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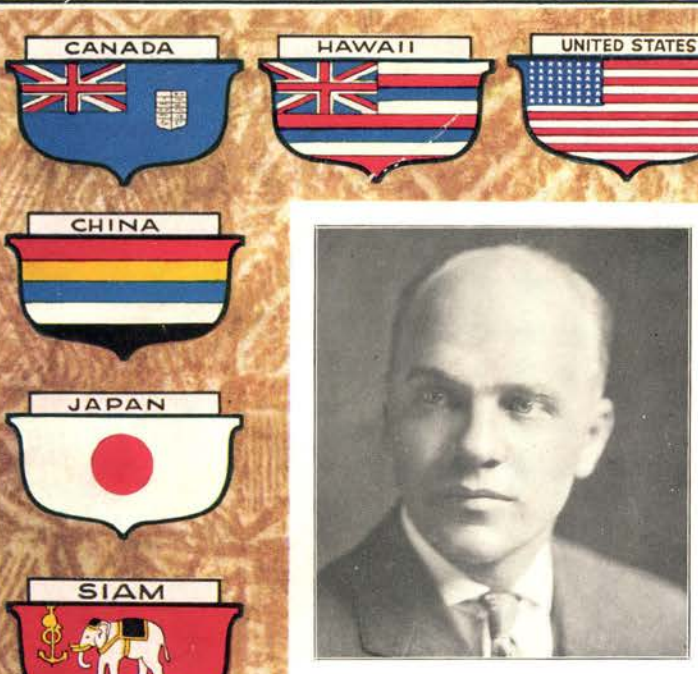
MID-PACIFIC MAGAZINE



Dr. Nils P. Lasen, Chairman of the Hawaiian Division of the Pan-Pacific Research Institution

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The Scientific Number of the Mid-Pacific Magazine July, 1927

At one of the recent weekly dinner meetings of the Pan-Pacific Research Institution workers in Honolulu, a request was made that the Mid-Pacific Magazine once in three months devote an issue to things scientific in the Pacific; this number to be edited by a committee appointed by the Pan-Pacific Research Institution.

The Mid-Pacific Magazine gladly complies with the request and this, the July number, is edited by Dr. G. H. Godfrey, H. Atherton Lee and A. J. Mangelsdorf, of the Pan-Pacific Research Institution. Their activities start with the editing of available articles for this number.

The number of the **Journal of the Pan-Pacific Research Institution,** bound with the July Mid-Pacific Magazine, is edited by Dr. David Starr Jordan, and contains a check-list of the fish of China prepared by Dr. Cora B. Reeves of Ginling College, Nanking.

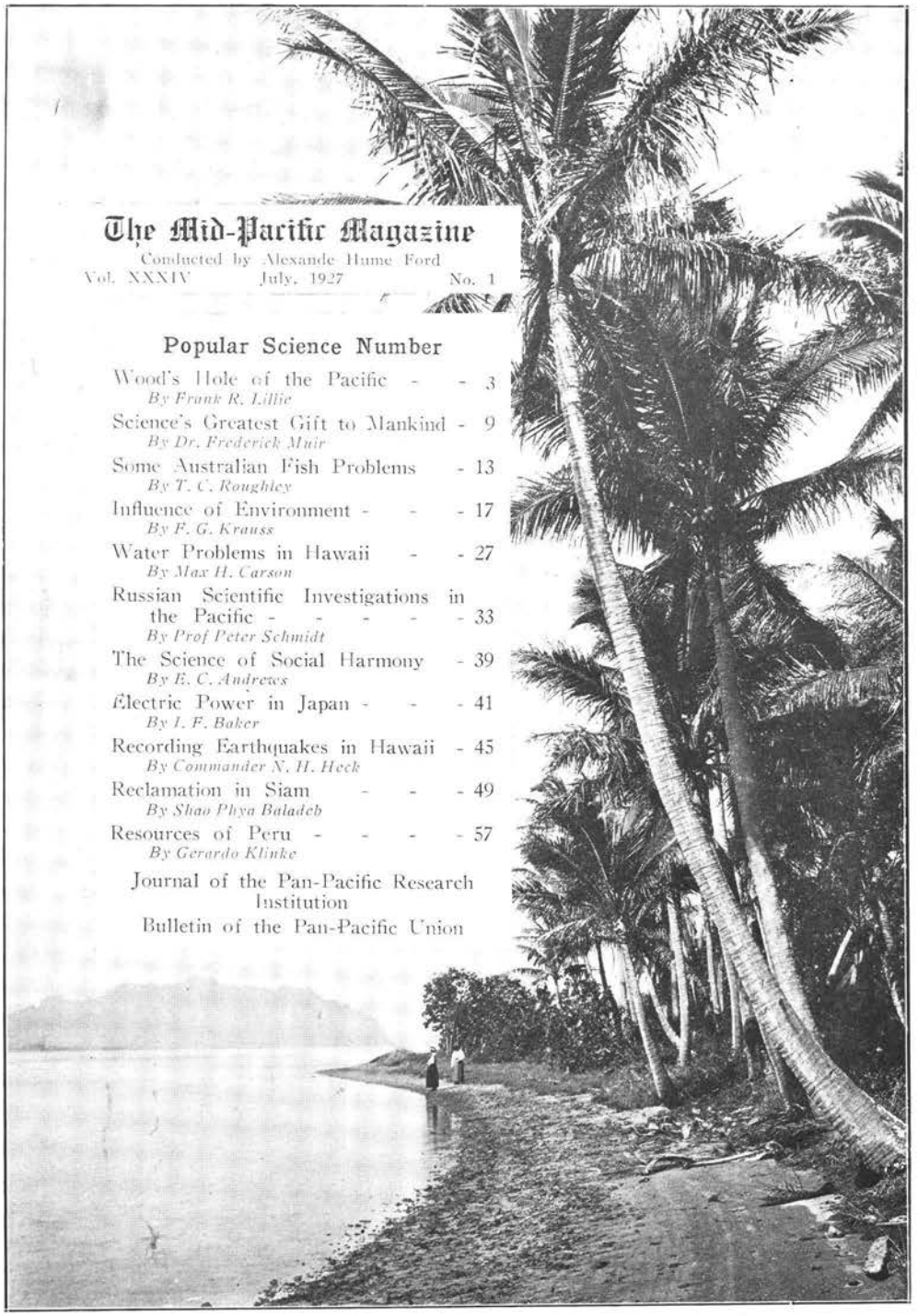
Dr. F. G. Krauss, who has with Dr. Jordan acted as editor of the **Journal,** is leaving for a trip around the world, making a visit to the Himalayan Mountains in search of a hardy variety of the pigeon pea, to introduce into Hawaii, where its value as cattle food is greatly esteemed. During his absence Dr. G. H. Godfrey will act as resident editor of the **Journal** in Hawaii.

Many of the papers read by scientists, local and visiting, as lectures, following the weekly dinners of the Pan-Pacific Research Institution, are well worthy of preservation, and some of these will be selected and published quarterly in the Mid-Pacific Magazine. It is hoped that members of the Pan-Pacific Research Institution groups in the Orient and on the American Continent, as well as in Australasia and Oceania will contribute also.

At the Pan-Pacific Club in Tokyo a number of world distinguished scientists have from time to time addressed that body, and verbatim reports of these are forwarded to the Pan-Pacific Union. Some of these are splendidly suited for publication. It is hoped that other Pan-Pacific Clubs entertaining distinguished scientific speakers will forward reports of these for consideration by the editors.

The Pan-Pacific Research Institution is asking its members in all lands to prepare research papers on the subject of Food and Population problems of each Pacific land and locality. These papers should form a fund of information on which to base the agenda for a second Pan-Pacific Food Conservation Conference. The publication and distribution of a selected number of these papers should aid materially the delegates to the Conference in regulating the presentation of their data.

In this, the July number of the Mid-Pacific Magazine, the regular **Bulletin** of the Union, which is bound with it, is made to conform to the general plan of making this number the first of a quarterly series devoted to matters of scientific interest to the peoples of the Pacific.



The Mid-Pacific Magazine

Conducted by Alexande Hume Ford

Vol. XXXIV July, 1927 No. 1

Popular Science Number

The organizer of the Pan-Pacific Research Institution and its first President was Dr. David Starr Jordan, a pupil of Agassiz and one of the founders of Wood's Hole. He remained for some months in the Honolulu Institution engaged in research work.

Woods Hole of the Pacific

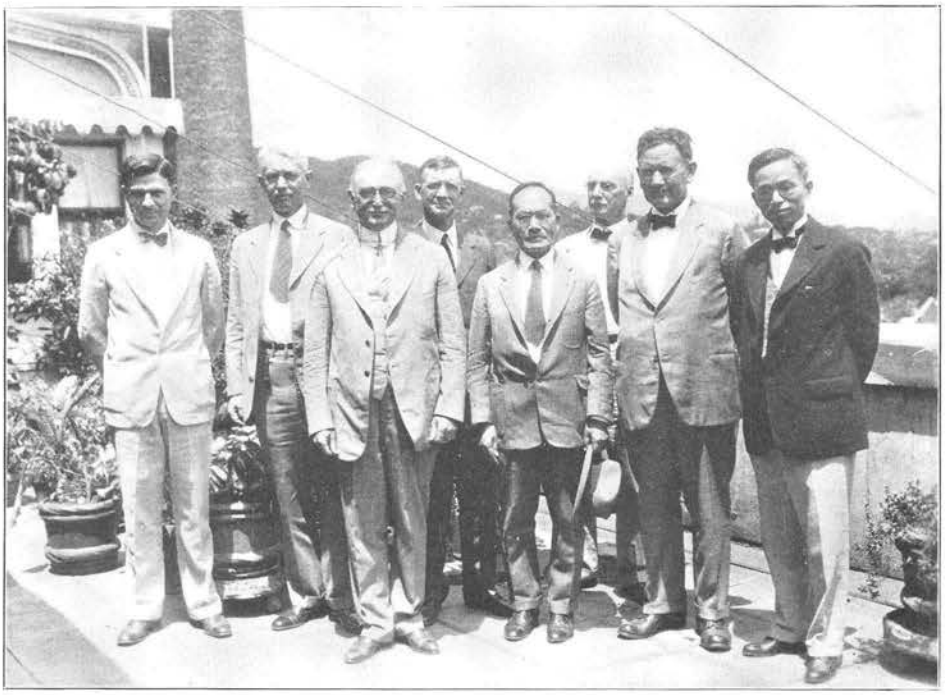
An Address by
FRANK R. LILLIE
(Before the Pan-Pacific Research Institution)

The main guesthouse of the Pan-Pacific Research Institution.

I came as a tourist to Hawaii and so am not prepared to show you pictures of Woods Hole, but when asked to speak about Woods Hole there was no use in resisting, and particularly when I am told about Dr. Jordan visiting here and his reference to Woods Hole and his hopes that this furthermost western point of American civilization might do what the most eastern point of American cilization has done for the progress of science. Last year my wife and I were touring in the Mediterranean region; this year we are in the Pacific region. As we were traveling around the Mediterranean we were impressed thoroughly with the fact that that was the birthplace of all of our civilization. It is a most impressive experience to travel in that Mediterranean basin and realize that the progress was then transferred from the basin of the Mediterranean to the basin of the Atlantic, where it is still progressing; and now as I come for the first time to the basin of the Pacific I am amazed at the scientific activity and progress that is evidenced here, and realize as one cannot who has not actually set foot here, that this is the great basin of the civilization of the future.

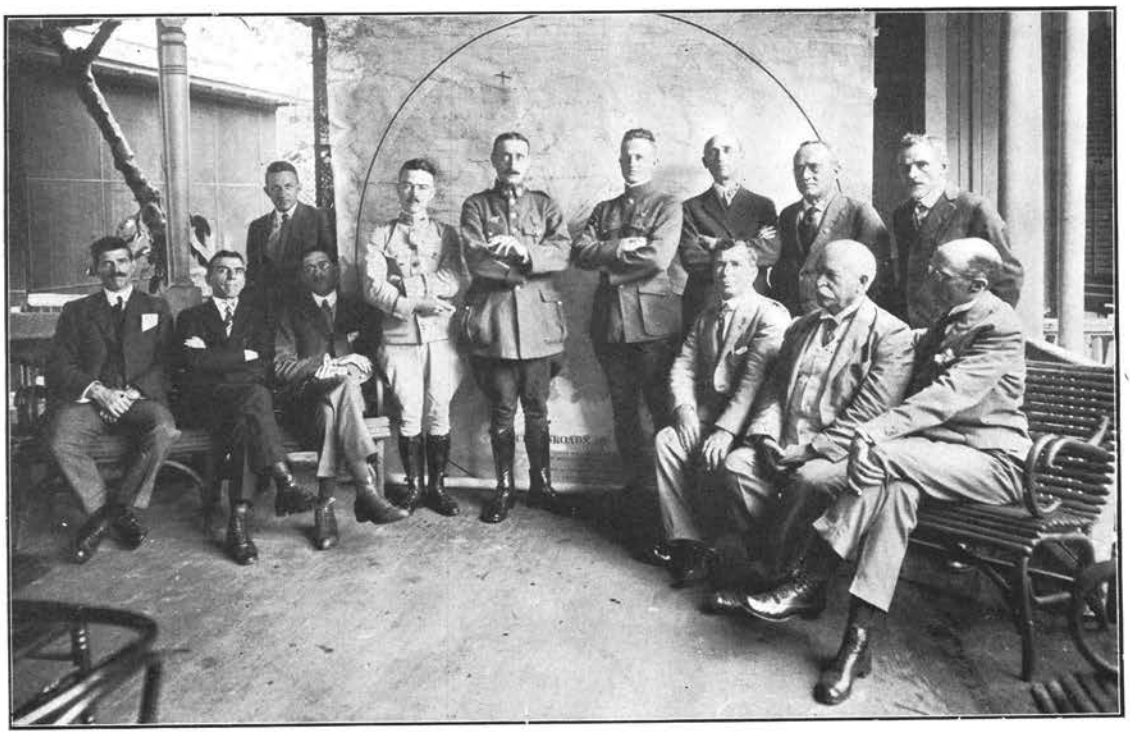
May I explain why I can give some account of Woods Hole? I have been going there since 1891, when I graduated from college and went there to begin my graduate studies; since 1893 I have been some sort of official at the Institution. In 1900 I became Assistant Director under Dr. Whitman and in 1908 I succeeded him as Director and remained until last year, when I retired to the ornamental position of President of the Board of Trustees. As the Laboratory was founded in 1888, I have seen most of its history. Its resources are now about two and a half million dollars, and it has the best equipped and largest marine laboratory in the world; within the last three or four years we have doubled the equipment and put in the most modern kind of improvements.

