizes them. After spawning, the female leaves the brood to the exclusive care of the male who fans them to insure proper aeration, picks out defective eggs, and defends the area against predators. The male guardian is able to distinguish obligate herbivors from other predators and usually allows them to swim through the territory undisturbed. Additional females may be attracted to spawn on the same site, and as many as five distinct clutches of eggs have been observed in a single "nest."

Fanning of the eggs by the male steadily increases during the five-day incubation period coinciding with the increased oxygen requirements of the embryos.

Analysis of the "maomao" reproductive behavior reveals the following sequence of events required for successful mating: (a) mutual recognition of gravid male and female, (b) submission of the female to the male's overtures, (c) orientation of the female, (d) acceptance of the female by the male in the "nest."

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7. The Effect of Special Diets on the Utilization of the Food by the African Giant Snail*

Whether or not the African Giant Snail is able to change its digestive enzyme production according to the type of food on which it has to subsist has been investigated by Prosser and van Weel (Proc. Hawaii. Acad. Sci. 1957-58; Physiol. Zool., 1958. 31:171). Of more importance still is the resorption of the digested material, since digestion is only the first step. Experiments covering 7 weeks were performed to determine the utilization of the special foods, that is, the amount of food resorbed by the animals. For this purpose two groups of four snails each were fed for 7 weeks either with boiled potato or with horse meat. At the end of each week each group received a weighed amount of food. After 24 hours the faeces and not-devoured food were collected. The "starch faeces" were hydrolyzed and the amount of reducing substances determined as mg. glucose with Schoorl's sugar titration. The Kjeldahl-N content of the "protein faeces" was also determined. The same determinations of samples of boiled potato and meat made it possible to compute the "glucose"- and N-content of the food given and by subtracting the first value from the latter, the utilization was found. This was expressed in per cent of the food offered. The results were:

	1	2	3	4	5	6	7	weeks
utilization of protein in %	80	79	76	51	76	61	65	
utilization of starch in %	80	86	84	52	37	37	44	

From these experiments the conclusion can be drawn that particularly the snails on a starch diet show an appreciable decrease in utilization after 3-4 weeks. Although nothing is known of nutrient requirements, other than "food" (like for instance certain vitamins, etc.), the data do suggest that a certain deficiency of some specific dietary requirement seems to play a role, particularly in the starch-fed animals.

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8. Personality Patterns in Several Generations of Japanese Americans

The purpose of this investigation was to measure personality patterns in several generations of Japanese Americans and compare the generations with each other and with a mainland normative population. The subjects were 320 University of Hawaii students who were of Japanese ancestry; of these

* Presented by title only.

135 were second generation and 185 were third generation Americans. The research instrument was the Edwards Personal Preference Schedule whose normative sample consists of approximately fifteen hundred mainland college students and whose results are reported in terms of fifteen personality needs: abasement, achievement, affiliation, aggression, autonomy, change, deference, dominance, endurance, exhibition, heterosexuality, intraception, nurturance, order, and succorance.

The results showed that the Japanese American group, considered as a whole, is considerably different from the mainland sample in its personality pattern. In general, the Japanese American group appears to have higher need for abasement, change, deference, order, and nurturance and lower need for achievement, dominance, exhibition, and heterosexuality. Few of the differences between the two generations of Japanese Americans achieved statistical significance, but consistency in the patterning of these differences suggests the possibility of several sorts of systematic change within this group:

(1) Some personality needs (abasement, affiliation, deference, endurance, intraception, nurturance) are more highly expressed by the Japanese American group than by the mainland sample, but within the local group less highly expressed by the third generation than by the second, perhaps indicating *movement down toward mainland norms.*

(2) Some personality needs (achievement, dominance, exhibition) are less highly expressed by the Japanese American group than by the mainland sample, but within the local group more highly expressed by the third generation than by the second, perhaps indicating *movement up toward mainland norms.*

(3) One personality need (change) is more highly expressed by the Japanese American group than by the mainland sample, and within the local group more highly expressed by the third generation than by the second, perhaps indicating *movement up away from mainland norms.*

(4) One personality need (autonomy) is less highly expressed by the Japanese American group than by the mainland sample, and within the local group less highly expressed by the third generation than by the second, perhaps indicating *movement down away from mainland norms.*

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9. A Reappraisal of the Ebbinghaus Curve of Retention

Since the pioneer work of Ebbinghaus on retention, it has been generally assumed by psychologists that his results were essentially correct, and constituted a reasonable approximation to "the" curve of retention. This view was reinforced by the careful research of such people as Luh, Krueger, and Jenkins and Dallenbach. Recently, Underwood has questioned the validity of all the classical studies of retention. He believes that a major methodological error of these studies was the use of subjects who had previously participated in a large number of similar studies, and that a large source of forgetting observed by Ebbinghaus and by those who repeated his work can be attributed to interference tendencies associated with this prior learning. Some recent studies suggest that forgetting is much less rapid during the first 24 hours than has been believed, perhaps 25 per cent rather than the 65 per cent forgetting obtained by Ebbinghaus. Apparently, far from having a basic psychological function adequately described, present-day psychology lacks an answer to the question: What is the course of retention as a function of time? The study which is reported represents an effort to obtain part of the answer to this question.

Fifty-seven student subjects, none of whom had participated in a similar experiment before, learned a list of 10 nonsense syllables, presented serially with a three-second interval between syllables. Learning was brought to the criterion of one perfect trial. Subjects were then divided into three retention groups and tested after one, two, and seven days. Two measures of retention were obtained: recall (number of correct responses on first test trial) and relearning (percentage of trials saved in relearning list to original criterion).

The results for the three retention conditions were: one-day interval, 69 per cent recall and 74 per cent relearning; two-day interval, 72 per cent and 75 per cent; seven-day interval, 45 per cent and 62 per cent. Because of the small samples used, the slight rise at the two-day point is doubtless due to chance.

The data suggest that Underwood's criticisms are probably valid, but that the forgetting process slows down after the first 24 hours. Since this latter effect was observed by Ebbinghaus, one may conclude that the present results differ from the classical studies in only one respect: forgetting during the first 24 hours is much less rapid than has been believed. Beyond that point the rate of forgetting reported by Ebbinghaus may be correct.

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10. A Theory of Visual Facilitation

There are two phenomena in visual perception both of which illustrate what we mean by facilitation. The first, which we might call contrast facilitation, involves two fields: a test circle upon which we discriminate brightness and brightness changes, and an inducing surround which concentrically surrounds the test circle. We find that facilitation in this situation occurs under a specific condition of luminances. That is, when the inducing surround is of a slightly lower luminance than that of the test circle, the test

circle appears "subjectively" brighter than it would if there were no inducing surround there at all, even though the test "physical" luminance has not been changed.

A second situation in which facilitation can be demonstrated involves only one field, the test circle, by itself. If we determine the threshold energy for the test circle; i.e., that light energy necessary just to see the test circle, as a function of the area of the test circle, we find that as the test circle increases from very small to some larger area, the energy necessary to see the circle decreases, or in other words, as the area of the test circle (the luminance of which is near threshold) increases, the brightness of the test circle increases. Here again, therefore, a manipulation of conditions facilitates the brightness of the test circle in the absence of a corresponding change in the luminance of the test circle.

The theory which attempts to explain these phenomena of facilitation is as follows: We know that in the retina, in the nonstimulated dark surround around the test area or around the inducing area, there are certain retinal elements that are discharging spontaneously. Further, we have evidence to support the notion that these spontaneously discharging elements are what are called "off" retinal elements; that is, these "off" elements discharge in the absence of light but are turned off when light hits them.

We know, further, that there is an antagonism between the "off" and the "on" fibers in the retina (the "on" fibers discharge when stimulated by light and do not discharge in the absence of light). This antagonism results in an inhibition of the activity of the "on" fibers while the "off" fibers are discharging. At this point, we have enough information about which to build our theory.

With respect to contrast facilitation our theory would state that when the inducing field is presented around the test field, it turns off the "off" elements immediately surrounding the test field, thereby releasing the "on" fibers within the test field from "off" fiber inhibition. (Since the inducing luminance is lower in this situation than test luminance, the "on" activity within the inducing field is not enough to disturb the activity in the test field.)