Woods Hole is situated in the village of Woods Hole on the heel of Cape Cod. Land is continued seaward by islands; to the south and east are Martha's Vineyard and Nantucket. The



A typical group of diners at the Pan-Pacific Research Institution. Left to right: D. L. Crawford, University of Hawaii; Guy Steward, president Hawaiian Academy of Science; Gov. W. R. Farrington, president of Pan-Pacific Union; Dr. Frederick Krauss, Dr. T. Harada, Dr. H. H. Goddard, Ohio State University; Dr. David Snedden, Columbia University; Dr. A. Itano, delegate from Japan.

A group of the sons of the Honolulu members of the Pan-Pacific Research Institution. They will make science their life work and dine together Saturday evenings at the Institution.



A group of research workers of the Pan-Pacific Union a decade ago, some of the early builders.

land is continued to the southwest by the charming islands known as the Elizabeth Islands, and as I have listened to the auphonious names of the Hawaiian Islands, I thought of the names of those far away islands: Naushon, Nashowena, Nonamesset, Uncatena, Wespecket, Pasquenese, Cuttyhunk and Penikese.

The last is the island of Penikese, which was the site of the first marine laboratory founded on the American Coast. This was the famous laboratory established by Louis Agassiz in 1873, and the laboratory to which our distinguished friend David Starr Jordan referred when he was here. Its origin was a little unusual perhaps: a business man of New York, a Mr. Anderson, had heard somewhere that Mr. Agassiz was anxious to have a laboratory on the seacoast and he came forward and offered this barren island and about $50,000 to Mr. Agassiz for his purpose; Mr. Agassiz erected and equipped his laboratory on the island of Penikese; it was very inaccessible, but his fame attracted students from all over the eastern parts of the United States, and there were so many applicants to come to his laboratory to study the first year that he had to write many courteous notes declining applications. Among the students who attended that first year was David Starr Jordan and my own teacher, C. O. Whitman. It was about this island that Lowell wrote his poem on Agassiz.

Jordan has written in several places about the scientific session of that year of 1873 and he has said that from that meeting arose very much of the progress of American biology for the next two decades. Unfortunately for the progress of the Penikese laboratory that same year Louis Agassiz died.

This was his last undertaking and in a way a great and prophetic undertaking. When Woods Hole was founded the old laboratory was still standing on Penikese, and an expedition went down and removed some of the mottos that were written on rough brown paper tacked upon the wall. Among them was, "Study nature, not books," and this we have had posted in the laboratory of Woods Hole. Another one was, "The laboratory is to me a sanctuary, let nothing be done in it unworthy of its great Maker." The laboratory at Penikese was conducted for a second year by Louis Agassiz' son, Alexander Agassiz, but the great vision was gone and it was discontinued; after the second year it remained unoccupied until it was accidentally destroyed by fire in 1891. Penikese later became the leper colony of Massachusetts.

There is no organic connection between Penikese and the Marine laboratory at Woods Hole—merely a connection of tradition which long survived; Hyatt of Harvard attempted to revive the idea, but the site chosen was obviously not very favorable and so about 1887 a group of Boston people organized and cast about for a good place for a permanent laboratory and they picked on Woods Hole; this location had previously been selected by Spencer F. Baird, who was then the director of the U. S. Bureau of Fisheries, which was established in 1873. Baird had been exploring the eastern coast for a site for a scientific laboratory and fish hatchery and picked on Woods Hole as the best site. The Trustees of the Marine Biological Laboratory thought they could not do better, and so a small plot of land was acquired across the street from the "Fish Commission Laboratory," and a small building was erected in 1888. The Trustees secured Professor C. O. Whitman as director of the laboratory and in so doing they secured an unexampled leader and did more than select a site and erect a scientific building. Whitman had recently returned from Japan, where he had succeeded E. S. Morse as Professor of Zoology in the Imperial University. Both men were strong friends of the Japanese people. After Whitman's return to America, he established a laboratory in Milwaukee and then went to Clark University, which was then a research institution. He was particularly well prepared to take over the conduct of the newly established institution in Woods Hole. He brought not only a strong scientific reputation but also fundamental ideas and ideals; one was that it should be a national institution for all America; another that it should be a cooperative institution in which all universities should have a part; there should be no entangling alliances, no control of the institution by outside parties; so in the next few years he was busily engaged in working on this plan of organization which was rapidly successful. In a very few years as many as 17 colleges and universities were subscribing small sums for research tables, etc.; but funds were needed rapidly, and the only revolution in the history of the Institution was staged on that account.

It is organized, I may say, as a corporation, as all Massachusetts institutions are; but our corporation is a scientific society with 300 members at present, who elect trustees, eight each year to serve four years, making 32; there are also five members ex officio, making 37 members. Much of the business is transacted by an executive committee of seven members. Thus has been developed an organization of scientific men united to produce a research institution of the best possible kind, serving its constituency, universities, colleges and research institutions to the best of its ability. For a long time there were lean years; the idea of the organization was somewhat new and it was difficult to persuade people

with money that professors might be good business men; so for a long time the sledding was very hard indeed. At one time an opportunity came to put the institution on its feet financially, but it would have meant fundamental changes of organization and after considering it closely the group decided that liberty was better than riches, that in the long run an organization conducted on scientific lines was bound to succeed. That decision was made in the early part of the present century and it was not until four or five years ago that the financial status finally came to be thoroughly solved. During all this time the institution was really saved by the financial cooperation of Mr. Charles R. Crane, formerly minister to China. He was a man of a variety of interests, and one was this sort of organization. He wanted to see it succeed, and so for between 15 and 20 years Mr. Crane contributed at the rate of $20,000.00 a year. Just before the Great War began we had strong hopes that we could secure the interest of the great educational foundations in our work but it was not until after the war that the time came that this could be accomplished. Dr. Vincent of the Rockefeller Foundation came down to see us and after investigation he made a proposition that the Rockefeller Foundation would put up half a million if we could get someone else to put up the other half. This was finally accomplished with the aid of the Carnegie Corporation, Mr. John D. Rockefeller, Jr., and Mr. Crane. In the meantime our plans for buildings, made three or four years before, owing to rising costs far exceeded the resources made available. Mr. Crane again came to the rescue and stated that he would see, regardless of the costs, that the plans were carried out. We erected the finest scientific laboratory in biology that I know of anywhere. This doubled our accommodations but in three years' time the pressure for accommodations had become so great that we were crowded, and this year we didn't know what to do about it. People are coming to us from all over the world; it has become not only a national but also an international institution. The attendance from abroad has been stimulated in recent years by the various fellowship programs of the Rockefeller Foundation and the International Educational Board, which have resulted in the bringing large numbers of medical and biological men to America and then to Woods Hole.

The Institution belongs to scientific men; there is no make-believe to that; it belongs to the members of the society and all members are scientific men, zoologists, botanists, physiologists and chemists of various kinds. The number of institutions which are contributing to the support of the Marine Biological Laboratory has increased from 17 in 1910 to 70 at present; all are institutions from the Atlantic seaboard and as far west as the Mississippi, which contribute from $50 to $1,000 a year each, depending on the research accommodations they desire for their workers. We have a much finer library than any small college could possess and their workers of course have the use of that. Two years ago the General Educational Board contributed $50,000.00 to get back issues and to complete the scientific periodicals in the library. With the beginning already made this is adequate for the completion of the library.

In the principle of cooperation lies the best of the Institution. We have cooperation of scientific men, of leading men in the biological world who are members; our trustees are all scientific men except our treasurer, who is related by marriage and temperament to the scientific problems. This Laboratory has no definite scientific program of its own except the advancement of biological science, and consequently the men bring their own prob-

lems and work on them alone. It is not exclusively a marine institution. Every kind of biological work is at home there. Many, for instance, are working on insects, and others are working on chemical problems, etc.

The affiliations of the medical men with fundamental sciences are becoming closer continually and one of the greatest contributions that it has been the good fortune of the Institution to make has been the close affiliation between the medical institutions and the more academic branches of the sciences.

Scientific research is the function of the institution, but we often feel that we promote research best by producing investigators. We have a number of advanced courses of instruction; admission is competitive and every student who is there is ambitious; he is set down at once with the great scientific researchers and at once he is associated with men who are producing science at the present time.

We have a variety of service departments; we have boats with a group of fifteen men in the summer continually at sea collecting; we sell a great deal of the marine collections used in the Laboratory and realize quite a lot from that; we operate dormitories and a mess hall, providing board for $7.00 per week; we are putting up two more fireproof dormitories. There is a scientific population of 400 in the summer. Most of them bring their families and so the population has grown and the price of living has grown too. We have quite an elaborate scheme of development for taking care of these people; we have acquired land which we sell in small lots to members only, on which many members have erected summer homes. The majority rent rooms and board at the mess.

Everything we do stands on its own feet financially, except the research work; the courses of instruction, the dormitories, mess, supply department, real estate department, all pay their own way and turn in a certain profit to the laboratory which goes back to the research, for which we have also an endowment of $900,000.00.

I was asked about the application of all this to the Territory of Hawaii owing to the fact that Dr. Jordan referred to establishing a "Woods Hole of the Pacific" here. I feel somewhat as the football player felt who had been declared ineligible because he failed in history. It was determined to make him eligible, as they were to play another team and he was their star, and so they arranged for his history teacher to give him an examination. The professor gave him the examination and he passed on 50 per cent. The professor was asked how he was able to pass the player and he said, "I asked him two questions. The first question was, 'When was the Declaration of Independence signed?' He answered, 'By Christopher Columbus, 1492'. That of course was wrong. I then asked him 'Who discovered America?' and he said, 'I don't know'. That, of course was right, because he didn't know, and so I passed him." That is the kind of an examination I would pass on Hawaii.

There are, of course, certain things in common, but the background is absolutely different. Perhaps you can get something from our general principles of organization: first is the principle of cooperation; along with that is the principle of governing, the principle of independence, the principle of control by scientific men rather than by business men whose intentions, of course, may be most beneficial, but after all scientific men know better what they want and need. The absence of a permanent scientific staff and program. All of these things follow from the one principle of cooperation of the scientific men in the advancement of scientific work.

Science's Greatest Gift to Mankind

By DR. FREDERICK MUIR
(At the Pan-Pacific Research Institution)

"What is the greatest gift science has given to mankind?" I have asked a number of persons this question, and the answers have been various. For instance, the healing arts, modern surgery, anaesthetics, modern control of diseases, the printing press, electricity, steam, our power of communication and transportation, and the material betterment of human beings represent a number of the answers.

When we consider what science has done for the physical comforts of mankind during the last two hundred years one is astounded! However, in spite of all these great material gifts I firmly believe that science's greatest gift to mankind is not in the material things of this world at all, but in the spiritual, and I have found that many biologists with whom I have discussed this subject, hold similar views. This might greatly surprise William Jennings Bryan but it would in no way disconcert him, to whom biologists are a terrible set of irreligious materialists. That there are some materialists among scientists is quite true, but there are far more outside of scientific circles, especially among those who do not even understand what modern science stands for. That scientists are not so materialistic as many think is shown by the fact that their great incentive to work is not for material advancement

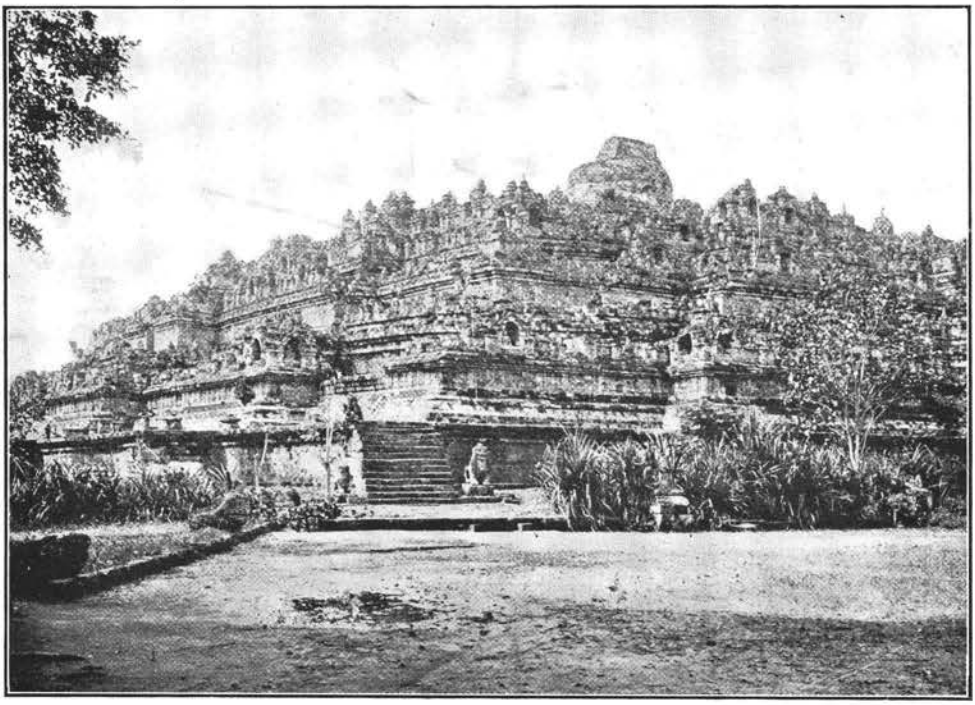
The Latin-American symbol of faith—the Cathedral.

of themselves or of others, but for knowledge, for the understanding of nature and humanity, which is for the spiritual advancement of mankind.

While this appears so evident and simple to me, yet I find it difficult, if not impossible, to marshal my ideas in such a manner as to convince others. In trying to do so, I must advance certain propositions.

The first of these is that mankind is ruled by Ideas. This is contrary to Karl Marx's economic theory, but I believe it is correct. Economics may be a driving power but it is Ideas that direct that force.

The greatest factors in human history have been religious ideas. These have moulded peoples in the past for good and for ill, and they are still moulding them. They have been the most permanent factors in human history because they are bound up with some of the deepest emotions of man-



In Java the Borobador, temple of the Hindu faith, has been unearthed after a thousand years to remind the world of the undying power fo religion.

kind—and man is an emotional animal. Christians and Mohammedans were driven by similar emotions but different ideas guided their actions.

The second proposition is that three sets of ideas or groups of mental activities have played an overwhelming part in moulding the activities of mankind. First, man's conception of God and his own relationship to Him. This is called theology. Second, man's conception of the universe or cosmos. This is cosmology or natural science. Third, man's conception of his relationship to his fellow beings. This, in its broadest sense is called sociology.

Sociology and cosmology are as old as man; theology is more recent. These three have acted and reacted upon one another. Early in the history of man, theology became the most powerful of the three and the effect has been felt down to the present time.

Among primitive peoples, both of the past and present, these three sets of ideas constitute religion. The priest was also the man of knowledge, and the law-giver. His cosmology or knowledge of nature was generally greater than that of the common herd and this gave him his power. Many of the laws which he gave were based on this knowledge and were of great benefit. Nearly all the laws, customs and ceremonies of such people directly reflect and are directly due to their ideas of the cosmos. No one with an unbiased mind can read such a book as Frazer's "Golden Bough" and fail to recognize the fact that these three sets of ideas have directed the emotional energies and desires of mankind, and have moulded the various civilizations. Of course the economic factors have limited the powers of these civilizations.

In Kyoto, the old capital of Japan, there are still hundreds of Shinto and Buddhist temples, side by side, emblems of the Oriental religions of peace.

Early in the history of mankind, certain great truths of theology were discovered or revealed, and so were some of the fundamental laws of sociology, but the knowledge of the cosmos was very limited. But little by little this knowledge was increased and handed down from generation to generation until with the coming of the printing press and other material advantages this river of such a small beginning became a flood which will carry us off our feet unless we are careful.

As this knowledge of the cosmos appeared, it reacted upon the ideas of theology and sociology, and it has been the readjustment of these two to the ever advancing river of knowledge that has constituted the so-called "conflict between religion and science," all down the ages. Religion by its very essence must conserve the truth as recognized by it, whereas science, by its very essence, must be ever pushing on to new discoveries. And the constant adjustment between the two can seldom be made without friction.

Bryan and his allies in their efforts to dam this river of knowledge are trying to defend a cosmos that was logical one hundred years or five hundred or five thousand years ago, and in their efforts they condemn the whole of science and all scientists. The question therefore arises as to whether the reaction of our changing ideas of cosmology upon theology and sociology has been for good or evil. One way of judging this is by comparing the actions of people at various periods holding different ideas as to the cosmos. To many people at the time North America was beginning to be colonized by Europeans, the burning and drowning of witches was perfectly logical and justifiable, whereas to the ordinary

educated man of America or western Europe of today, such a thing is revolting. It cannot be claimed that this is because we are more religious today, but I do claim that our ideas about the cosmos do not allow us to believe in witches, and therefore such action would be illogical. We do not condemn the early Christians of Egypt who destroyed so much of the library of Alexandria and tortured Hypatia to death in a most revolting manner, because we are more religious than they, or because we are better Christians, but because our ideas as to science are vastly different, and what was logical and therefore necessary to them is illogical, and therefore wrong, to us. To the ancient Mexicans human sacrifice was logical and necessary, and if we hold his ideas about the cosmos and how, through certain gods who controlled the various natural phenomena, the destinies of mankind could be changed by such sacrifice, we also would consider it necessary for such to take place.

Turning to living races, we find that natives of Borneo, New Guinea, Africa and other places nearer home spend a considerable portion of their time and energies in performing acts which we consider illogical but which are the direct outcome of their ideas of the cosmos and therefore logical and necessary. And I can vouch for the fine characters of some of these men who so act, and I know that they are as upright, moral and religious as we are, according to their lights. To the man who believes that each natural phenomenon is controlled by a personal god who can be influenced by various rites, the killing of a person to bury under each corner pole of his new home, may be not only a logical but a virtuous action.

It is the advancement of our knowledge of the cosmos or science which has liberated the human mind from what we term superstitions, which dominated the ideas and controlled the actions of people. This is reflected in the change in our ideas of theology and sociology, and as this knowledge has become more and more correct, so have customs and ceremonies been abandoned along with the ideas which made them logical and necessary. This I conceive has been the great spiritual gift of science to mankind.

It is quite true that men have put many of the great discoveries of science to unworthy ends, but this is equally true of religion, art, love, patriotism and every other true and beautiful thing in the world. But if science has outrun the moral capacity of mankind are we not justified in asking—who is to blame? In fact, we might turn and argue that had theology kept pace with science, then we might have had a perfect society and such abuse of science would not have happened. Because of these abuses Bryan and his allies are not justified in trying to sweep away the discoveries of science. In fact their position as Christians is wrong, for they have no faith, as they must believe that a just and wise God has given us the capacity to understand nature and use its forces but has withheld the necessary moral capacity to use this understanding justly. I prefer to believe that along with the capacity to understand, we have been given the moral capacity to use our understanding justly, but like every other great gift we can only attain to it through trial and tribulation. Not by putting out the light of knowledge but by increasing it shall we eventually win out.

An Australian corner in the Pan-Pacific Museum showing Australian fish on the walls.

Some Australian Fish Problems

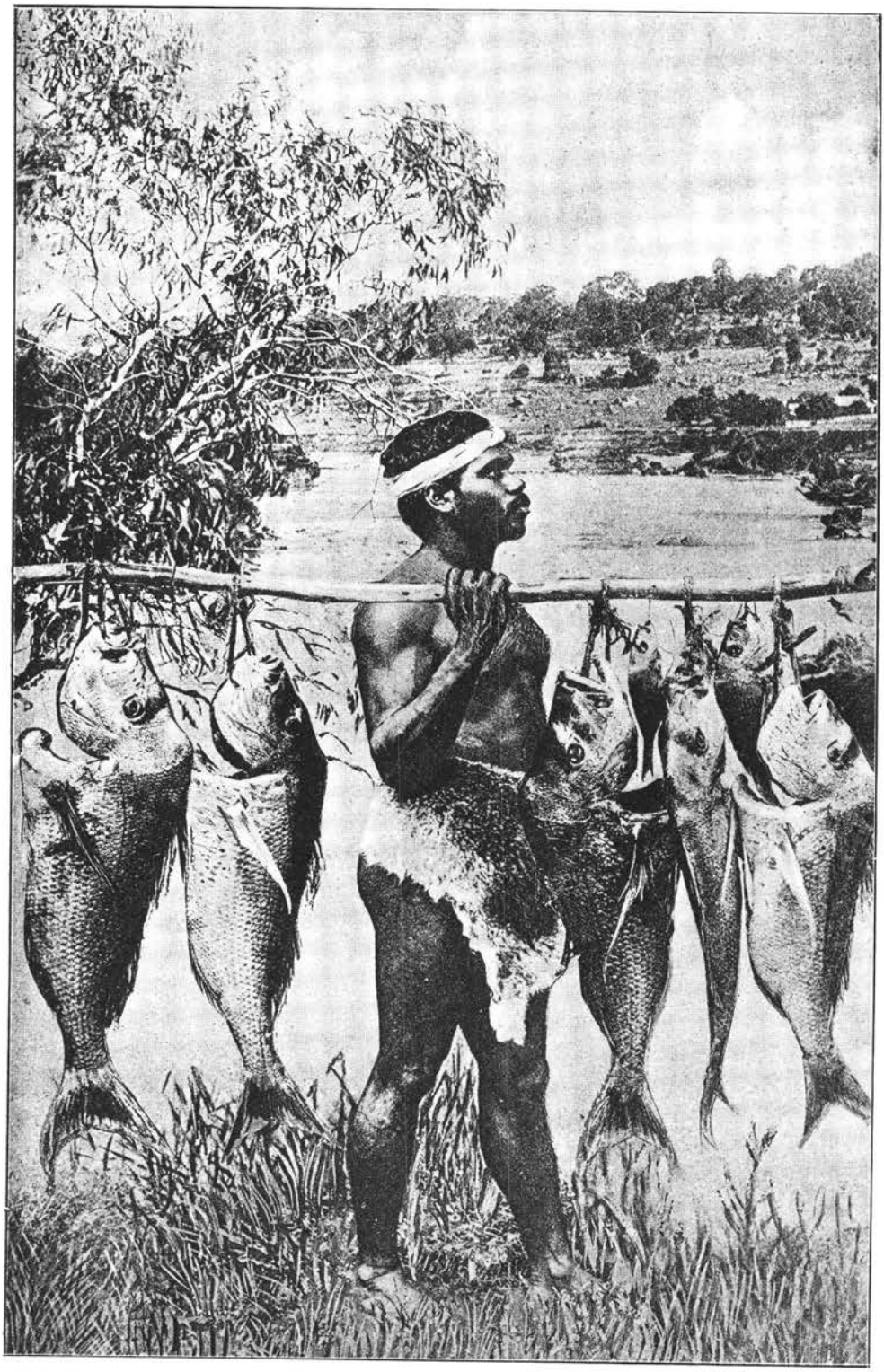
By T. C. ROUGHLEY
Chairman Marine Biology Section, Zoological Society, New South Wales

I am asked for suggestions embodying a line of attack on such questions as the study of life-histories, migrations, etc. of the fishes of the Pacific.

I feel that suggestions more valuable than mine might emanate from the U. S. Bureau of Fisheries and from American ichthyologists generally, for the study of these questions in those waters has reached a stage far in advance of anything attained in Australia.

In the first place the most outstanding requirement necessary for any successful work in these waters is the establishment of one or more Biological Stations fitted with laboratories and essential apparatus. I suppose no country in the world is so lacking in this regard as Australia, and without such stations real progress cannot be hoped for in the directions I have indicated. A good sea boat equipped for such investigation would also be a necessary adjunct.

As an example of the type of work requiring solution, I may quote the seasonal migrations of our herrings, which are of outstanding importance. We know that at times during the winter months enormous shoals proceed northward along our coast; but can we in-



Australian waters teem with fish, as may be judged by this picture of the day's catch of an aboriginal Australian black. Today fish are bred scientifically and Australia is giving attention to her fisheries as a food supply.

dicate whether they appear every winter? If they do, what indication have we of the actual time and the conditions governing their appearance? If they do not, can we account for their absence? About these questions we know nothing. May we not therefore be neglecting a most valuable source of food supply?

I have at times been asked by commercial men whether I should recommend to them the exploitation of our herring fisheries. In view of the uncertainty surrounding the whole question, I have not been able honestly to advise the risk of their capital. I would not at the present time put a penny of my own into such a venture, and I regard other men's money as valuable as my own.

We should explore our coastal waters during the winter months; detailed surveys for herrings should be made continuously from Tasmania to Queensland; the plankton and its variations should be studied in the presence and absence of herrings; water temperatures should be recorded in as many stations as possible during succeeding winters; and oceanic currents carefully computed both in direction and velocity. These conditions which may, and probably do, regulate the migrations of these valuable fishes, and must therefore be studied, and studied seriously and comprehensively, before a herring fishery can be established on a reasonably sound and scientific basis.

But we have no facilities whatever for conducting such work. I believe that I am the only scientist whose work is devoted to Australian fisheries and my facilities for doing so are crude in the extreme. My field investigations on the oyster, for instance, have been conducted in boat-sheds!

I hope you will not think that I regard the fisheries of the Pacific as the fisheries of Australia; but I do regard our coast as the weak link in any investigation work embracing the shores washed by the Pacific.

A series of Biological Stations on the Pacific coast of America, Hawaii, Japan, China, the Philippines, Australia and New Zealand is essential if a broad knowledge of the fisheries of that ocean is to be obtained. Is not the establishment of that chain of stations the very first object for consideration?

Then, how to co-ordinate the work of those stations? This will be accomplished only by mutual co-operation. Annual conferences at Honolulu will provide a means of planning future work, which should be organized and systematic.

Reverting to the question of herrings, we know that they proceed north along the east coast of Australia, but how far north do they go? It may be possible that stations in countries to the north of Australia may be required to continue the work where we leave off. Then, how far south do they begin their migration? Again it will be found that the co-operation of Tasmania and New Zealand will have to be sought in the elucidation of this question. At the annual conference the year's data should be brought together and compared, papers read, and discussions take place as exhaustive as the added knowledge will allow. The whole of the information could here be co-ordinated and arranged by a publication committee elected for that purpose, and issued in a volume worthy of the subject and the Pan-Pacific Union.

The respective governments sending delegates should be educated to realize the magnitude and importance of the work, so that resolutions passed by conference for the development of any phase of such work in any country would have a reasonable chance of receiving the backing essential to their immediate fulfilment.

Though I have mentioned herrings, I have done so by way of illustration only. It is, of course, only one of many such problems to be studied. The migration of the mullet, one of our stable food

fishes, for instance, can only be studied satisfactorily by the co-operation of countries north and south of Australia.

Although the study of the economics of our fisheries is so backward here, rapid advance should be made by a staff of earnest workers who are prepared to devote their life's work to a sincere study of the subject.

The greatest pleasure I have yet received from my own work has been the eminently satisfactory progress made in the oyster industry of New South Wales. Four years ago I began to devote my whole time to the development of our oyster fisheries, and the progress made in the industry during that period has given me an insight into what one man can accomplish if he throws his whole heart into the work. First of all, I concentrated on unleased and supposedly barren ground; by the study of the nature of the bottom, its adaptability to various methods of cultivation, the availability of material suitable for clutch, the rise and fall of the tide, and the general characteristics of each area such as the prevailing currents and salinity, I have been able to convert many hundreds of acres into some of the most productive beds on the coast. Then I planned for the raising of the standard of cultivation on many areas where the methods in use were wasteful or otherwise unsuitable. Having won the confidence of the culturist, I was able in most cases to persuade him to adopt the methods I advocated, and thus large and numerous areas have been reclaimed from mediocrity. Finally, having succeeded in increasing the output, I had to concentrate on increasing the demand. This I have accomplished by newspaper propaganda. Periodically I would have an article published in our newspapers or journals boosting the oyster as food and correcting numerous misapprehensions which militated against its use. As a result the trade is in a more prosperous condition than at any period hitherto.

You will pardon, I hope, this transgression, but so gratifying has been the result that it has infused me with optimism in regard to our fisheries generally, if a band of enthusiastic investigators will unite to work wholeheartedly. Immense sacrifices must be made into one's own private time, but is there greater reward than that of achievement?

I trust that in this brief sketch of an initial plan of campaign, there will be found something of value. To me there appears to be nothing in the scheme which is not of a thoroughly practical nature; nothing which any country should not be prepared to undertake; and nothing which can be eliminated without jeopardising the whole conception of economic ichthyology from a Pacific aspect. In other words such steps appear to me to be fundamental.

Making beets produce more and more sugar with each succeeding generation.