With respect to area threshold facilitation, our theory would state that as the test area increases from small to large, or as the borders of the test area extend outwards, it figuratively pushes away the effects of "off" spontaneous discharge. That is, as the test area grows in size, its light falls on more and more "off" retinal elements, thereby reducing more and more the inhibitive effectiveness of the "off" discharge field.

This theory adequately explains existing data that have to do with contrast and area-threshold facilitation. It also suggests further specific tests which are now in progress.

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11. Space, the Scarce Commodity in Atoll Living

A coral atoll, while endowed with almost unlimited space in the waters of lagoon, reef, and ocean, is characterized by critical shortages of land needed for house sites, food production, and relief from overcrowded living. In the Marshall Islands, Arno Atoll exemplifies this situation. Lagoon areas amount to 130 square miles but barely five square miles of land exist in the more than 100 named islands. In 1950 when the present study was conducted the atoll's population was about 1,000. In this paper two of Arno's 22 communities are examined as to the manner in which the problem of restricted space on land has been met.

Parenthetically, the Marshallese consider resources of lagoon, reef, and ocean to be sufficiently abundant that ownership or use rights have never been defined. Intense concern about land, however, is evidenced by the fact that every bit of every island, no matter how poor, is claimed by one or another family group, or lineage. Each landholding is commonly described as a shore-to-shore cross-section of an island, which in larger, wider islands provides all of the necessities of atoll subsistence.

In the hamlet of Jabu, one of five communities in the extremely narrow, 15-mile long island of Ine, the shore-to-shore distance is nowhere more than 350 yards. The population of 53, representing five corporate lineages, occupies landholdings in the wider, more favored parts of the island where breadfruit is easily grown. The less desirable, narrow parts of Jabu are also divided into parcels although productive only of coconut, pandanus, and such hardy plants. Individual lots, 36 in all, range from half an acre to more than six acres. The holdings of one prominent lineage amounts to 24 acres distributed in seven parcels between poorer and more productive areas of Jabu.

Greater wealth in space and land resources exists at Arno Island, the largest in the atoll. Actually 500 feet shorter than Jabu, Arno's width in places approaches half a mile, which means that soil and groundwater conditions are especially favorable for production of staples like taro and breadfruit. Residential units, representing some 31 lineages, extend from one end of the island to the other. Some of Arno's 63 landholdings are nearly as small as those on Jabu but others run as high as 18 acres in extent. One of the largest corporate properties consists of four such parcels which together equal 40 acres. The island's population in 1950 was 205, and estimated density of population was about the same as on Jabu.

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12. Origins of American Scientists by States of Birth: Relevance to Scientist Production

Using the 1938 edition of *American Men of Science* as a source, the late Dr. Edward L. Thorndike conducted a study of scientists by states of birth compared to the white populations of the states.

This study revealed an immense disparity between the states in per capita scientist production. The highest state (Utah) was 14.4 times as high as the lowest (Georgia). The highest state was 30 per cent beyond the second place state (Colorado).

Using the 1949 edition of *American Men of Science* as a source, the present writer did the same kind of study again to see what changes might have occurred in that decade during which the number of scientists listed grew from approximately 28,000 entries to approximately 50,000.

Again a great disparity between the states as scientist producers was revealed. However, the highest state (which was still Utah) was now only 11.7 times as high as the lowest (which was now Arkansas). The highest state was now 32 per cent beyond the second place (which was no longer Colorado but Idaho).

Several studies have been made which shed light on the factors which stimulate scientist production. None of these analyze the differences in scientist production between the various states of the union as a source of information on factors stimulating scientist production.

The present study is a preliminary analysis of what factors seem to be present in the top scientist producer (Utah) which are not present in the less productive states. Several factors seem to be eliminated as the main causative agents in Utah's lead by the fact that several other states not only have the individual factors to an approximately similar degree but even the admixtures of the factors to a similar degree.

No student has reported being able to associate any of the following with Utah's lead:

Higher inherited abilities in its population, climate, types of industry and employment, comparative average or total income, racial stock of its people, or national origins of its people.

Utah has been almost as distinctive for an excellent public school system as for production of scientists, being recognized as first in percentages of young people going to college and highest in average number of years education in its population. Yet its standing in education is not proportionately as far beyond other states as in scientist production.

A most clear and incontestable sociological difference between Utah and other states is the presence and influence of the Mormon Church in that particular state. A study among Utah-born scientists points to the philosophy and influence of the Mormon Church as a likely causative factor in high scientist production. Another study by a non-Mormon student (De Boer, Denver U.) credited Mormon influence with being largely responsible for Utah's high standing in education in general.

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13. Studies of Factors Affecting the Floral Development of *Carica papaya* L.

Many trees of the hermaphroditic form of Solo papaya are unstable, producing normal flowers most of the year but changing from season to season and occasionally changing sporadically from one flower type to another out of season. Flowers initiated during cool winter temperature are highly carpeloid (more female and less male parts) when they bloom. Flowers initiated during the high temperatures of summer often have abortive pistils or a greater ratio of male to female parts than normal when they bloom in the fall.

An early low-bearing type papaya treated at three months of age with 17 nights of 40°, 60°, and 80° F. temperatures produced flowers tending toward higher female development after cold nights and less female development after warm nights. Hermaphrodite plants growing in the field covered with a polyethylene tent (day temperature increased 10°–15° F.) produced flowers having fewer male and more female parts than normal one month after treatment.

These results support the tentative hypothesis that in the papaya plant there is produced a substance which increases during warm days and is reduced during warm nights but accumulates during cool nights (or wide diurnal fluctuation in temperature). A high level of this substance in the growing apex results in the development of more pistillate flower parts and a low level results in less pistillate and more staminate flower parts.

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14. Satellite Tracking at the Haleakala Observatory

With the anticipated launching of artificial earth satellites, it became necessary to find means of precisely obtaining positions of satellites while they are in orbit. Optical means are employed since electronic methods have not been developed sufficiently to obtain the accuracy required.

The Smithsonian Astrophysical Observatory has the responsibility of obtaining precise positions of all artificial earth satellites launched during the International Geophysical Year. A network of twelve tracking stations, using Baker-Nunn Satellite Tracking Cameras, located around the world between the north and south 30° parallels obtain photographs that make possible the positioning of a satellite in the most exacting manner known today.

As a service of the IGY Program, the data collected by the satellite tracking stations are made available to universities, institutions, and interested individuals upon request from the Smithsonian Astrophysical Observatory.

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15. Some Ionospheric Phenomena Associated with Nuclear Explosions

The United States Government exploded two nuclear devices from Johnston Island, about 700 miles to the southwest of Honolulu, on August 1, 1958, at 12:50 a.m. Hawaii time (1050 GMT), and on August 12, 1958, at 12:30 a.m. Hawaii time (1030 GMT). Both of these produced flashes clearly visible from Honolulu, the first being by far the more brilliant and spectacular. One would presume on the basis of the observed flashes, that the first explosion took place at a very high altitude, perhaps 80 miles or more, and the second at a considerably lower altitude. Both of these nuclear explosions produced disturbances in the earth's ionosphere which were observed both visually and instrumentally.

The ionosphere is a region of the earth's atmosphere, ranging from 60 to 200 miles above the surface of the earth, which plays a vital role in the production of the auroras, the magnetism of the earth, and in the transmission of radio waves over long distances. Observers from Mt. Haleakala on Maui, at an elevation of 10,000 ft., reported seeing a red cloud drift overhead from the direction of Johnston Island about a half hour after the explosion. This red cloud was undoubtedly an aurora-type phenomenon taking place in the ionosphere as a result of the energy released by the explosion. Only a very small and faint aurora was produced by the second explosion.

It is a common experience that solar disturbances often increase the ionization in the ionosphere so that radio signals are absorbed in the ionosphere instead of reflected in the normal manner. Such an effect produces what is called a radio fade-out. A very strong radio fade-out followed the first explosion immediately and lasted for several hours. After the second explosion there was no fade-out for almost 8 hours. But soon after 8 a.m. a very strong fade-out commenced and lasted until about noon, after which it gradually subsided. Attempts to relate these fade-outs to solar disturbances have not shown any known events on the sun that would normally be expected to produce a fade-out.