Influence of Environment on the Stability of Inherited Characteristics

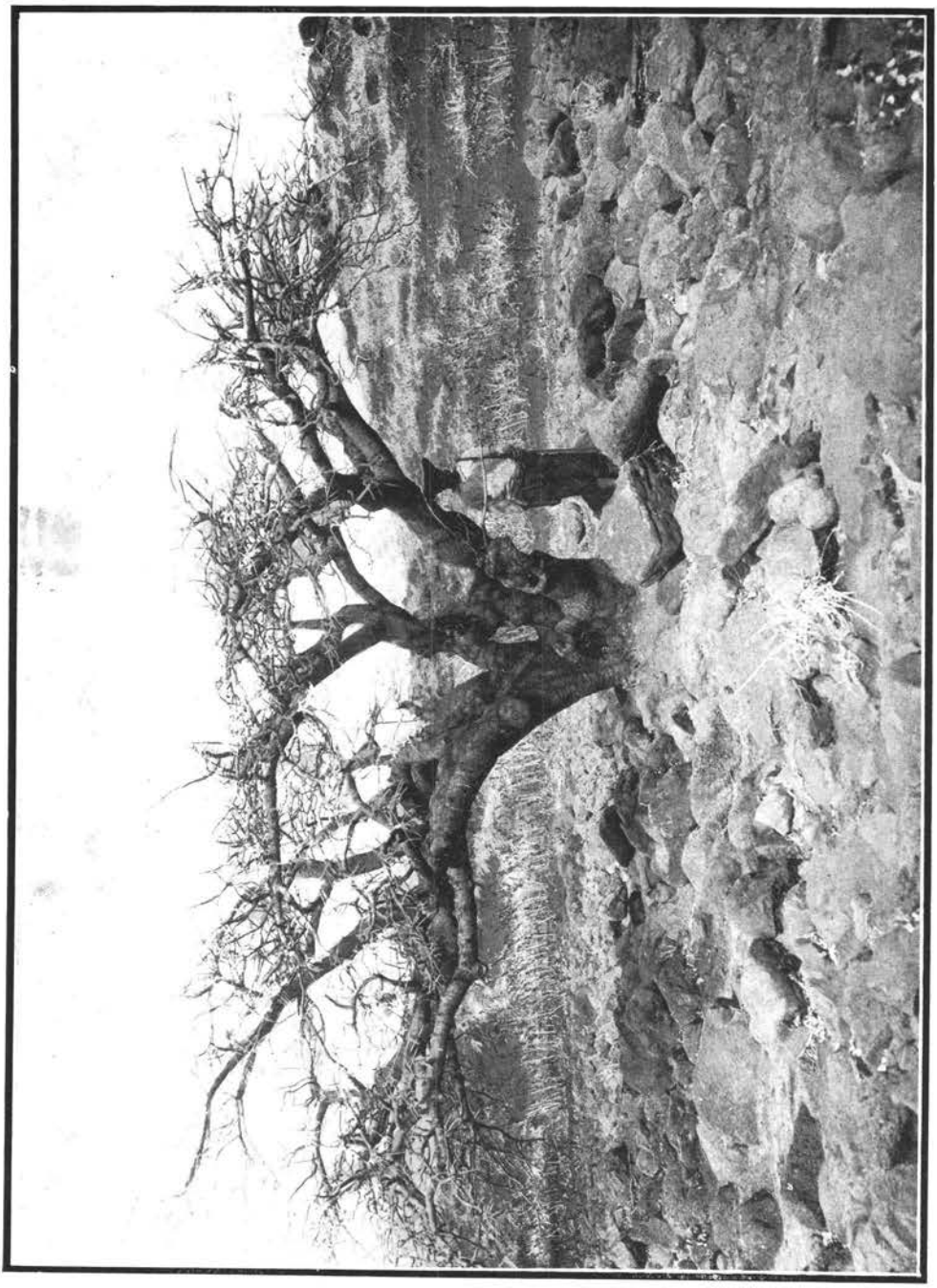
Arguments Presented in a Debate at a Weekly Meeting of the Pan-Pacific Research Institution

By F. G. KRAUSS

When the Committee on Progress of the Pan-Pacific Research Institution assigned this subject to me, I assumed that, in part at least, they had in mind the long debated question as to whether so-called acquired characters, or characters due to environment, are hereditary or not. Be this as it may, I should like to attack our problem on this basis which must necessarily involve a presentation "bearing upon the influence of such environment factors as altitude, temperature, sunlight, soil composition and biological enemies, etc., on the stability of inherited characters of plants."

The modern theory of heredity is based upon the numerical and quantitative data derived by crossing two sexed individuals that differ more or less markedly from each other in one or more characters. The theory is primarily concerned with the distribution of units between successive generations of individuals. Similarly as the chemist postulates invisible atoms and the physicist electrons, the student of heredity appeals to invisible elements or factors (determiners) that have recently been named "genes," the indivisible units of the heredity mechanism.

The theory of evolution is quite universally accepted by biologists today, as is likewise the belief that all living matter has had a common origin. What scientists are less agreed upon is in the mode of the origin of species and varieties. This is not to be wondered



The Wiliwili tree of Hawaii is an example of the effects of heredity and environment. This tree grows in almost desert areas, requires little water, and its wood is prized by the Hawaiians for its lightness. They use it for the amas or outrigger floats of their fishing canoes.

at when we consider how little we really know of the great divergencies and complexities of the hereditary stream, upon which sails the great ship of evolution. We have not yet explained why one species ranges widely and is very numerous, and why another allied species has a narrow range and is rare. Still less do we know of the material relations of the innumerable forms which existed in past geological ages. Doubtless a better knowledge of these relations would prove of the greatest aid in explaining some of the vexed questions of evolution.

Nevertheless, most of us no longer entertain the theory of the earlier naturalists—that each species has been created independently. But we believe with Darwin that species are not immutable, but that those belonging to what are called the same genera are lineal descendants of some other and generally extinct species, in the same manner as the acknowledged varieties of any one species are the descendants of that species. Furthermore, many of us accept Darwin's Theory of Natural Selection as an important though not exclusive means of modification in living organisms.

From this common ground two supposedly widely divergent schools have arisen since Darwin's time. These might be designated as X, the school which believes that acquired characters are transmitted to, or inherited by future generations, as propounded by Darwin, Kammerer, the Austrian biologist and others, and the Y school, the second unknown quantity or variable, which maintains that so called acquired characters cannot be inherited as postulated by Weismann and his followers, who, I think, it is only fair to say, have the largest following at the present time. Be this as it may, the question propounded in this debate is: "What are the permanent effects, or what is the influence of habit and of the use or disuse of parts, of altitude, temperature, moisture and drouth, sunlight, soil composition, biological enemies, etc., upon the stability of inherited characters of plants (and animals)?"

Darwin has maintained that changed habits produce an inherited effect, as in the period of the flowering plants when transported from one climate to another. With animals he notes that the increased use or disuse of parts has had an even more marked influence; for he states that, "I find in the domestic duck that the bones of the wing weigh less and the bones of the leg more, in proportion to the whole skeletno, than do the bones in the wild duck; and this change may be safely attributed to the domestic duck flying much less, and walking more than its wild parents. The great and inherited development of the udder in cows and goats in countries where they are habitually milked, in comparison with these organs in other countries, is probably another instance of the effect of use." Darwin gives many other illustrations of a similar nature in both plants and animals, and then concludes that changed conditions of life are of the highest importance in causing variability, both in acting directly on the organization, and indirectly by affecting the reproductive system. He states frankly, however, that he does not think it probable that variability is always an inherent and necessary contingent, for he states that in some cases unquestionably the intercrossing of aboriginally distinct species appear to have played an important part in the origin of new forms, but he thinks the **importance of crossing has been much exaggerated,**—and, "over all these causes of change, the accumulated action of selection, whether applied methodically and quickly, or unconsciously and slowly but more efficiently, seems to be the predominant power."

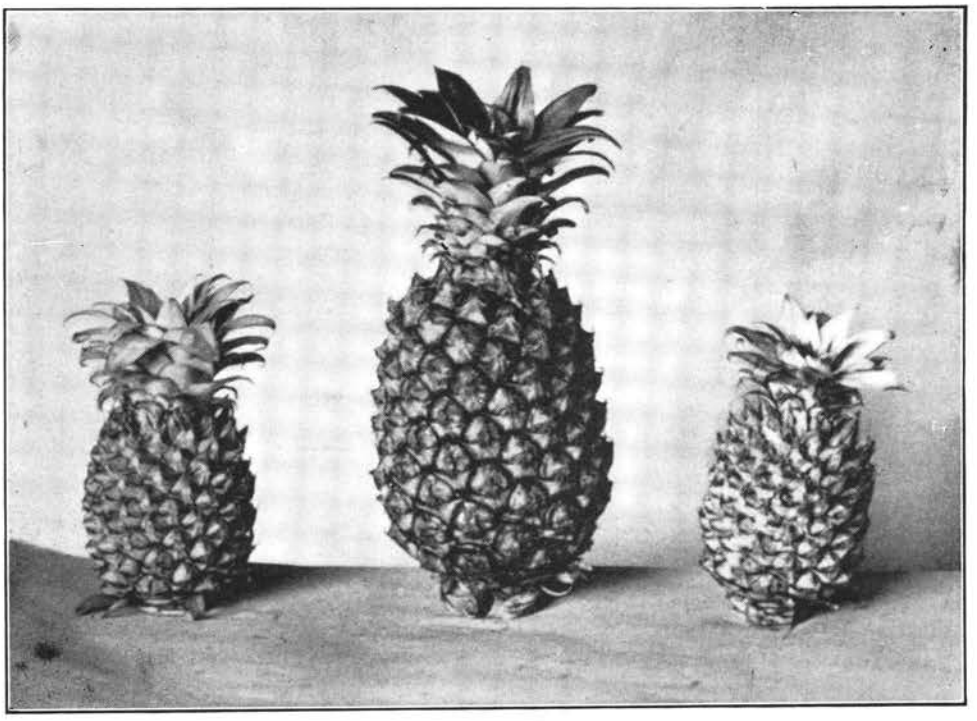
I think that much of the lack of

agreement in this controversy is due to the meaning of the term "acquired character." It should be remembered that the actual characters themselves are not inherited, but only the "determiners" or potentialities which control the way in which the organism reacts to its environment. While we may say that a certain hybrid variety of sugar cane or pineapple inherits its parents' vigorous constitution, or color markings, the statement is not meant to be literally true; it is meant that just as there was something in the parents that was responsible for the development of the characters in question so there are similar factors in the progeny which develop similar results under similar environmental stimuli.

In a sense every adult character is "acquired" because it is not expressed at birth. Every new character must have been "acquired" or added, sometime and somewhere, else it could not be present. Perhaps our question would be better stated if changed to: What kind of characters are inherited, or are not all acquired characters merely inherent potentialities, and therefore transmittible from parent to offspring? Discussion is futile unless a common denominator in the form of a clear definition is forthcoming.

Weismann's conception of an acquired character is any somatic modification that does not have its origin in the germ plasm, and he believed that only those modifications that take place in the germ plasm can be inherited. He gave the following reasons for rejecting the belief in inheritance of such characters: (1) there is no known mechanism by which somatic characters may be transferred to the germ plasm; (2) the evidence that such transfer does occur is inconclusive and unsatisfactory; and (3) the theory of continuity of germ plasm is sufficient to account for the facts of heredity as by him expressed. In effect, Weissmann cannot comprehend how recent events can influence preceding events, a latent germinal character, to bring how water that has passed over the weir can return and affect the flow of the water whence it came. He appears to assume that the germ plasm is isolated from the somatoplasm very early in the development of the fertilized egg into an independent individual, and that when it is so isolated it takes no active part in the history of the body. In other words, the body cells are merely carriers of the germ cells and are unable to affect the characters of it any more than a rubber hot water bag, although capable of assuming a variety of shapes, can affect the character of the water it contains. Perhaps this is a poor illustration, since it must be admitted that the living organism is a physiological as well as morphological unity and that the two classes of cells cannot be completely insulated in such a unity. It is only fair to state that some cytologists hold to this latter belief, while Morgan and a host of others hold to the opposite view.

Personally, I would not express my views as frivolously as Conklin is said to have done in speaking of the inheritance of mutilations, i. e., "Wooden legs are not inherited, but wooden heads are". On the whole, I think the opposition has perhaps almost as strong a stand as we. We think that the germ plasm theory is sufficient to account for the facts of heredity; and we are not convinced that a particular somatic character can be called into being by any known external causes, such as, the environmental influences which may temporarily sway organisms from the mean, or to change them to something as new or different as we definitely know may be brought about through mutation or hybridizations. To truly inherit an acquired character means more than to simply reawaken forth a hidden potentiality. Lastly, to

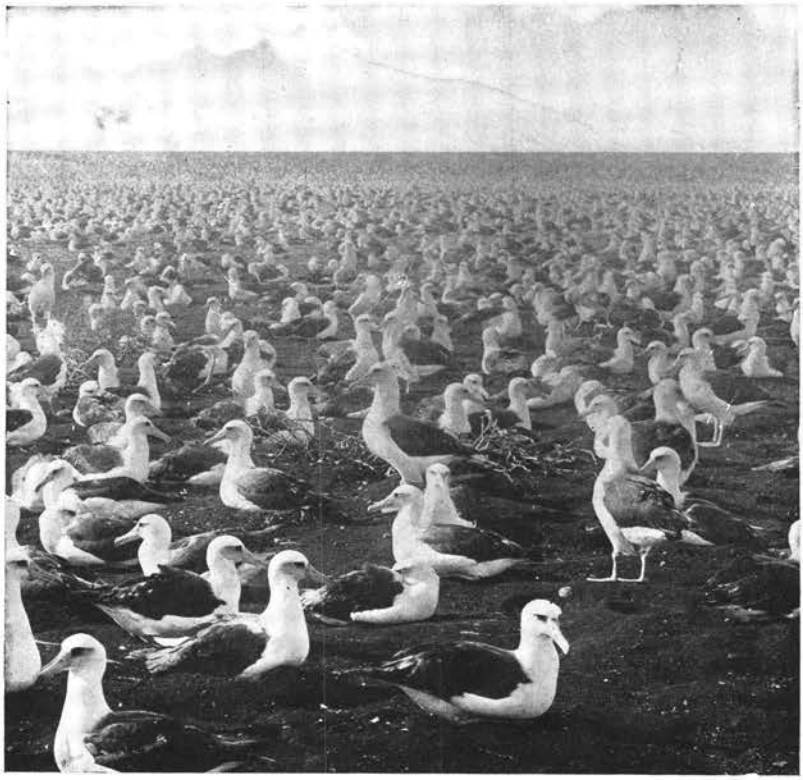


Specimens of disease-resisting pineapples that are being bred in Hawaii.

make the opposing theory valid the acquired character should reappear in succeeding generations, even in the absence of the original external cause which brought forth the character in question.

The deeper I get into this problem the more difficult it becomes for me to distinguish between inherited and acquired characters. Are they or are they not one and the same thing? Are not the potentialities within every living organism so great and varied that what some of us called acquired characters are merely manifestations of formerly unknown potentialities which under a peculiar stimulus assert themselves and having gained momentum carry on for a generation or two, and then subside until given a new impetus? Or let us take another track (you see I am seeking truth rather than controversy). This seems to me the scientific spirit—inquiry, ever inquiry, by every possible means; that of the experimenter appeals to me most, but here I am only talking, talking, but we will recite a few of our experiments to help bear out our theory.