Geomagnetic disturbances are also known to be frequently produced by solar events such as flares. A large flare may emit great quantities of ultraviolet and even X radiation, as well as high energy particles. When the radiation is absorbed in the earth's atmosphere ionization is produced and a small fluctuation in the geomagnetic field often results. Sometime later when the particles arrive in the earth's atmosphere a fairly large and sudden disturbance may result. The magnetograms from the Honolulu Magnetic Observatory of the U. S. Coast and Geodetic Survey indicate a sudden but small disturbance at the precise time of each of the explosions. Ten to 15 minutes later a much larger disturbance occurs, reaches a maximum in another 10 to 15 minutes, and then returns to normal. We interpret the first small disturbance to be the result of the ultraviolet radiation emitted by the explosion, and the later and larger disturbance to the high energy particles produced by the explosion.

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16. Correlative Phenomena with Auxin and Adenine Sulfate Demonstrated by Simple Tests with Etiolated Pea Seedlings

There is now considerable evidence that plant hormones operate in various regulatory phenomena as participants in correlative reactions. One plant response so regulated is the formation and growth of organs. Initially the hormones participating with auxin in organ formation were given the general physiological name, calines. The calines were distinguished as caulocaline, phyllocaline, rhizocaline, and florigen according to their action in regulating the formation and growth of stems, leaves, roots, and flowers, respectively. It now appears that one compound, adenine sulfate, reacts with auxin in all of these processes and, in addition, regulates the formation of lateral branches.

These different responses to adenine sulfate, whether in controlling the growth and formation of organs or of lateral branches, are determined by its relative concentration in comparison with that of auxin. Low auxin (indole acetic acid) and high adenine sulfate results in accelerated stem growth as found here and by others. In this reaction adenine sulfate qualifies as caulocaline. As for phyllocaline activity, adenine sulfate presumably independent of auxin controls the growth of leaf mesophyll. In the initial work on this effect of adenine sulfate, mesophyll growth was found to be promoted by a diffusate prepared from peas. The active constituent was later identified as adenine sulfate. Veins and midribs are believed to be regulated in the same way as stem growth which at this time appears to be under joint control of auxin and adenine sulfate. The conjunctive role of auxin and adenine sulfate in the formation of roots and flowers has been shown, although more work is needed. Adenine sulfate in these cases reacts as rhizocaline and florigen, respectively.

These observations made by different investigators with various plant materials seem to fit together in support of adenine sulfate as a universal caline. Some recent studies employing etiolated pea seedlings

(Alaska) further substantiate this conclusion. A summary of this work follows (1AA—indole acetic acid; AS—adenine sulfate):

1. Seedlings which were treated with 40 ppm AS showed a marked increase in stem length in 14 days. Here AS appears to function with normally occurring auxin in stem growth, fulfilling the part of caulocaline.

2. Seedlings which were prepared as above, but treated in addition with 10 ppm 1AA applied apically, formed lateral branches. In this case the reaction of AS with high auxin in the formation of lateral branches is shown.

3. Seedlings of seeds which were soaked in 40 ppm AS for 5 hours before germination, formed lateral branches directly above the cotyledons within 8 days. It seems that in this treatment AS combined immediately with natural auxin present in the cotyledons to form lateral branches before any lessening of auxin content occurred through its utilization in stem growth.

4. Seedlings which were decapitated and given no additional treatment formed typical lateral buds. On the basis of auxin-adenine sulfate phenomena, this would be explainable as a reaction between increased auxin released at the site of lateral buds through loss of concentration gradient and normally occurring AS.

5. Decapitated seedlings which were treated with 40 ppm AS showed a growth rate of lateral branches far above those not receiving AS. Here again is illustrated the caulocaline effect of AS.

6. Decapitated seedlings which were treated over the cut surface with 100 ppm indole butyric acid in lanolin formed no lateral branches. This is the typical phenomenon of bud inhibition through apical dominance by auxin as it occurs concentrated terminally in stems of intact seedlings.

7. Decapitated seedlings which were treated with indole butyric acid as above, and in addition with 40 ppm AS, formed lateral branches. Here again is an experimental demonstration of reaction between AS and high auxin in the formation of lateral buds. In addition, the effect of AS in overcoming apical dominance is shown.

Appreciation is expressed to Francis S. Shibuya and Kenneth H. S. Kwak, Chaminade College of Honolulu students, who performed some of the tests described.

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SPECIAL SESSION II

EXPLORATION OF THE PACIFIC OCEAN AND ITS DEEP-SEA FAUNA BY THE "VITJAZ"

During the last 10 years complex oceanologic investigations have been carried out in the Pacific Ocean and its adjacent seas by the Institute of Oceanology from its ship the R/V "Vitjaz." This ship, which has a displacement of 5,600 tons, contains 13 laboratories with facilities for all kinds of oceanographic work and has living accommodations for 65 scientists and assistants besides the crew.

The "Vitjaz" has been engaged in 29 expeditions, 4 of these under the IGY program. More than 4,000 stations have been occupied, more than 600 during the IGY. On the fourth and final IGY cruise, 330 stations have been occupied in eight traverses totalling 24,000 nautical miles in length.

Hydrologic work has been directed to the study of the distribution, structure, origin, interaction, and transformation of water masses, and especially to the current systems of the northern and western Pacific and their boundaries. The chemistry of the water, the atmosphere, and the bottom sediments have been studied.

The geologic work has included echo-sounding recording of ocean-bottom relief and bottom sediment mapping by means of coring. A core of 34 m. length has been recovered. Special attention has been directed to the exploration of trenches. A new one has been discovered northwest of Fiji, and the greatest known ocean depth, 10,990 m., was located last year in the Marianas trench.

The biological work has included studies of the fish, plankton, and bottom fauna. Much attention has been given to the bottom fauna of the deep sea, and particularly of the trenches, in 10 of which bottom trawls were made. The deepest trawl was made in the Marianas trench at 10,710 m. The catch included actinians, polychaetes, crustaceans, and holothurians.

The deep-sea bottom fauna in the abyssal zone and particularly the ultra-abyssal zone (below 6,000 m.) is characterized by "primary deep-sea species," primitive in their organization and systematic position and accordingly considered older, but also includes "secondary deep-sea species," more progressive and with slight taxonomic self-dependency, perhaps migrants from lesser depths of the ocean. A new phylum of invertebrates, the Pagonophora, has been described from the abyssal zone.

In general the bottom-fauna biomass varies inversely with the depth. The deep-sea bottom-fauna biomass has been found to vary from values measured in g/m^2 in regions near continents or large islands to values of a much lower order of magnitude in mid-ocean areas. Particularly low bottom-fauna biomass values have been found in the central tropical Pacific, corresponding to a scanty plankton population there and in the northeastern region between California and Hawaii where large escarpments, a narrow shelf zone, and sparse outflow from shore provide only a small quantity of organic matter at the bottom.

The Pacific Ocean is vast and complex. Only by cooperative efforts of oceanographers from all of its bordering countries can its problems be studied successfully.

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FINAL SESSION

1. Report on Upcoming Pacific Science Congress

No abstract available.

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2. Corrosion Studies

Corrosion is a chemical change in which metal passes from the elementary to the combined state.

Metals are corroded by several different conditions. The most common, atmospheric corrosion, is affected chiefly by the amount of moisture present in the air. Here in Hawaii, however, the amount of sodium chloride present from ocean spray does the most damage.

To study the rates of corrosion of iron in different solutions, measured amounts of steel wool were moistened with water, sodium chloride, calcium chloride, cane sugar solution, glycerine, and acetic acid and thrust into separate glass tubes which had their open ends placed in water. Other tubes were filled with rusted steel wool and dry steel wool. Corrosion taking place in the tubes used up the captive oxygen present and caused water to rise up the tube. Hourly measurements of the water column showed the per cent of oxidation occurring. Although 100 per cent oxidation is theoretically possible, it was never achieved and readings up to 90 per cent were never consistent.