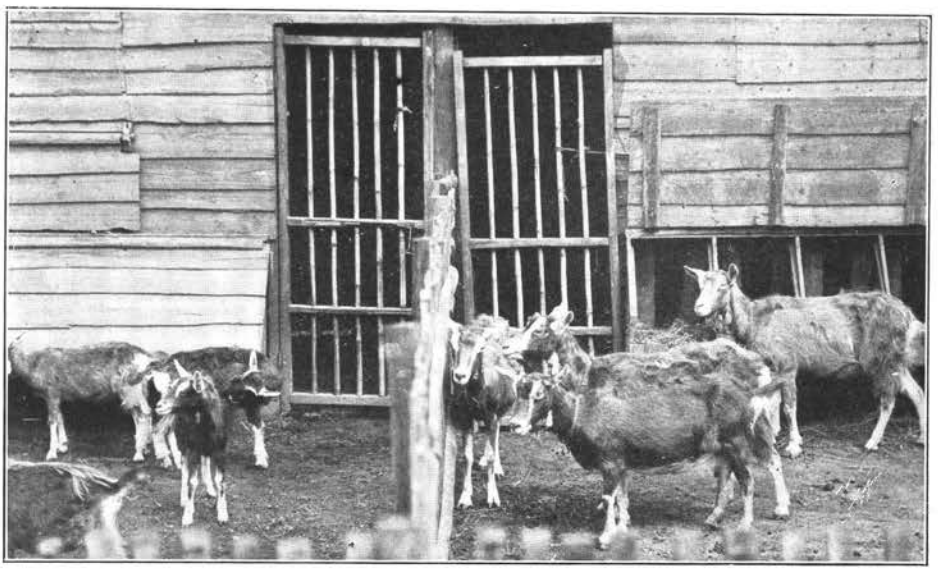
Is the ability to speak a language in its entirety an acquired characteristic, or is there an inherited disposition, an inborn tendency which might be compared with the rudimentary teeth with which we are born, only that in the matter of acquiring a language or, music, etc., outside help is necessary to develop the inborn tendency? Song birds taken from their nests as helpless fledglings and deprived of their adult kind, nevertheless, will sing their native songs, and the human kind as of Indians abandoned as little children, it is claimed, out of their childish babbling, develop a new language. Thus may we con-



Native birds on one of the outlying Hawaiian Islands, where from their nests they still follow the life of their forbears.

clude with Romanes that the animal and the human being is the product of inherited and acquired characters. Is it possible that these acquired characteristics are passed on to the next generation? That characteristics inherited from forbears can be and are passed on to posterity is of course nowhere doubted. With a certain approximate exactness, we know the laws underlying this inheritance and the mechanism by which it is brought about.

Is there such a thing as "progression" and "retrogression" by generation according to our choice and understanding? Kammerer and his school believe they can answer in the affirmative through experimental evidence gleaned from organisms of a lower order than ourselves, because they recognize that the Darwinian method of mere observations and statistical comparison will not yield the solution. I believe that the most fundamental experiments concerning the inheritance of acquired characters have been conducted on butterflies. It was shown that if the chrysalis of the netted moth is kept in the refrigerator the majority of the adults that emerge will be of a darker color than the parents. That in turn the progeny of these altered forms inherit, in part at least, the dark markings of their parents, which are darker than those of their grandparents without having come under the environmental influence which is supposed to have brought the change. Similar experimental evidence has been discerned by substituting heat for cold. It is also well known that



Toggenberg goats in Hawaii that have been bred through centuries to give large quantities of milk.

certain dyes fed to or injected into a female bird may find their way into the egg and reappear in her progeny. An acquired effect has in this case been transmitted from one generation to the next. But it is equally certain that such a process does not represent inheritance in the true sense; rather the process simulates inheritance and might therefore well be termed pseudo-inheritance. A similar transmission is followed by several diseases, of which syphilis is perhaps the best example. In this case it is known that the protozoan parasite causing the disease may be transmitted from the mother to her children and these in turn again transmit the disease to their children. This is purely a passive transmission, as in the cases of dyes just cited. Other similar processes may be cited as in the bacillus causing white diarrhea in fowl; pelvianic in silk moths and Texas fever in cattle, all of which are similarly transmitted through the egg, but not by virtue of any permanent change in chromatin matter, and we cannot therefore term these diseases as being inherited in the sense we use the term. On the other hand, there is the general belief that a predisposition or susceptibility towards a disease like tuberculosis may be inherited. In like manner may the mother acquire resistance to specific diseases which immunity may be transmitted to her offspring. The male has not this power, nor has any such acquired immunity been shown to have been transmitted to more than one generation. It appears evident that there has been no change in the hereditary constitution. An acquirement has been transmitted with the hereditary material, but has not become a part of it. It seems to us that the reappearance of a parental condition in the progeny cannot be taken as definite evidence that it is truly inherited.

We might cite illustrations of the effects of poisons and other chemical and physical agencies in inducing variations in animal and plant, which are supposed to be transmitted by inheritance. Possibly it is true that alcohol, excessive heat and cold may injure or

destroy the least stable or weakest links in the hereditary chain which we have termed the genes or "determiners" of which the chromosomes are supposed to be made of. There is evidence that some poisons may act selectively to kill the weaker germ-cells outright and allow the stronger to survive. I think it was Pearl who obtained fewer but more vigorous progeny from alcoholized than from unalcoholized fowls.

On the whole this type of experiments has tended to show that, while the acquired changes or variations may be carried over for several generations, there is a tendency for the influence to wear off unlike that which we would expect in true inherited variation, or where this is not the case, it would appear to be explainable by the hypothesis of mutation or the loss of genes themselves, as already stated.

If the inheritance of acquired characters comes under this category, rather than that based upon the changes that are supposed to take place in the sommao or body cells, as contrasted from the germ cells, then we believe our controversy is largely ended.

Mutilations of the body, even though persisted in for many generations, as for instance in the case of foot binding in Chinese girls, are well known not to be inherited, although some people still believe that docking the tails of sheep and the dehorning of cattle is responsible for bob-tailed and hornless animals, that are so born. Nevertheless, we must not be too sweeping in our conclusions here. It is possible, as some authorities maintain, that eye injury for instance, may induce the formation of anti-bodies in the blood, under the influence of which the remaining eye may be affected and in turn affect the factors for eye characters in the germ cells. Again, however, you will note that we come back to the ultimate principle that the germ cells must become affected to cause transmission to the progeny. That the amount and kind of food supplied to plants as well as animals exerts a powerful influence everyone is aware. Variations in nutrients or simply moisture applied to plants affect size and productiveness, color or foliage and fruit, and to a certain extent the chemical composition of the plant as a whole. If plants are starved or have lack of moisture they are dwarfed and produce small and usually few seeds. (Cajanus indicus may produce small seeds under drouthy conditions, but in greater number than otherwise, and this is also true of other exceptional plants). If such small or shriveled seeds are planted it may happen that the progeny are small even when grown under optimum cultivated conditions. This may likewise hold true of asexually propagated plants, such as potatoes, pineapple and sugar cane. This, however, does not constitute hereditary changes in the sense that we understand the term, but is due wholly to the smaller amount of food material stored in the seed and upon which the plant is dependent for its start in life. The succeeding generation from such stunted plants if grown under a favorable environment show no deterioration. We have in mind a case in which seeds (cuttings) were selected from an old neglected, many times ratooned clump of sugar cane bearing only four thin canes, from which the succeeding plant crop grown under favorable environment produced a clump of 12 very choice canes. As a matter of fact, seed growers generally consider over-stimulated, overgrown plants rather poor parentage from which to propagate either by seed or vegetatively. These same laws pertain to the animal kingdom, as most stockmen will attest. I believe that entomologists have similar proof on this point. The experiments of Pietch, who fed gypsy moth larvae on walnut leaves instead of oak leaves, their nor-

mal food, and found that the resultant moths were lighter in color than the normal. However, after two generations there was a reversion to the original type, showing that the change was apparently a temporary one, like the effects from underfeeding.

On the influence of light, perhaps there is no better illustration than that presented by Kammerer himself, one of the foremost advocates of the inheritance of acquired characters (see "The Inheritance of Acquired Characters," by Dr. Paul Kammerer. Translated by A. Paul Maerker: Brandon, Boni and Livernight, Publishers, 1924). He has shown that the non-development of the eyes of cave animals is probably due to the absence of light, since when these were exposed to weak light for regular intermittent periods, parts of the eye were stimulated towards normal development. From this result, it has been argued that the disappearance of sight in cave animals represents the inheritance of an environmental effect progressively impressed on the germ cells. It also shows, however, that the eye producing potentiality has been inherited through all the generations of eyeless animals and can be called into full expression by appropriate stimulus.

Acclimitization or the adaptations which appear in animals and plants when they are transferred to new environment are a fruitful source of debate for the geneticist, whichever side he may defend and we may well draw some lessons from this source. In the southern states, corn plants have a longer growing season and take longer to mature than corn grown in the north. When such late maturing southern strains are grown in the north they are said to become acclimated to the shorter growing season after several generations, by maturing earlier than the same strains grown in the south. This has been regarded by some as evidence of a cumulative effect of lower temperature and possibly other changed conditions. On the other hand, the theory has been advanced by others that the reason is probably due to natural selection acting on spontaneous variations in growth and maturity rate, for only those plants which mature early will set seed. The others are killed by frost before maturity. Thus each generation is descended exclusively from the early maturing plants and in time the whole population comes to be composed of the hardier plants. This is the theory of the survival of the fittest, which might serve to explain much of the stand taken by the non-conformists who so valiantly adhere to the doctrine of the inheritance of acquired characters, which sometimes I wish I could believe to be a fact.

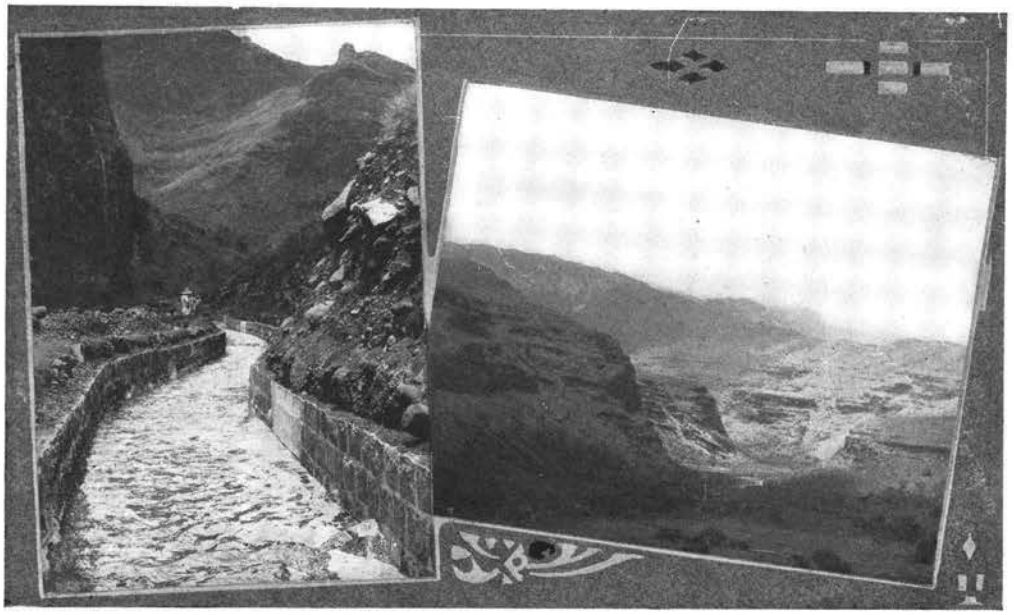
On the matter of adaptation of corn to changed climatic environment, permit me to recite some of my own experiments. In 1918-20 we grew some ten varieties of Zea Maize at 500, 2000 and 3000 feet elevations. Among these was the so-called Kula Hybrid variety. This corn is usually planted in April in the higher altitudes where it matures in November. In other words, it has there about an 8-month growing season. In that period it often grows 12 feet tall and produces as high as 80 bushels of grain per acre. The soil is very deep silt, apparently of exceptional fertility. When this corn is grown at Haiku at 500 feet elevation, it matures in just half the time that it required in Kula (which is also the "cooler" region), conversely, all of our early maturing Haiku varieties when planted in the Kula region required about twice the ordinary time to mature. These relative maturity periods were maintained for at least three successive seasons and when their order of planting was reversed they always

returned to their original or normal maturing period. In this project we were forced to the conclusion that at the higher altitudes the low night temperature caused suspended growth during the night while in the lower and warmer altitudes growth was continuous day and night.

Another illustration of the apparent non-inheritance of acquired characters which came under my personal observation was in making comparative studies of Southern Cotton varieties, a larger number of which was imported into Hawaii by the Federal Experiment Station in 1907-10. Some of these were pedigreed and were known to have been grown as annuals for many generations. Nevertheless, under our conditions practically all of them acted as perennial types. A similar condition prevailed in our rice breeding experiments. In our own experience covering some thirty years of experimentation with many types of plants we found little or no evidence that leads us to believe that there is well defined proof that acquired characters are inherited. My own humble explanation of all phenomena of this type of inheritance may be summed up in the wonderful potentialities of all living things.

More recently seriological and other novel influences have been brought to bear on our problem. Among these may be mentioned immunizing sera X-rays and radium. While it appears possible that some heritable variations have been obtained by these means, the fact remains that these agents are new and not well known and that the experiments are not yet completed to a definite conclusion, although much is being made of this work by those opposed to our own theories.

It would be interesting to consider the influence and effects of use and training in the species Homo sapiens and of the wonderful phenomena of instincts in animals. If acquired traits are not inherited, what is the explanation of the origin of extremely specialized instincts which the young of so many animals exhibit at birth, without training and no chance for imitation? All have seen how the young chick hatched in the incubator and without ever having seen other fowl walks upright, scratches the ground, pecks at grain and drinks freely within an hour or two after hatching. Entomologists tell us they have more wonderful examples among insects. Are these examples of habits which have become hereditary? It is little wonder that my esteemed friend, Dr. Muir, should think so. And while I still believe that few or no variations or so-called acquired characters which are ordinarily considered as environmental have as yet been fully established as being permanently transmittible or heritable, and while it seems quite definitely proven that m a n y o f them a r e n o t inherited, nevertheless, I greatly respect the views of the opposing side. As a matter of fact I have been long wanting to believe with MacBride and Kammerer "that our children and our children's children will more speedily attain all the good qualities that once we diligently acquired That it will be easier for them to execute what we mastered after hard training, that they will survive more easily to what we almost succumbed, that what we look for they will find, where we could make only a beginning, for them it will be happy consummation, and when we battle with victory still uncertain they, let us hope, will conquer."



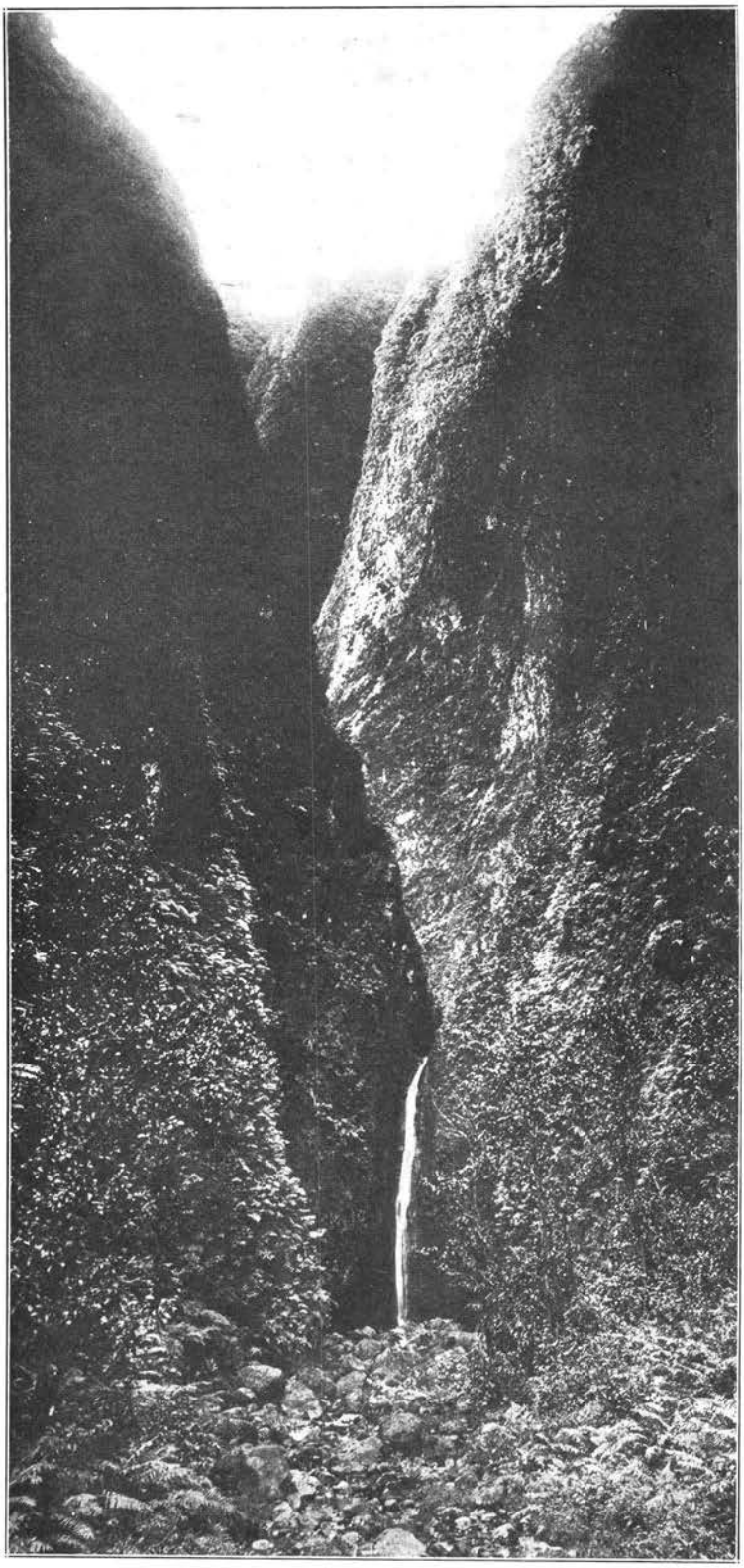
How the water is brought from verdure-clad mountains to the thirsty canefields; and the denuded mountain areas that have become deserts.

Water Problems in Hawaii

By MAX H. CARSON (District Engineer U. S. Geological Survey)
Before the Pan-Pacific Research Institution

I will speak partly tonight on the work of the Geological Survey on the measurement of water in Hawaii, and some of the ways in which the water problems here differ from those in other lands. We have conditions here in Hawaii rather similar to those we have just heard described in the talk about Peru. That is, in Peru they get their water on the east side of the mountains and have desert on the other side. We do not have deserts, but we have some similar conditions on our Islands. Our Islands have mountain ranges, and these ranges intercept the water, which falls on the eastern side of the mountains. Not only that, but it falls in the mountains. The breeze passes over the plains on the eastern side until it hits the mountains. This breeze, striking the mountains here, tends to precipitate the moisture, and when it reaches the top of our lower ranges, there is still enough moisture left so that we get a further precipitation, which is greatest just beyond the top.

In the Koolau mountains we get our highest rainfall on this side, but just a little ways on this side. Our rain clouds rise about nine or ten thousand feet, so when they strike the high mountains, like Mauna Kea or Mauna Loa, the moisture all drops on the windward side, and on the lee side we have no water. Up here in Manoa



A typical Hawaiian mountain gulch from which the waters may be conserved for irrigation purposes. Sometimes the mountains are bored to bring by tunnel from the other side the waters needed for growing sugar cane.

Valley we get rainfall that runs from 150 to 200 inches per year, and down at the beach we get about fifteen inches, so that in a range of two miles we get a variation of from fifteen to two hundred inches. On Kauai we get a rainfall of over 400 inches, and then it drops to below ten within a day's travel, not by air, but by foot. So you can go on foot in a day from a climate where we have 400 inches per year, to where we get from five to six inches, and that all in one or two rains.

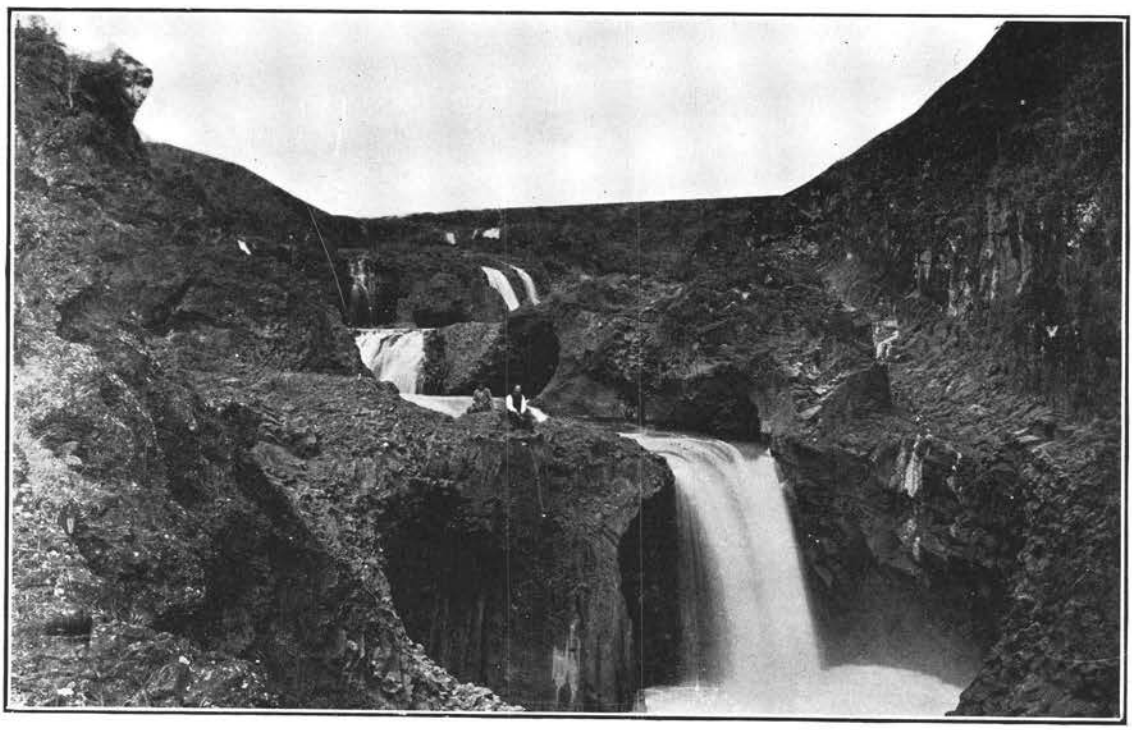
With the exception of the plantations on the Hamakua coast of Hawaii nearly all the sugar companies in the Hawaiian Islands have to depend on irrigation for their water. Their problem is to get the water down to the plains from the highlands.

We also have the problems of steep slopes and small streams. Valleys are close together. We have an illustration of that here on Oahu where you can stand with one foot in Manoa and the other in Nuuanu Valley, straddling the ridge. The streams coming down are small and there are lots of them, so that you cannot tap one stream and get much water. That means the problem of determining the amount of water is complicated. Where you have fifty small streams in eighteen or twenty miles to be measured it is obviously impractical to measure them all accurately all the way along. So that is one of the ways in which our problems differ from those in the mainland. Streams so small they would be passed up in the mainland we have to spend money on here for water gauges.

Our steep slopes and the rather spotty condition of rainfall makes our problems more difficult. For instance, there is a spot in Moiliili which is a rainy strip. You see dry pavements on the town side and the Kaimuki side, and wet ones in Moiliili. This spotty condition means one stream may be up and another down, making comparisons difficult. Due to the steep slopes the streams are also very flashy. A stream will run along with a small amount of water, and then suddenly it rises way up. Here in Manoa Valley we have a normal discharge of three or four million gallons a day. Then we will suddenly get a discharge that may run to three or four thousand million gallons. The South Wailua, on Kauai, has a minimum flow of two or three million gallons per day and a maximum of about forty thousand million gallons. That is one of the problems that we have to face in irrigation.

A man wants to know how much acreage he can put under cultivation, and he comes to us to find out. Our organization is the Territorial Division of Hydrography, which cooperates with the Geological Survey, Water Resources Branch, the three main divisions of which are the surface water division, ground water division, and quality of water division. There is also the power resources division, but it occupies a smaller field. Out here in the Territory we are represented by the Surface Water Division, and I am the engineer in charge. Our ground water problems out here just grew, and we were saddled with them. As the ground water division to which they belong is not represented here we are doing the work although we belong to the surface water division. The personnel of the Division of Hydrography of the Territy and the Federal Geological Survey in Hawaii is the same. We all have dual titles, so that sometimes I use Territorial and sometimes Federal stationery. Consequently it is a close form of cooperation—there is no conflict. It is working out very nicely. So much for organiztion.

The main water problems in Hawaii are problems of irrigation. We are not worried about power problems yet, although it would be physically possible, to develop power here. The artesian



Water flowing over lava beds on the island of Hawaii. These streams have their source in the forests high up the mountain side.

problem is connected largely with the city of Honolulu, rather than the plantations, because it is a question of control. Perhaps I had better leave that for the present and take up the measurement of water, which is the biggest job of our office.

The general scheme of measurement of water is based on the formula that quantity equals area times by velocity. This is the basis of our measurement. We have a current meter with which we can make a measurement of the quantity of water which is flowing in the stream. We stretch a tape across the stream and measure the mean velocity at about twenty sections, compute the area for each section, and multiply the velocity of the section by its area. This gives us the discharge of the section, and by adding the discharge of the sections together we have the discharge of the stream. In this way we can find out how much water there is in the stream when you take the measurement, but half an hour later it may be different. So we select a section in the stream, usually a pool above a ledge of rock or some other permanent structure that is likely to remain constant. We call this permanent structure the control, as this controls the level of the stream or pool. As long as this remains constant it makes no difference how the pool changes. A given quantity of water will always produce the same stage. If the water is one foot over the control, you will get the same quantity of water at one time as another. We attempted to take measurements at as many stages as possible of the same stream. Then we plot these on a curve which we call a rating curve. From this curve we make out a rating table which gives the discharge of each stage of the range for which it is

made out. We have an instrument, a water stage recorder, to give us a record of the stages, and as long as the control remains the same we can get the flow. Where a flood peak lasts only fifteen minutes or so and the stream rises as fast and drops again as quickly as our streams do it is quite impossible to obtain measurements at the higher stages and the problem of extending the rating curve is largely one of intelligent guessing. In doing that we use logarithmic paper, we get records of some other streams and compare them, we make slope analyses, and finally get a curve we think is right. And then the next season we may get a different curve and we find we were all wrong.

We are working now in Kalihi on a device for giving us a record of the slope of the stream at its highest stage. We have small floats which will rise but will not fall and therefore mark the point where the water was highest. By using four of these on one slope section, two at the upper end and two at the lower, and by taking the differences in elevation we can get the slope of the stream for the last flood. And by using this in the formula: Velocity equals c times the square root of rs, where r equals the haudralic radius and s equals slope we can determine coefficient c if the velocity is known. The haudralic radius can be determined with levels and the slope by experiments with these slope guages. The velocity can be determined from the rating curve over the lower sections of the curve that is defined by measurements. Then a curve of coefficient c can be drawn and extended for use in working out the velocities for stages not defined by measurements. The beauty of this is that the coefficient only varies between about forty and sixty, and you should get within ten percent of the right answer by using a coefficient curve.

That is all just an experiment, but it gives promise. So I think we will be able to contribute something in the near future to the practice of stream gaging. As we cannot measure all the streams we have gaging stations on a few and determine the flow of those in between by comparing them to the stations that are being measured. This is the best we can do, because it would cost too much to go into all of them.

There is another phase to this matter. You know, these people want records, and want them right now. How big shall they dig their ditches, how great an area can they cultivate, etc. The problem of the government on that kind of a proposition is to try and guess what they are going to need ten years from now, so we will have the information when they want it. We have not the complete records on hand, and nobody wants to put up the money for such an investigation, but they will come along ten years from now and want the information. That is the problem of the geological survey everywhere. Within the last five years the sugar plantations have been waking up very much to the question of the duty of water and studies have been started and the men who are making these studies are beginning to use our records, which were started in about 1910.

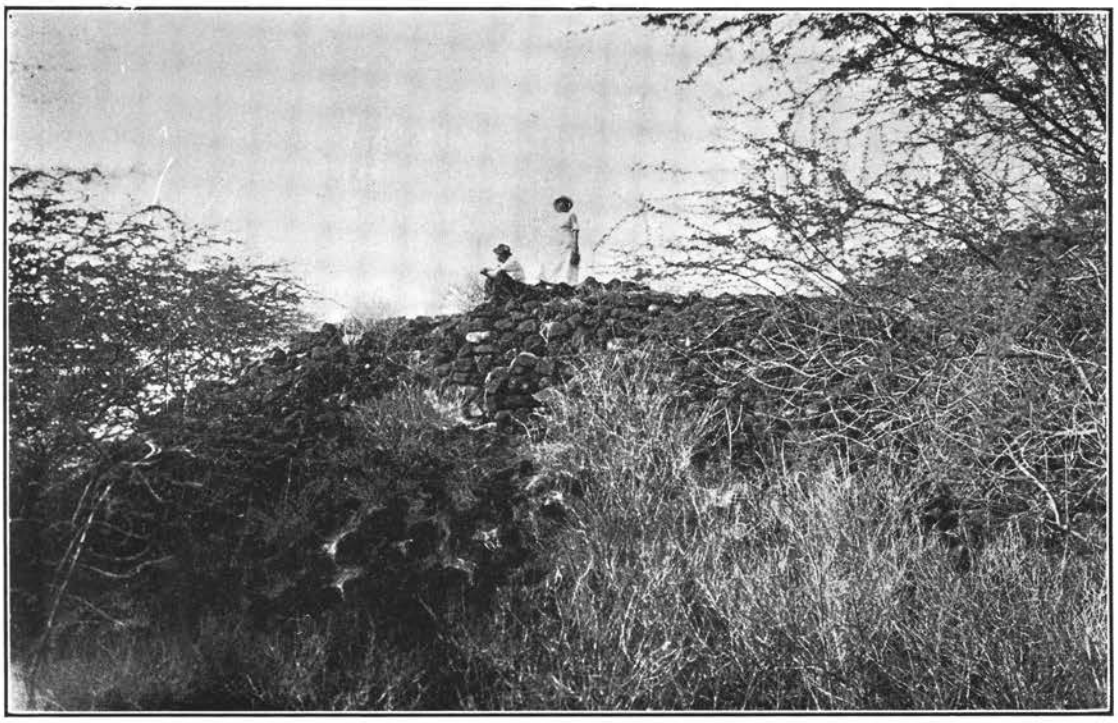
On the mainland they only need to read the stations in some of the larger rivers once or twice a day. But here if you get two records a day you would get nothing. For instance, the rain we are having right now would not show up on such a record for Manoa stream. So all our streams have recording guages, and we keep a close check. We have twenty on Kauai, forty-two on Maui, seven on Molokai and ten on this island. There are only two on Hawaii, largely due to physical conditions on that island. Most of the water there is privately owned, and the government has not much direct interest in their problems. On Kauai the water forms large streams. We have many sta-

tions on Maui, because the water there has been developed by a system of ditches. Much of the water is owned by the Territorial Government and leased to private interests.