Galvanic corrosion was observed by dissolving agar-agar in water to form a gel and adding .1 molar solutions of potassium ferricyanide and phenolpthalein. By placing two metals of different reactivity in contact with each other in the solution, definite anodic and cathodic areas were observed. Anodic areas are blue and cathodic areas pink. This is effected by the action of the positive and negative ions on the potassium ferricyanide and phenolpthalein, respectively. Corrosion took place at the anodic areas only, and the amount of corrosion varied as to the difference of the colors of the anodic and cathodic areas.

Actual galvanic corrosion takes place only if current flows. An iron nail and a piece of magnesium foil were placed in contact in a table salt solution. After an hour, corrosion had eaten away the magnesium in many places and voltage had dwindled from 1.5 to .5 volts.

Final conclusions are: Water acts as a catalyst on corrosion. Electrolytes, acids, and alkalies also act as catalysts, but do most damage when hydrated. Nonelectrolytes retard corrosion. Different solutions cause different types and shades of rust. Rust acts on itself as a catalyst. 100 per cent oxidation does not occur. The oxidized material seldom removes more than 93 per cent of the oxygen from the air. Common methods of corrosion prevention are effective against most corrosives, but do not stop all types of corrosives. Corrosion takes place more readily at points of stress and strain.

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3. The Gibbsite Concretions of Cape York, Australia

A sample of gibbsite concretions from Weipa, Cape York, Australia, was obtained by G. Donald Sherman of the Department of Agronomy and Soil Science, University of Hawaii, during his trip to Australia in 1957.

The bauxite deposits occur in the low level coastal plains along the Gulf of Carpenteria of the upper portion of Cape York Peninsula. During the cyclonic storms of the monsoon season (December to February), this area is covered by the flood waters of numerous intermittent rivers and drainage systems to a distance of 10 miles inland. These cyclonic storms promote the floods through heavy precipitation and by the high waters in the Gulf of Carpenteria.

It was observed that some of these concretions were whitish on the outside, while others were more reddish-white. Upon splitting these concretions, it was further observed that they were either nonconcentric or concentric types.

No attempt was made to separate the different types of concretions. Instead, a representative sample was taken, and differential thermal and chemical analyses were made. The differential thermal analysis showed that the sample was predominantly gibbsite. The thermal curve showed a strong endothermic peak at 325° C. which is indicative of the mineral gibbsite. There were also small endothermic peaks at 105° C. and at about 525° and 550° C. The former is due to adsorbed water while the latter two may be due to the presence of boehmite and some kaolin-type mineral, respectively. The chemical analysis of the Australian sample showed 5.68 per cent SiO_2, 63.48 per cent Al_2O_3, 5.96 per cent Fe_2O_3, 2.32 per cent TiO_2, and 25.00 per cent loss on ignition. The pure mineral gibbsite contains 65.35 per cent Al_2O_3 and 34.65 per cent H_2O, while the mineral boehmite contains 84.97 per cent Al_2O_3 and 15.03 per cent H_2O. Because of the presence of only 25.00 per cent loss on ignition (the ignition of a sample at 800° C. to measure the expulsion of such constituents as CO_2 and H_2O) in the Australian sample, it is believed that this sample may contain some boehmite in addition to gibbsite.

Thin-section studies of several concretions were also made by Klaus W. Flach of the Soil Survey Laboratory of the Soil Conservation Service, U.S. Department of Agriculture at Beltsville, Maryland. Of six concretions studied, four of them showed well-organized concentric shells whereas two did not. The microstructure and the presence of rounded quartz grains in one of the latter suggest a fossiliferous sandstone in a relatively early stage of weathering. Aside from the inclusions of minute crystals in this concretion,

there are also many subrounded holes in the matrix which are either empty or filled with quartz. Some of the holes have well-developed gibbsite crystals, while others contain a mixture of quartz and gibbsite. The quartz grains are the only primary mineral observed, and it is believed that the replacement of these quartz grains by gibbsite may have been only one of the ways in which the concretions were formed. The thin skin of this concretion is an amorphous, dense, light gray material. The second concretion of this type is redder in color and in contrast to that just described does not have quartz grains or gibbsite.

The concretions with concentric shells have alternating layers of lighter and darker red opaque material which may be gibbsite and boehmite, respectively.

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4. Volatilization Losses of Soil and Fertilizer Nitrogen

In the past ten years four different research groups have reported significant deficits of nitrogen applied as fertilizer to soil, after cropping, leaching, and fixation losses had been taken into account. These deficits, presumed to represent volatilization losses, have varied with type of fertilizer applied, type of soil, and degree of soil acidity, and have amounted in some cases to 85 per cent of the fertilizer nitrogen applied. Such losses from aerobic acid systems are thought to result largely from reactions of the nitrite ion, which in acid medium may be decomposed or reduced to produce four gases: nitric oxide, nitrogen dioxide, nitrous oxide, and nitrogen. In the studies reported here, soils variously treated with nitrogen fertilizers or nitrite were incubated under a helium-oxygen atmosphere and the evolved nitrogen containing gases identified and measured on a gas chromatograph. The data showed little evidence for nitrogen losses as nitric oxide or nitrogen dioxide. Nitrous oxide was evolved in trace amounts from some soils, but not from others similarly treated. There was little indication that nitrite reacted with ammonia to form nitrogen gas, but there was strong evidence that nitrite was reduced to nitrogen gas by some component of the soil complex, probably of the soil organic matter.

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5. The Battle Against Blindness in Asia

Asian or preventable blindness has for centuries been linked to social and economic problems. Ignorance, apathy, poverty, and malnutrition are some of the primary causes.

The shortage and maldistribution of trained medical personnel, great distances to the nearest hospital, with poor transportation facilities further contribute to the high incidence of eye diseases and blindness.

Despite overwhelming odds, noteworthy forward strides have been made. These gains are due to modern medical discoveries, emphasis on health education, the collective efforts of physicians, universities, local, national, international, scientific, charitable and missionary, and governmental organizations. In addition to local governments, representatives of foreign governments have discovered that an effective way to win the friendship of people is to aid them in restoring their vision and health.

It is hoped that, in the future, improved means of communication and continued aid from Western countries will enable educators, public health officers, and eye surgeons in the underdeveloped areas of Asia to apply the medical discoveries made in the West.

It is also hoped that more attention will be paid to the prevention of blindness rather than caring for the blind. In the words of Helen Keller:

> "If a tenth of the money we now spend to support the unnecessary blindness were spent to prevent it, society would be the gainer in terms of cold economy, not to mention considerable happiness and humanity."

WILLIAM JOHN HOLMES
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6. Genetic-Environmental Control of Flowering in *Trifolium repens*

Trifolium repens occurs in Hawaii chiefly at elevations above 2,000 feet where it has been introduced from the temperate zone. Field collections of Hawaiian clones of *Trifolium repens* indicated wide differences due to genetic variation.

Most notable differences among clones grown at low altitude (Honolulu) were flowering potential. Clones were classified as flowering or nonflowering. Flowering clones exhibited a wide range of blossom production from sparse to profuse, indicating a precise genetic control of the flowering mechanism.

Experiments were conducted at four different elevations in order to determine differentials of reaction of genotypes to different environments. When grown at the high elevation station, all clones came into flower, regardless of their behavior at low elevation. Differences between clones attributable to genetic effects were manifest in degrees of flowering.

A second series of experiments was conducted with four of the clones used in the original studies. Plants were grown in cans to exclude contamination of clones. The cans were located at 2,000 and 6,700 feet. Similar results were obtained as in the field plots. All clones came into flower at the high elevation station but not at the 2,000 foot station.

A third series of experiments using controlled environment cabinets showed that when grown even at

sea level conditions of Honolulu, the "nonflowering clones" were induced to flower by treatment with low night temperatures. Crosses among flowering and "nonflowering" clones have been obtained for further genetic study.

Acknowledgement is made to D. M. Kinch, Hawaii Agricultural Experiment Station, for design of the controlled environment cabinets; to personnel of the Haleakala Branch Station and the Hawaii National Park, Haleakala Section, for obtaining certain data; and the Haleakala Ranch and Western Regional Technical Committee W-58 for facilities and support.