I don't know that I have said much about the water problems of Hawaii. But before I conclude, let me say a few words about the artesian problem. We have under the plains of this island our artesian areas. They are formed by the lava rock, which is in general quite porus. This island was probably at some time about a thousand feet higher than it is now. Erosion has occurred, and the valleys have been cut out. The island lowered and these valleys have been filled with sediment, which was deposited right on top of this porus rock. This valley fill is practically impervious and the bottom now extends to below sea level. The fresh water behind and under this impervious layer keeps the salt water down. Artesian areas run from Kaaawa around Kahuku thru Ewa and Honolulu to about half way to Koko Head.

On the plantations they have tapped this supply about as hard as it will stand, thus reducing the pressure to the point where further draft might get salt water. But when they get to this point they have sense enough to know it and cut down their pumping. Here in Honolulu we have four main artesian areas and the city water system, furnishing water to consumers, is using less than half the water that is being drawn. The rest is being used by industrial concerns and irrigators such as the Rapid Transit, the Hawaiian Electric Company, the Y. M. C. A. and similar concerns and those who use water from private wells.

When you get twenty grains of salt in the water you begin to know it, and when you get up to forty it has a distinctly unpleasant effect. But this water is perfectly good for irrigation up to 60. Suppose we do get up to the point where we have 60 grains per gallon, and the city shuts down on the consumption, it would have no effect on the other wells, because they could still use their water for irrigation and industrial use. It is not that we will exhaust the supply, but we cannot control the amount we use. Suppose we were getting to the point where we were getting forty grains, and had to cut down, and then we had a series of dry years. That is the thing that the Sewer and Water Commission has been trying to get to the legislature. That is the problem we are working on, and on which we need further investigations to make the public realize the situation. I think it has gotten to the point where it is no longer a problem of our office, but should be given to an organization that can make a deeper study of it and make real constructive suggestions for the remedy. We have been telling people what the condition is, and now it is up to Honolulu to put somebody to work to remedy the condition. I can make a man seal a well if it leaks, and so we have been able to stop this loss, but this is all I can do.



Remains of the old Russian fort on the island of Kauai, where the Russian explorers landed.

Russian Scientific Investigations in the Pacific

By PROF. PETER SCHMIDT
Leningrad University

(Before the Pan-Pacific Club of Tokyo)

SCIENCE is international in its origin and in its nature and thus scientific researches and investigations unite the nations. Science brings before them the fact that they all have the same questions to solve and must follow the same ways to find the truth. Indeed there is nothing better than science to improve international relations, and since the furthering of such a purpose among the nations bordering on the Pacific Ocean is the aim of the Pan-Pacific Club, you will allow me perhaps to choose as the object of my address the scientific investigations on the Pacific undertaken by my countrymen.

Russian science is not very old. Last year the bi-centennary of our Academy of Sciences was celebrated and this occasion marked also the bi-centennary of Russian science. And next year will mark the 200th anniversary of the beginning of Russian scientific investiga-

Natives of Siberia, whose ancestors may be the progenitors of the North American Indian. They wander as far north as Behring Straits.

Russian peasants who have migrated to Siberia and are pushing the native tribes farther into the wilds of an inhospitable area.

tions on the Pacific Ocean. For in 1727 the first Russian scientific expedition under Commodore Bering appeared on the coasts of the Okhotsk Sea.

But in fact the Pacific Ocean and the Far Eastern countries were known by the Siberian Cossacks one hundred years earlier. Ivan Moskvitin was the first who came to the coast of the Okhotsk Sea in 1640. And later Poyarkoff, Stadukhin, Dezhnev (1640-48) and other Siberian pioneers discovered not only Amur and Kamchatka but also the Bering Sea and the Anadyr River. They were intrepid conquerors, and at the same time explorers, as they supplied the authorities with maps of the countries they had visited. The first map of Siberia compiled by Godunov was published in 1667 and contained indications of China, Amur, Kamchatka, but Japan was unknown to Russians at that time.

At the end of the seventeenth century Kamchatka was explored and conquered by Atlassov and Morozko. And in 1706 Michael Nasedkin discovered the Kurile Islands.

But the first real scientific expedition was that of Commodore Bering, planned and ordered by Peter the Great. It left St. Petersburg in 1725. This expedition had a scientific problem to solve, mainly to ascertain whether Asia and America were connected or separated by a strait. But the exposition did not solve this geographical enigma definitely as Bering on the ship St. Gabriel entered the strait now called the Bering Strait, reached the latitude 67 deg. 18 min. N., and not seeing any land to the north turned back. He did not see the American coast, whereas two expeditions, those of Fedorov and Gvozdv, were landed in 1730 on the coasts of America near the Prince of Wales Cape.

More successful from a scientific point of view was the second expedition of Commodore Bering (1733-41), as he was accompanied by two famous naturalists, Steller and Krasheninnikov, who zealously studied both land and sea, nature and peoples, and gave us a solid scientific basis for further studies.

This expedition was unfortunate. The ship was wrecked on the island which is called today Bering Island, and the famous investigator died of fever. But many discoveries were made; the American coasts were visited and the Aleutian Islands discovered. Surveys were made on the coasts of the Okhotsk Sea, Kamchatka, Kurile Islands and of a part of Japan.

After this excellent journey many Russian expeditions of extreme geographical value followed, especially in the beginning of the 19th century. The famous first Russian circumnavigation of Captain Krusenstern (1803-6) gave not only a survey of nearly all the Japanese coasts, Sakhalien, Kurile Islands and Kamchatka, but brought also lots of interesting and valuable observations on the flora and fauna of land and sea, made by the companions of Krusenstern, di Tilesiius and Langsdorff.

The expeditions of Lieutenant O. E. Kotzebue (1815-18 c. 1823-26) were also rich in discoveries, especially in the South Pacific, where many islands and groups of islands completely unknown were found and mapped. The expedition of Lutke discovered also many new islands in the South Pacific and studied besides the physical nature and fauna and flora of the Bering and Okhotsk Seas.

But the most remarkable was the navigation of the ship Vostok under Captain Bellingshausen, as the last not only surveyed some islands of the Antarctic archipelago, but was the first to discover, on Jan. 17, 1821, the Antarctic Continent. The part discovered was called Alexander the First Land. This nearly unknown Russian navigator had in fact accomplished a deed

One of Russia's typical cities, such as are being built in Siberia.

comparable to that of Columbus,—he had discovered a new continent, a sixth part of the world.

After the period of successful circumnavigations and expeditions on the sea, followed another period of more detailed study of the conquered lands.

From the middle of the 19th century we have a series of scientific expeditions undertaken mostly by the Russian Academy of Sciences and the Russian Geographical Society.

The names of Middendorff, Schrenk, Maack, Raddle, Friedrich, Schmidt, Dittmar, Maximovicz are very well known to the naturalists interested in the study of the East of Asia, as they collected an enormous amount of scientific material in every branch of natural history. Their collections and observations were not only studied but also published in many foreign languages so that they are accessible to all students.

These publications of the Russian expeditions form the solid basis for the knowledge of the nature of the Amur district, Kamchatka, Saghalien, as also of the neighboring parts of the Pacific Ocean.

Russian scientists have expended a great deal of energy on the exploration of the fauna, flora and physical condition of the Pacific and neighboring countries. At first their investigations were promoted by scientific interest alone, but later on with the increase in the population of the country and with the development of fisheries and the fur industry on the Amur, in Kamchatka and on the Commander Islands, scientific explorations have obtained a more practical character and have been directed chiefly to the study of fishes, fur seals and other useful animals.

The importance of such scientific investigations of a practical character

A College for Making and Housing Engineers Built by Japan in Manchuria

begins to be more and more acknowledged during the last decades, with the development of fisheries and lately also under the influence of the grave diminution in the number of fish due to over fishing. The most scrupulously exact scientific study of the biology of fishes and of the physical conditions of their environment, of their food supply and their migrations can alone afford a proper basis for their exploration.

These new problems, that are set by the present conditions of life, create new demands upon scientific investigation. If it was formerly sufficient to bring a skin, a skeleton or an alcohol preparation of an animal for the enrichment of science with possibly some valuable discovery, a precise idea of the life of useful animals is now necessary to be given, which can only be obtained at the expense of years of the most persevering study, connected as it is with numerous measurements, weighings, dissections, microscopic investigations and frequently with very complicated and expensive experiments, such as, for instance, fish marking required for the study of fish migrations.

This alteration of the problems of scientific exploration had its influence in the methods of investigation. Indeed from the simple collecting of zoological objects, that demands the exertion of a few, it has now become necessary to institute complicated collective researches of many scientists of different specialties and to have ships specially equipped for scientific work.

Moreover, if in past expeditions, various countries could work in different parts of the sea and obtain scientific results of definite value, now, in view of the widening scope of contemporary scientific problems, presenting ever increasing difficulties, the study of the sea should be undertaken by the united efforts of all interested countries and so co-ordinated as to conform to some one general plan, established with their concurrence. The same methods of in-

vestigation being followed by all, its results would very much gain in being comparable.

In this respect we have a most convincing example in the organization of an international scientific exploration of the northeastern part of the Atlantic: "The International Council for the Study of the Sea," created by Great Britain, Germany, the Netherlands, Belgium, Denmark, Sweden, Norway, Russia and Finland in 1902. It drew up a general plan of marine investigations for all these countries, submitted scientific exploration to certain regulations, worked out new methods, raised new problems and co-ordinated the publication of reports.

The International Council organized also at Copenhagen a Central Laboratory for elaborating and testing oceanographic apparatus and instruments used for marine investigations.

Many scientific investigations have been organized by the governments represented in the Council and they gave exceptional results for the benefit of science and practical purposes.

In the North Pacific many most important biological, hydrological and practical problems connected with the sea industry are awaiting solution.

As the nature and fauna of the North Pacific Ocean are not yet sufficiently investigated, it would be especially desirable to conduct preliminary exploration on a general plan by means of like methods, for the convenience of comparison and for drawing general deductions. It would also be of great advantage to coordinate the methods of exploration with those of the International Council for the Study of the Sea, as then the tracing of parallels between the natural conditions of the Pacific and Atlantic Oceans would be rendered much easier.

Hitherto the explorations of the Pacific, undertaken by various countries, has not been coordinated and it is a matter of difficulty to compare the results obtained. However, the mighty unifying spirit of science exemplified in the organization of Pan-Pacific Science Congresses gives us hopes that an international agreement will be attained and the exploration of the Pacific will be undertaken in the future by the united force of all interested nations and will give us a new example of the productiveness of scientific cooperation.

A typical Siberian village.

The Science of Social Harmony

By E. C. ANDREWS
State Geologist, N.S.W., University of Australia

(Before the Pan-Pacific Club of Tokyo)

IT gives me great pleasure to speak at this gathering. Listening to the address which has gone before, and knowing what I do about the Pan-Pacific Union it would appear that its real aim is the promotion of harmony among the peoples of the Pacific. Governor Farrington of Hawaii said this when speaking of the work of A. H. Ford to the Pan-Pacific Science Congress in Honolulu.

Let us assume for the moment that this promotion of social harmony between nations already "Pacific" is our real aim. Have we any clear-cut program or rules wherewith to attain our grand purpose? We must confess that all of us have great aspirations, yet remarkably few of us ever become truly inspired. The hisses of the small boys at the "movies" when the villain is doing his worst, and their vociferous applause when he is routed by the hero, show how greatly they aspire. Yet in the walks of life they become keen competitors for place and position. They do things in actual life which their better selves condemn. In other words they receive no inspiration; they appreciate the good, but they rarely practice it.

Let me state the solution as I see it in the case of Science. One of the great books of the world has it somewhere that "Ye shall know the truth and the truth shall set you free." Science is divided into two groups, scientists and quacks, or scientists and those who seek place and recognition. I wish to speak here only of the true scientist.

The scientist aims at truth for its own sake. He solves a deep problem in Natural or Mental Science. He ascertains the Law of Gravity and the science of Astronomy is made possible. He finds the law of vibrations and straightway telegraphy and "wireless" spring into our ken. He finds the laws of hygiene, both material and mental and salvation is already available for those who wish to become well.

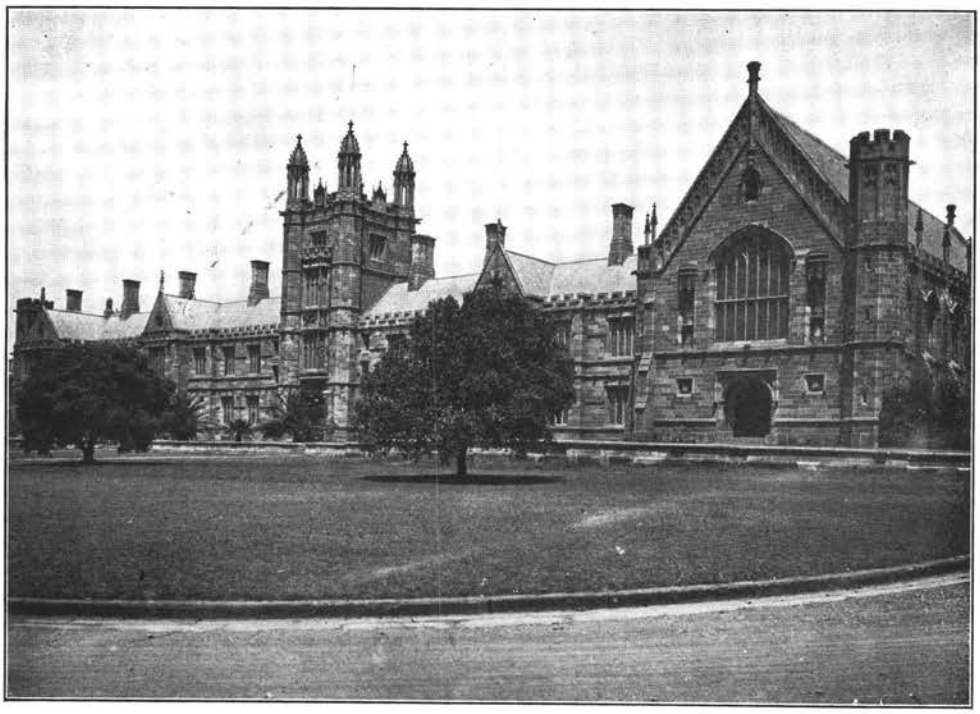
His immediate problem solved he straightway passes onto the next problem awaiting solution. He takes out no patent rights for his work, neither material, intellectual, nor spiritual. As a true mother nurses her child without stipulation of material reward, as a nightingale pours forth its song, so the scientist gives freely. Nevertheless he also reaps, but the harvest is spiritual. As the Master said, "The truth has made him free." All the great scientists have been spiritual. They know no creed but Truth and they are gathered among the Immortals. They become Inspirations for future workers.