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7. Relationship Between Slaughter Weight and Carcass Characteristics in Swine

Fifty-six barrows of mixed breeding ranging in weight from 119 to 204 pounds were slaughtered to determine the relationship between slaughter weight and certain carcass characteristics. The barrows were started on feed at an average weight of 53.5 pounds and were hand-fed a high molasses ration until slaughter. A slaughter weight was randomly assigned to each animal at the beginning of the feeding period.

When the animals reached their pre-assigned slaughter weights, they were taken off feed and held 20 hours without feed and water and a shrunk live weight was obtained (slaughter weight). The hogs were dressed a modified shipper style and chilled 6-8 hours prior to cutting. Backfat measurements were taken opposite the first rib, last rib, and last lumbar vertebrae. The carcasses were cut mainland style. The yields of ham, loin, Boston butt, picnic, and belly were determined by expressing the weights of each of these cuts as a per cent of the carcass weight. In addition, per cent of lean cuts and per cent of primal cuts were calculated. Per cent of lean cuts refers to the combined yield of the ham, loin, Boston butt, and picnic. Per cent of primal cuts refers to the combined yield of the ham, loin, Boston butt, picnic, and belly as a per cent of the carcass weight.

The carcasses from the heavier hogs were fatter than those from the lightweight hogs as indicated by a thicker backfat, a lower per cent of lean cuts, a lower per cent of ham, a lower per cent of picnic, and a higher per cent of belly. The regressions of these traits on slaughter weight were all statistically significant.

Each 10-pound increase in slaughter weight was associated with a 0.15 percentage point decrease in per cent of ham, 0.09 percentage point decrease in per cent of picnic, 0.16 percentage point increase in per cent of belly, 0.35 percentage point decrease in per cent of lean cuts, and 0.045 inch increase in average backfat thickness. The regressions of per cent of loin, Boston butt, and primal cuts on slaughter weight were small and not statistically significant.

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8. Air Pollution: An Educational Problem

Air pollution affects all of us. It may either have a direct effect on our health or well-being, or may affect us indirectly. Air pollution control is expensive and this is reflected in our cost of living.

Many facets of the air pollution problem are thought of as being within the scope of what we refer to as "science." However, in our schools, teaching and learning activities are, for the most part, enclosed in neat little compartments. Few opportunities are provided for seeing relationships between the subject matter of science and human activities and problems.

Since air pollution is in many situations a serious community problem, our schools, as the primary agency in the community engaged in the process of education, ought to contribute in some way to the solution of the problem. By working along with other agencies in the community, the school can help young people and adults gain a better understanding of, and become better able to cope with, the variety of problems associated with air pollution.

Air has been thought of and referred to as an "inexhaustible and immutable" resource. Today we realize that air is not an immutable resource and perhaps sometime in the future we may be forced into realizing that it is not quite as inexhaustible as we would like to think.

The contaminants present in the atmosphere may be either gases or aerosols. The general methods used in removing gases from the atmosphere, either as part of a control program or for determination and measurement, are absorption, adsorption, condensation, and mechanical retention. In the removal of aerosols, sedimentation, impingement, filtration, centrifugation, and precipitation are the methods commonly used.

The effects of atmospheric contamination vary widely from situation to situation. The effects on human beings, plants, animals, structures, and materials must be examined in an adequate consideration of the problem.

The nuisance effects of air pollution on human beings are well known. Reduced visibility, eye irritation, nose and throat irritation, malodors, and the like do produce harmful psychological and sometimes physical effects in man. However, there is a lack of information about the effects of prolonged exposure to low-level concentrations of atmospheric contaminants.

The air pollution problem lends itself easily to the techniques of "scare journalism" and the efforts of ill-informed pressure groups. There is a great need for more research, especially in the area of the health effects of air pollution, and any attempts at inaugurating action or reform should be based on the best scientific information available.

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9. One Phase of Liesegang Ring Research

In 1896 the German photographer R. E. Liesegang observed that when an aqueous solution of silver nitrate was allowed to diffuse into a layer of gelatin gel containing a small amount of potassium chromate, periodic bands or rings of silver chromate formed as the silver nitrate spread outwards.

A plate on which rings have been formed shows, first, an area of continuous reaction (initial reaction area); then, second, alternate bands of precipitated silver chromate and gelatin; finally, on the outer edge of the precipitated bands, a hazy ring (called the outer diffusion area) can be seen.

The behavior and characteristics of Liesegang rings have been studied under various conditions by varying such factors as gel or gel electrolyte (potassium dichromate) concentrations, photographing them, and using the photographs as a basis for measurement and study.

Experimental Series I: Variation of diffusant ($AgNO_3$) concentration. Results: (a) The higher concentrations of silver nitrate were observed to diffuse faster than the lower concentrations; (b) the initial reaction area width increased rapidly as concentration increased, leveling off and decreasing slightly as the concentration approached 50 per cent; (c) the width of the outer diffusion area remained fairly constant as diffusant concentration varied; (d) the spaces between rings decreased as diffusant concentration increased.

Experimental Series II and III: Variation of gel and gel electrolyte ($K_2Cr_2O_7$) concentrations. Results: (a) Ring spacing increased as gel concentration decreased; (b) high gelatin concentrations produced better formed rings than low concentrations; (c) gel electrolyte concentrations above 1 per cent did not form rings.

Experimental Series IV: Microanalysis of banding. Results: (a) Precise microrings of a deep rose-red color formed extending outwards from the initial area of precipitation; (b) the numerous minute particles on the outer edge of the rings and the few large particles on the inside indicate that a ring is formed by precipitation beginning at its outer edge and moving inwards.

Experimental Series V: Periodic banding on smoked glass. Periodic banding is observed when oil is allowed to spread on smoked glass. This may be caused by either one or a combination of two things: (a) The instability and coagulation tendency of the sols of the elements, and (b) the electrodynamically induced charges that carbon smoke particles should gain as oil flows past them.

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10. Observations of Surface Ozone at Mauna Loa Observatory

Meteorologists and other geophysicists are interested in atmospheric ozone because of its contribution to the earth's heat balance and the atmosphere's physical structure, and as a tracer material for the large and small scale circulations of the atmosphere.

Observations of ozone at the U. S. Weather Bureau's 11,150-foot observatory on Mauna Loa began in 1957 as part of the IGY. Total atmospheric ozone is determined by a Dobson spectrophotometer and the ozone content of the ambient air by the quantitative liberation by ozone of iodine from potassium iodide. The chemical analysis is performed automatically by an ozone recorder recently developed by V. H. Regener, and produces a continuous trace of ozone concentration. Ozone is discriminated from other oxidants—a perennial problem in ozone analysis—by separating the incoming air into two branches, one of which is then heated to 300° C. to dissociate its ozone. Since heating does not affect the other oxidants, the difference between the reactivities of the heated and unheated samples is attributable to ozone.

Total and ambient ozone data are presently being studied for seasonal, diurnal, synoptic, and other variations. The two-month lag of surface behind total ozone apparent at Arosa, and often cited as evidence of the transport of air from the stratosphere to the lower atmosphere, is not found in the Mauna Loa observations. On the contrary, although obscured by breaks in the record, seasonal changes in surface ozone appear to precede by several months those in total ozone. Both surface and total ozone also fluctuate widely from day to day, although less in summer than at other seasons; but no obvious correlation exists between these variations.

The rapid destruction of ozone in the lower atmosphere by catalysis and oxidation processes requires discussing its short-term variations in terms of the observing site's topography and the other physical features which govern local air motions and, hence, ozone destruction rates. Daily radiative heating and cooling of Mauna Loa (which has more than 128 square miles of dark lava surface above 10,000 feet) generate upslope and downslope currents along the mountain's flanks. These, in turn, give rise to characteristic diurnal shifts in wind direction and the other weather elements and usually, although not invariably, to peak values of ozone at night and minima during the day. This daily course of surface ozone is unlike what is observed at other mountain stations

where interchange of air with the surrounding free atmosphere is sufficient to keep ozone values relatively stable.

Whether the daytime decline in ozone represents its destruction by vegetation, aerosols, and water droplets during the ascent of air from lower levels, or simply the expected vertical gradient of ozone, can be determined only from further observations; it is planned to make these in the free atmosphere and along the mountain slopes as suitable instruments become available.

It is hoped that comparison of surface and total ozone values at Mauna Loa with one another and with similar observations made elsewhere will contribute to our understanding of the general circulation of the atmosphere and of local air movements in the vicinity of Mauna Loa.

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11. Uptake of Sr^{85} and Ca^{45} Through Epithelia of Fresh-Water and Sea-Water Adapted *Tilapia mossambica*

The electrolyte concentration in the body fluids of teleost fish falls between that of fresh water and sea water. Such fish living in either medium are faced with the problem of maintaining their internal medium at a relatively constant level. When fish migrate in either direction from water of one salinity to another, they must adjust their hydromineral regulation accordingly.

In order to obtain an insight into how fish accomplish this task, it is necessary to isolate experimentally the various surfaces of exchange and means of excretion of both water and ions.

To achieve this, a compartmentalized tank has been constructed which enables us to separate all epithelia exposed to environmental water except those of the gills, mouth, and head. Further separation of ion and water transfer routes is achieved by esophageal ligation and anal and urinary papillae cannulation.

In a series of experiments, using the euryhaline cichlid, *Tilapia mossambica,* the rate of movement of Ca^{45} and Sr^{85} through various epithelia has been measured. We have found that the skin of the body of *Tilapia* is only slightly less permeable than that of the gills. The rate of movement of calcium and strontium in fresh-water adapted *Tilapia* is about one third the rate of transfer of the same ions when the fish are adapted to sea water.

The urine excreted by the fresh-water adapted individuals contains less calcium and strontium than is contained in their blood; whereas the calcium and strontium in the urine excreted by the salt-water adapted fish is the same as the concentration in the blood.

When these fish are transferred from fresh water to sea water, the rate of excretion of urine falls from an average of 12 ml. per twenty-four hours to about 3 ml. for the same period. However, the fish in fresh water swallow almost no water; whereas they swallow as much as 15 ml. for the same period when placed in sea water.

These results prove the value of the technique and indicate that we will be able to formulate a valid picture of the hydromineral regulation in *Tilapia* when we have studied the several ions contained in their environment.

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12. Fish Schooling: A Possible Factor in Reducing Predation

This paper considers the possibility that fish schooling is a mechanism for protection against predation. There are two factors operating at cross-purposes: Regarding a single fish as a group of size one, schooling (a) reduces the number of groups and consequently the chance of detection, and (b) increases the size of groups, thus increasing the chance of detection. A third factor which may give an advantage to schooling is the limitation of capacity of the predator.

An expression is developed for the probabilities that a predator sights (and therefore eats) a nonschooled forage fish and a schooled forage fish. From these probabilities, an expression is found for the expected number of forage eaten when they school and when they do not school. Other things being equal, if the expected number of schooled forage eaten is less than the expected number of nonschooled forage eaten, then schooling is advantageous to the forage.

Since the number of forage a predator can eat is never more than the number present but may be less, the formulae can be simplified somewhat, leaving the advantage or disadvantage to forage through schooling as an inequality of probabilities. The probability distributions of the variates are found so that the probabilities in the inequality may be evaluated; such probabilities depend on four constants: average distance between predator and forage, standard deviation of this distance, sight range of the predator, and a size measure of a school of forage.

It is shown that for any reasonable values of these constants, the probability of detecting any particular forage fish is approximately the same whether it is schooled or not so that the meaningful consideration in the number of forage eaten when schooled vs. when not schooled is the reduced frequency of the predator's encounter with schooled forage. For example, if the predator meets 70 forage a week and can hold 10 at one feeding, he eats optimally if he finds 10 nonschooled forage a day; however, he may starve if he finds one school of 70 in the week, at which time he can hold only 10. Thus the meaningful fac-

tors in schooling advantage are (1) predator capacity, (2) the period of association of predator and school, and (3) school size. It is shown that as the number of forage fish in a school increase (total forage held constant), the consumption rate of forage by the predator will decrease.

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13. A Report on the Development of Conscience in 140 Sixth-Grade Children

In the early socialization of a child, conformity to social rules is achieved solely by the development of fear of external punishment. Later a more complicated process occurs, the origin of which, Freud traces to a process which he calls identification. Through identification a child learns to accept the parents' standards of conduct as his own. The term conscience is applied to this kind of inner control, which can be recognized in a child by two behavioral characteristics: (a) the maintenance of self-control in the face of temptation, and (b) occurrence of guilt feelings after transgression of a standard of conduct.

The present study employed the concept of identification as an intervening variable to make predictions from child-training practices to the child's responses of resistance to temptation on a behavioral measure. Subjects were a sample of 140 children from the 379 families investigated by Sears, Maccoby, and Levin (1957). In the latter study measures of the kinds of child-training practices relevant to the development of identification were obtained. The children were 5 or 6 years old at the time of the study. When these children were 10 or 11 years in age they were given the behavioral tests of resistance to temptation.

Measures of resistance to temptation were obtained with a simulated shooting gallery. The apparatus consisted of a "ray-gun," and a 15″×15″×10″ box housing an electrical system of relays, on the front of which were revolving illuminated rockets and five large pilot lights. Scores from 0 to 5 were registered on the pilot lights by pulling the trigger of the "ray-gun." Subjects were instructed to record their score per shot, and to cumulatively total their score each time for 20 shots. They were told that if they obtained 35 points they would be awarded a marksman badge, 40 points a sharpshooter badge, and 45 points or more an expert badge. The experimental sequence was pre-arranged, however, and totaled 32 points when *only* obtained scores were recorded. Subjects were shown how to play the game in a group. They were then taken out of their classroom individually, led to the experimental room, and at the door each subject was told that the experimenter was busy working on some "things" down the hall. Each subject was asked to play the game alone, and to bring his score sheet to the experimenter when he finished. Rapport was high for all subjects.

Forty-two subjects resisted temptation. Twenty-five subjects were classified as low-yielders, 34 as moderate yielders, and 39 as high-yielders.

A preliminary analysis of the data suggests that, in general, hypotheses drawn from identification theory were supported. It was expected that a warm mother, who creates socialization anxiety in the five behavior systems—oral, anal, sexual, aggressive, and dependent—(Whiting and Child, 1954), would develop in a child strong identification and therefore resistance to temptation. Significant relationships were obtained with antecedents from each of these systems.

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14. Leaderless Group Discussion as a Selection Technique

A definite need for further probing into problems of leaderless group discussion technique validity as a selection device was felt following a selective review of the literature. This study proposes to examine the relationship which intelligence, aptitude, experience, and social and personality skills have to individual success in a group discussion.

Eighty-seven candidates for admission to the Honolulu Police Academy were administered the usual battery of selection devices including application blank, intelligence test, police aptitude test, and leaderless group discussion evaluation. In addition the Heston Personal Adjustment Inventory was administered.

Significantly related to success in the leaderless group discussion were the variables of intelligence (as measured by the Otis Test of Mental Ability), police aptitude test score, and the "Confidence" scale of the Heston. Failing significance at the prescribed 5 per cent level but being significant beyond the 10 per cent level was the "Emotional Stability" scale of the Heston.

Age, experience in related occupations, and the Heston scales of "Sociability," "Personal Relations," and "Analytical Thinking" were not significantly related to group discussion performance.

The correlates, however, are low enough to exclude any assumption that the group discussion technique may be duplicating other selection devices. The technique apparently selects as successful candidates those subjects with a higher degree of intelligence, aptitude for the area being appraised, confidence, and—perhaps—emotional stability. These appear to be qualities having face validity for success as a policeman.

The variables that did not correlate significantly did nonetheless have positive correlations in the expected direction. Failure to find significance might be due to a lack of relationship between indicated quali-

ties, a lack in the construction or naming of the various scales, or a chance lack of relationship on this particular sample.

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15. A Survey of Freshmen Values and Educational Choices

This study reports on the first phase of a projected systematic investigation of values and related variables among young people in Hawaii as they may influence educational and vocational choices. Three checklists, arbitrarily grouped into general values, external influences, and specific interests, were constructed following analysis of senior college student responses to the open ended question, "What led you to select the major or curriculum which you have been following in college?" These check lists were administered to 1,321 University of Hawaii freshmen in the fall of 1958, 73 per cent of those registered, and also to 650 graduating seniors in spring 1958, 92 per cent of those registered.

When the proportions of values, external influences and interests reported by the freshmen sample as a whole were compared with those reported by the seniors, a majority of them differed significantly at the 99 per cent level of confidence. However, when the rank orders of the reported influences on educational choice were compared, there was high stability of values (Rho .91) and interests (Rho .93) and moderate stability of external influences (Rho .64) between the student samples. Satisfaction from the field and security of employment were the most popular values of both groups; but the freshmen checked satisfaction significantly less frequently and security significantly more often. High school courses and parents were the most popular external influences indicated by the freshmen; work experience and aptitude and interest tests were most popular among the seniors. Both freshmen and seniors were influenced most in their choices by interest in work with children and youth, ideas, science, and adults.

The results of this study were considered tentatively to be consistent with the theory of Super and others that the adolescent by the time he reaches college age has developed a relatively permanent self-concept and that educational choices are the product of complex, interacting, internal, and external forces.

A more detailed report of this investigation has been prepared: Caroline F. Will and Arthur A. Dole, "A Survey of Freshmen Values and Educational Choices, I." B.T.G. Research Report No. 4. University of Hawaii, mimeographed, 1959.

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16. Neonatal Maturity and Responsiveness

Investigation directed at determining the relationship between neonatal responsiveness and neonatal maturity. Neonatal responsiveness defined in terms of total score on scales dealing with sensorimotor characteristics of behavior. Three indices of neonatal maturity selected were recumbent length, birth weight, and wrist roentgenograms. Subjects were clinically normal white infants considered of the same socioeconomic strata measured within 24 hours after birth. Testing period ranged from 20 minutes after feeding until 60 minutes prior to next feeding. Statistical treatment of data by means of Spearman rank difference correlation. Analysis showed significant intercorrelations between weight, length, composite length of the four bones of the palms, and composite area of the four phalanges adjacent to the palmar metacarpals. Intercorrelations between maturation, vision, weight, length, composite length of four bones of palms, and composite area of four phalanges adjacent to palmar metacarpals not significant and either of zero or inverse direction. Suggestive evidence for existence of independent factors.

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17. On the Ability of Schizophrenics to Play "Normal"

Recent research has suggested that role playing or empathic ability is related to general adjustment. Working with college populations, a number of investigators have found that better-adjusted students play roles and empathize with greater facility than those who are less well adjusted. By logical extension it might be assumed that "normals" generally are more skilled in this function than neurotics and psychotics. However, some very recent studies have shown that certain schizophrenic groups have considerable role-playing skill.

The present investigation attempted to throw further light on role playing in schizophrenia. On the basis of previous research, the following hypotheses were formulated:

(1) Acutely ill schizophrenics are better able to play the normal role than chronically ill schizophrenics.

(2) Whether acutely or chronically ill, schizophrenics who subsequently improve are better able to play the normal role than those who do not.

The subjects of the investigation were 25 acutely ill and 29 chronically ill schizophrenic women who were patients at the Territorial Hospital. Each of

these two groups was divided into fast and slow improvement subgroups on the basis of an evaluation of subsequent hospital course.

Each subject was tested in two sessions of the same day. In the first session the subject was administered the Rorschach and schizophrenia scale of the Minnesota Multiphasic Personality Inventory (MMPI Sc) under standard instructions. In the second session these two tests were administered again with special role-playing instructions to the subject to respond in the way that a "typical, average, ordinary" person would.

Each Rorschach protocol was scored for Schafer's "principal indicators of schizophrenic disorganization." The MMPI Sc was scored in the usual manner. On both tests, high scores were regarded as evidence of schizophrenia, and reduced scores under role-playing instructions were considered to be evidence for the ability to play the normal role.

Three of the four main results were in the predicted direction but only one achieved statistical significance. The first hypothesis, that acutely ill schizophrenics are better able to play the normal role than chronically ill ones received little support; the Rorschach results were in the predicted direction and approached statistical significance; however, the two groups did not appear to differ on the MMPI Sc. The second hypothesis, that schizophrenics who subsequently improve are better able to play the normal role than those who do not, received somewhat more support; both the Rorschach and the MMPI Sc results were in the predicted direction and the former proved to be statistically significant.

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18. Soils and the Food Problem

In many underdeveloped countries population is growing faster than resource development for food. This is not because of any general lack of soil resources; it is because public health measures and the desire for better living are far ahead of scientific research and agricultural development. If all soils in the world that are suitable for food crops were used as efficiently as those in Holland, for example, world population could be several times the present number.

Then too, in many countries the food situation is no worse than it ever was. But recently people have heard about the abundance in the United States and are more conscious of their own situation than before.

In underdeveloped countries the agriculturist faces several serious handicaps:

(1) Low social status of farm people, even including professional agriculturists;

(2) low political standing of agriculture;

(3) lack of machines, chemicals, and transport;

(4) lack of basic data, especially about the soil resources.

After all, we cannot transfer agricultural practices from one kind of soil to a contrasting one in a different social organization. We can transfer only basic principles and skills. Most of the actual techniques of soil use and conservation must be invented on the spot to fit the local kinds of soil and social systems. Usually changes in these systems can be made only slowly.

Somehow many of the key people responsible for food production in these countries, including some of their American and European advisors, assume that agriculture is relatively simple. They assume that "someone" knows what are the best practices. It is only necessary to find this "someone," have him explain them, and set up an extension program to carry the good word to the cultivators.

What they fail to appreciate is that we have been studying the soils of advanced countries many years. Soil surveys have been made, often two or three times in the past 75 years, as our knowledge increased.

Even though there are more kinds of soil in the tropics than in all the rest of the world, little is known about great soil areas occupied by many hundreds of millions of farm people.

Without this essential scientific background, substantial progress is impossible. Had I the time and you the patience I could pile up examples of both little and great schemes going to ruin for lack of local soil knowledge—knowledge that we are beginning to take for granted in all advanced countries.

Actually we have hardly begun to put science to work for improving agriculture. I don't know whether we can have world peace even if we do solve the food problem. But I am sure there will not be peace while millions live on the edge of starvation.

With a fraction of the money and brains now used in the world for celestial mechanica alone, the battle of food can be won while there is time.

I wanted to make this point here, in Honolulu. You have developed to a high level some aspects of tropical agriculture. You have the facilities and experience on which to build a tropical soil research institute that can begin to develop the basic soil data needed for an efficient agriculture in many countries. The need is very great and, I fear, the time is running out.

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Lum, Miss Theresa W. T.
‡Lyman, Clarence
*Lytle, Hugh

†Macdonald, Gordon A.
MacNaughton, Boyd
MacNaughton, Malcolm
Mack, Merton H.
Maeda, Miss Shizuko
Maeshiro, Melvin M.
*Manchester, Curtis A.
†Mangelsdorf, A. J.
Manke, K. F.
Mapes, Mrs. Marion
Marks, Robert H.
Marlowe, Ralph H.
Marnie, James G.
Marshall, Donald C.
Martin, D. J.
Martin, Joseph P.
Martin, Robert T.
*Masatsugu, Teruo
Mason, George
†Mason, Leonard
Masuda, Miss Matsuko
Matsumoto, Walter M.
Matsuoka, Shigeo
Matsusaki, Y.
Matsushima, Richard
Matthews, Donald C.
Mau, Kong Tong
Mayo, Donald S.
Maze, W. J.
McAlister, William C.
McCleery, Walter L.
McGary, James W.
†McGuire, Donald C.
McGuire, Thomas R. L.
McMorrow, Bernard J.
McQuarrie, Irvine
McRoberts, Miss Mary A.
†Mees, C. E. K.
Middleton, Charles R., III
*Midkiff, Frank E.
Midkiff, John H., Jr.
Millard, R. D.
*Miller, Carey D.
Miller, Harvey A.
Miller, P. T.
*Miller, Robert C.
Mills, George H.
Milnes, Mrs. Marjorie B. R.
Milnor, John C.
‡Minette, Henri P.
Mitchell, Donald
Mitchell, Wallace C.
Miyake, Iwao
Miyasaki, Yuzo
Moe, Clayton R.
Moir, W. W. G.
Molyneux, A. V.
*Moomaw, James C.
Moore, Glen
Mordy, Wendell A.
Morgan, Edward J.
Morgan, Eugene P.
Morgan, W. A.
Mori, Raymond
Morita, Miss Dorothea Y.
Morita, Kiyoichi
*Moritsugu, Toshio
Mount, J. O.
Mullahey, W. J.
*Mumaw, Charles
Murata, Jack
Murphy, Garth I.
Myers, William A.

‡Nagao, Wallace T.
Nagasawa, Larry K.
Nakae, Mrs. Haruko N.
‡Nakagawa, Susumu
Nakagawa, Yukio
*Nakamoto, Goichi
*Nakamura, Eugene L.
Nakamura, Robert M.
Nakasone, Henry Y.
*Nakata, Miss Setsuko
Nakata, Shigeru
Nakea, Mrs. Violet N.
Namba, Ryoji
Naquin, Walter P., Jr.
Natsui, Dorothy
Naughton, John J.
†Neal, Miss Marie C.
Nelson, Tell
Nelson, Torlef
Newhouse, Jan
Nicholson, James R.
Nickerson, Mrs. Lydia C.
Nickerson, Thomas
Nielsen, Jack
Nishibun, Joe
†Nishida, Toshiyuku
Nishihara, Mitsuo
Nishijima, Satoru
Nishioka, Yoshimi
‡Noda, James
Noda, Kaoru
Nolan, Mrs. Esther C.
Nonaka, Tatsuo
Nordfeldt, Sam

Oda, Tadashi
O'Dea, Miss Katherine
Oguri, Mikihiko
*Ohta, Miss Ella Miyeko
Ohta, Miss Margaret
Okazaki, Kyuro
Onna, K. M.
Orr, Miss Kathryn J.
†Otagaki, Kenneth K.
Otsu, Tamio

*Palafox, A. L.
Palma, Joseph
Palmer, Clarence E.
†Palmer, Harold S.
Pang, Herbert G.
Pang, L. Q.
Pang, Morris S. Y.
Parry, H. Dean
†Payne, John H.
Pedley, Mrs. Blanche A.
Peiler, Mrs. Alice W.
Pell, Charles G.
Pelle, Salvatore A.
†Pemberton, C. E.
Penhallow, H. Chadsey
‡Penhallow, Richard
Peperzak, Paul
Perry, Cortes L.
Peters, Charles W.
Pettersson, Hans
Philipp, Perry F.
Phillips, Lyle
Philpott, Jack M.
Pietruszkiewicz, A. J.
Pilmer, Robert
Pinkerton, F. J.
Pinkerton, O. D.
†Poole, Charles F.
Porter, Paul H.
Powers, Howard A.
Price, Samuel
*Price, Saul
Price, Sumner
Puaa, Mrs. Annie K.

‡Quaintance, D. C.
‡Quate, Larry W.

Rainwater, H. Ivan
Rainwater, Mrs. H. Ivan
Rakestraw, Norris W.
Ramage, Colin S.
Rea, Mrs. Jessica L.
Reber, Grote
*Reid, Mrs. Della F.
Reppun, C. Eric
*Reppun, J. I. Frederick
Rhodes, Leon J.
Richert, T. H.
Riffenburgh, Robert H.
Riggs, Mrs. Mary E.
Rigler, Robert G.
Rinkel, Murice O.
Ripperton, J. C.
*Roberts, Joyce O.
Robinson, William A.
Rockwood, Paul C.
Rose, Bernard
Rose, Stanley J.
Rosenberg, Morton M.
Ross, Ernest
Ross, Serge
Rossier, Charles
*‡Ruhle, George C.
Ryman, Eugene C.

St. John, Harold
Saito, Herbert T.
Sakata, Seji
Sakimoto, Richard Y.
Sakimura, K.
Samson, Walter H.
*Sandberg, Floyd A.
Sanford, Mrs. Norma
†Sanford, Wallace G.
Sanford, Mrs. Wallace G.
Sayer, John T.
Schaefer, F. A., III
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Schmidt, Carl T.
Schmidt, Frederic C.
Schmidt, Mrs. Helen D.
Schrader, Phillip C.
Scott, Arlen M.
Scott, Frank S., Jr.
Seckel, Gunter R.
Seeley, DeLos A.
*Seo, Stanley T.
Sexton, Harold M.
Shaw, Thomas N.
Shepard, R. Frederick
Sher, S. A.
Sherk, Kenneth W.
†Sherman, G. Donald
Shigeta, James Y.
‡Shigeura, Gordon T.
Shim, Mrs. Nellie C.
Shimabukuro, Seichi
Shimakawa, Michie

Shippen, Herbert H.
Shiramizu, William T.
Shiras, Edwin Paul
Shiroma, James
Shklov, Nathan
Shoemaker, James H.
Shomura, Richard S.
†Sia, Richard H. P.
Sideris, C. P.
Silva, James A.
Silva, Mrs. Mary C.
Simpich, Frederick, Jr.
Sinclair, Gregg M.
Singleton, Robert R.
Singleton, V. L.
Sister Mary St. Lawrence
Sister St. Thomas More
Slattery, Miss Mabel
*Sloan, Norman R.
Sloane, George E.
†Smith, Donald H.
Smith, Elbert G.
Smith, Jimmie B.
†Smith, Madorah E.
Smith, R. Q.
†Snyder, Laurence
Soo, Harry Y.
Souza, Mrs. Mary F.
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Spalding, Philip E., Jr.
Sparaga, Albert
Spencer, Frank C.
Spencer, Robert S.
†Spiegelberg, Carl H.
Spillner, Erich C.
Spoehr, Alexander
Spring, Thomas
Stearns, Alvan C.
Steffee, Miss Elizabeth
Steiger, Walter R.
*Steiner, Loren F.
‡Stephens, Mrs. Ella
Stevens, William H.
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Stormont, John L.
Strasburg, Donald Wishart
Stuhler, Louis G.
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Swanholm, Carl E.

Takagi, Yoshie
Takahashi, David
Takahashi, Makoto
Takasaki, Kiyoshi J.
Takata, Harry H.
Takazawa, Futoshi
*Tam, Richard K.
Tanaka, Tokushi
*Tanimoto, Ralph H.
Tanimoto, Tyrus T.
Tanoue, Roy T.
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Terayama, Hajime
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‡Thompson, William Y.
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Tilden, I. L.
Titcomb, Miss Margaret
Togashi, Teruo
*Tom, Edward S. H.
Tom, Miss Lorna
Tom, Mee Lin
Tomita, Theodore
Townes, Mrs. Edith
Townsley, Sidney J.
Trexler, Clarence W.
Trouse, Albert C., Jr.
†Tuthill, Leonard
Tuttle, Daniel W.
Tyau, Henry T. Y.
Tyau, Steven
Tyler, Arthur R.

Uchida, Richard N.
Urata, Rokuro
Uyehara, George K.

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Van Dyke, Fred
Van Landingham, John William
†Van Weel, Pieter
van't Woudt, Bessel D.
†Van Zwaluwenburg, R. H.
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Vernon, Miss Mabel D.
†Vinacke, W. Edgar
Vinacke, Mrs. Winifred R.
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Voorhees, George
Vorfeld, R. T.

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Wagoner, Howard Eugene
Wainwright, Stephen
*Wakatsuki, Mrs. Helen
Waldron, Kenneth D.
Walek, F. M.
*Walker, H. A., Jr.
*Walker, Hastings H.
Wallace, Arthur F.
Wallrobenstein, Paul R.
Walsh, William
Walsh, William J.
Ward, Mrs. Patricia B.
Waring, Gerald A.
Warner, Miss Bernice
Warner, H. H.
†Warner, John N.
*Wassman, Rudolph Carl, III
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Waterhouse, John T.
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†Wayman, Oliver
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‡Weeks, John D.
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Yoshimoto, Carl M.
Yoshina, Teruo
Yoshioka, Tad T.
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*Young, Hong Yip
Yu, Tsi-Shan
Yuen, Heeny
Yuen, Quan Hong
Yuen, Miss Victoria S. F.

Zane, Lawrence F. H.