Science helps man, it promotes social harmony between nations, because it is Truth. It knows no Diplomacy. It is abiding. It is the same yesterday, today, tomorrow and forever. It also confers material benefits. Man and animals alike can appreciate that phase of its activities. Man does not need preaching. He abhors the didactic. He has enough aspirations, enough to find out by experience that "the road to Hell is paved with good intentions." What he needs is material benefit given unselfishly. This results in his moral advancement. This sounds simple enough but in actual prac-

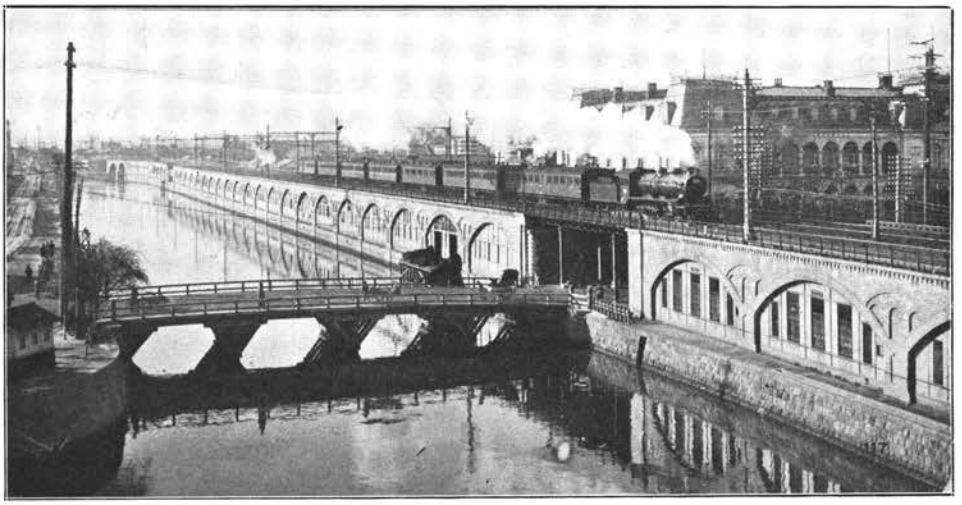
tice it is exceedingly difficult. It is the boy in the "movies" again. For he who would help his fellows disinterestedly, must not even seek thanks, limelight, nor other social recogntion. This is Inspiration.

Let us take a concrete case. Sometime ago a few geologists became interested in the Pacific. It gradually dawned on them that this vast region was a great structural unity. It had endured through the ages as a basin surrounded by continents. It was the Pacific of the Occident, the Taiheiyo of the Japanese. It was so vast a structure that the nations on one side of it did not even suspect the existence of comrades or foes on the other side, until recently. Then came the annihilation of time and space by the findings of science. Then men conferred and asked themselves if this great inorganic unity might not also be made to support a great organic unity. It were easier to maintain peaceful relations between nations which have not fought each other than to patch up peace after severe strife.

Fear begets strife. Convergence of opinion promotes peace. The scientist knew that man can appreciate material benefit. If someone could gather representative scientists from various countries and pool their knowledge they might show the nations how to grow two blades of grass or fodder where before only grew one. The scientist, being a philosopher, knew that he must not say that he is altruistic, this would prove him to be not a scientist but a man seeking recognition. His left hand must not know what the right one was doing. He must simply cast his bread upon the waters knowing that it "shall return after many days."



One of the buildings of the University at Sydney, Australia.



The elevated railway in Tokyo has been electrified, as have some of the state railways.

Electric Power in Japan

An Address Before the Pan-Pacific Club of Tokyo by I. F. Baker, Director of the Westinghouse Company in Japan

At this time, just forty years since the introduction of electric power to Japan, it is appropriate to consider the economic assistance which electricity offers to mankind and more particularly that portion of the world which touches the waters of the Pacific Ocean.

The first servants of mankind were no doubt human beings themselves, and evidence of this exists in the gigantic engineering works of Egypt. The Pyramids and other structures were built by the intense application of thousands of human bodies controlled by a few master minds. Later on animals were domesticated to such an extent that they superseded to some extent human toil, and as civilization progressed the power of the wind was utilized for the propulsion of ships and driving of light machinery. The last century witnessed a great development in civilization by the use of steam, and steam power still has a powerful influence in increasing the comfort and efficiency of human beings. However, it is becoming more and more evident that electricity will be the universal power of the future.

The present electrical horsepower of Japan is approximately five millions distributed among seventy million people. If we assume that one horsepower is the equivalent of the physical effort of fourteen men, it will be seen that each person in Japan has at present one electrical servant. Such servants do not insist upon an eight-hour day; they are ready to work at any time, and to their extensive employment in Japan is due much of the great advance in industry as well as the improvement

Electricity developed from water power now turns spindles on a Japanese cotton mill.

Many mountain streams in Japan furnish from their upper reaches abundant water supply.

in the standard of living which has taken place. That the limit has not been reached is shown by the fact that in the United States electrical development has reached forty million horsepower, which provides three electrical servants for each inhabitant, thus raising everyone to the situation of an employer of labor and placing him in the desirable position of greater income with less expenditure of physical labor and shorter hours of work. That Japan is approaching this condition is shown by the fact that power consumption is doubling every five years. This increased use of power is caused by its application to the electrification of existing mills, the manufacture of chemicals and a widespread increase in use in the home.

The value of electricity as a motive power in mills has long been recognized, but another field has now opened which is freely predicted to be of equal importance in high-grade manufacture, that is the use of heat processes in building goods for the market. The best grades of steel are not only refined in electric furnaces, but the best tool steel is finished in electric tempering furnaces. Furthermore, these furnaces are unequalled for tempering wire, the higher grades of glass, and other materials which require close temperature control to give satisfactory results. Tons of expensive lenses are now imported into Japan each year which would be annealed locally with the aid of electricity. Electric heat permits the common laborer, with no special knowledge of heat treatment, to produce a better product than the experienced treater who uses fuel fired equipment. Surely here is a field of the greatest importance, as it enables a country not only to supply its own needs, but to increase the quality of its products so that they can be successfully exported abroad.

Electricity fills a primary need in the chemical industry, and large electric plants are being built for making fertilizers. Furthermore, the low cost of power in Japan will permit eventually the manufacture of aluminum, which is needed so much as a substitute for steel and copper.

Electricity in the home is now considered a necessity. Every year thousands of charcoal hibachi are replaced by the more cleanly and healthful electric heater. The electric iron and fan are familiar friends in hundreds of thousands of households, while many electrical devices for cooking and heating are extensively used. Another great field is that of refrigerators. It is expected that 1,000,000 electric refrigerators will be marketed in the United States this year, and their use will no doubt spread to Japan. Therefore, electricity not only provides heat in winter, but comfort in summer by fans and cold storage by refrigerators.

Japan is rich in water power, and statistics show that from this source is being realized ten billion horsepower hours per year. Reduced to simpler terms, this is the equivalent of five million tons of coal saved annually, which at a low rate of 10 yen per ton, means a saving of 50 million yen worth of that valuable resource.

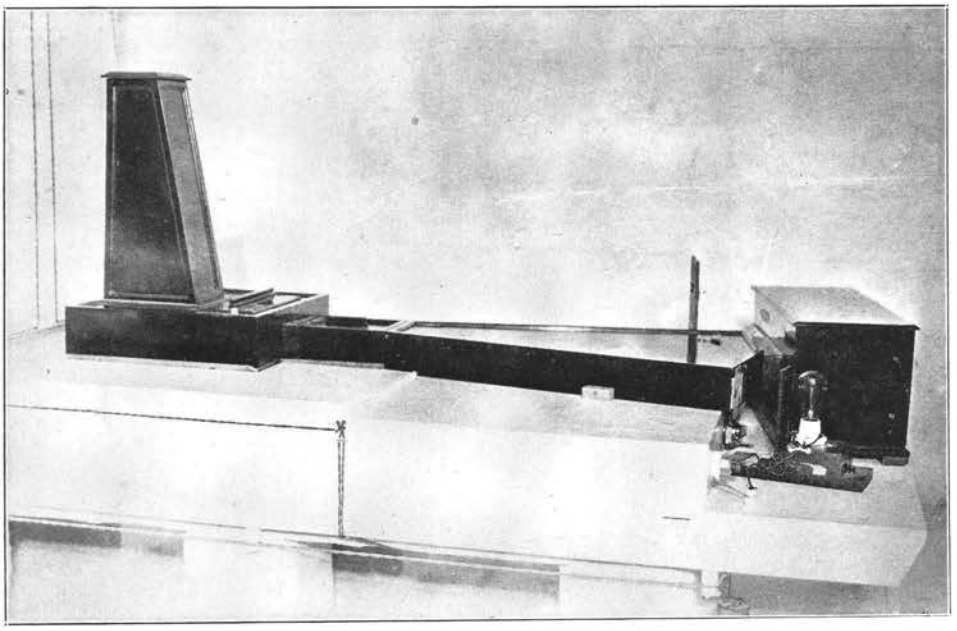
It is well known that Japan has a limited supply of coal, perhaps enough to last 250 years if the present rate of consumption is not exceeded. By a simple calculation it can be shown that the hydro-electric power already developed has prolonged the supply of coal by 40 years. The present and future development of water power is, therefore, of immediate interest to everyone in Japan, in order to save coal. The Imperial Government has already assisted such enterprises by granting power concessions to worthy companies. Furthermore, extensive electrification of the railways is taking place to substitute the power of water for that of steam. However, the development of hydro electric power re-

quires large sums of money, and it is not an easy problem to provide this. The installation of a horsepower of water power costs about three times the investment of a horsepower of steam, and with a restricted appropriation of money there is great temptation for electric companies to install the less expensive steam power. Of course the expense of coal and the shorter life of a steam plant raises the cost of power until it is more than that of power from an hydraulic plant; nevertheless, the demand for electricity must be met in some way with the funds available.

One handicap which exists is that the bonds issued by a company cannot exceed the paid up capital stock. This means that some companies in Japan must sell more stock before they can carry out plans for expansion. A company must, therefore, pay a high dividend of 9 or 10 per cent on the stock in order to sell it, whereas they can borrow money at 7 per cent. It has been suggested by several financiers that this situation can be easily and safely remedied by the change in the law to permit the issue of two yen in bonds for every yen of stock issued. This would provide cheaper and simpler financing, making a healthy condition in the company and benefitting the public at large.

Some countries on the Pacific are not so fortunate in possessing large water power sites, but they are endeavoring to improve their economic condition by other natural resources. In Australia, for example, there is a tremendous deposit of low grade fuel called "brown coal," which can be burned in boilers; hence a large power plant has been erected at this spot and the power is being transmitted to some of their larger cities. Development of hydro-power and electrification of railways is also proceeding steadily in New Zealand and in Java. The unrest in China has greatly retarded the development of power in that enormous country, except in the protected district of Shanghai, where the use of current is progressing at about the same rate as in Japan. However, the total developed power in China, if distributed among all their people, could only afford one electrical servant for every 70 inhabitants, so that electricity has, thus far, done little to lighten the grinding toil of that country. The advantage of electric power is clearly recognized in Russia, and large projects are contemplated there which will be of great assistance in building up that nation.

The sum total of the widespread use of electricity in countries of the Pan-Pacific Association will make the Pacific Ocean truly the centre of unequalled happiness and prosperity.



A Meline-Shaw seismograph as installed at the University of Hawaii.

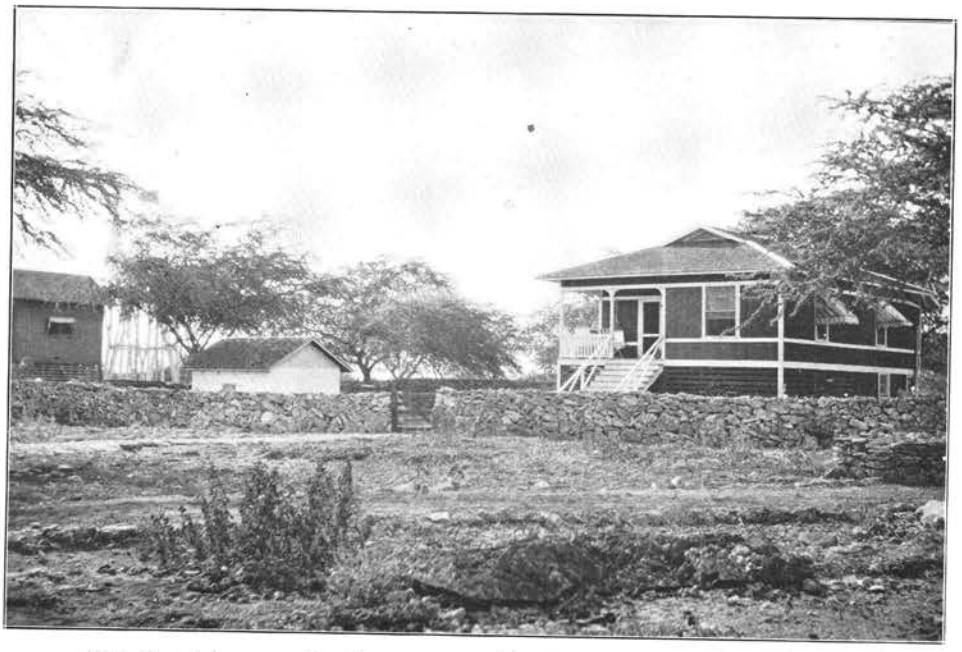
Recording Earthquakes and the Earth's Magnetism in the Hawaiian Islands

By COMMENER N. H. HECK

Chief, Division of Terrestrial Magnetism and Seismology, U. S. Coast and Geodetic Survey

Hidden away in a grove of keawe or algeroba trees on the coral plain near Ewa, Oahu, there is a group of buildings of which little is known by the people of Oahu, yet the work carried on here is known by groups of scientists in all parts of the earth. This is the magnetic observatory of the United States Coast and Geodetic Survey, which has been in operation for twenty-five years and for all that time has made continuous records of the changes in the earth's magnetism. Besides this magnetic work, earthquakes have been recorded at this station since 1903 until recently when the seismographs were moved to a site provided by the University of Hawaii. The Coast and Geodetic Survey will continue the seismological work with the cooperation of the University.

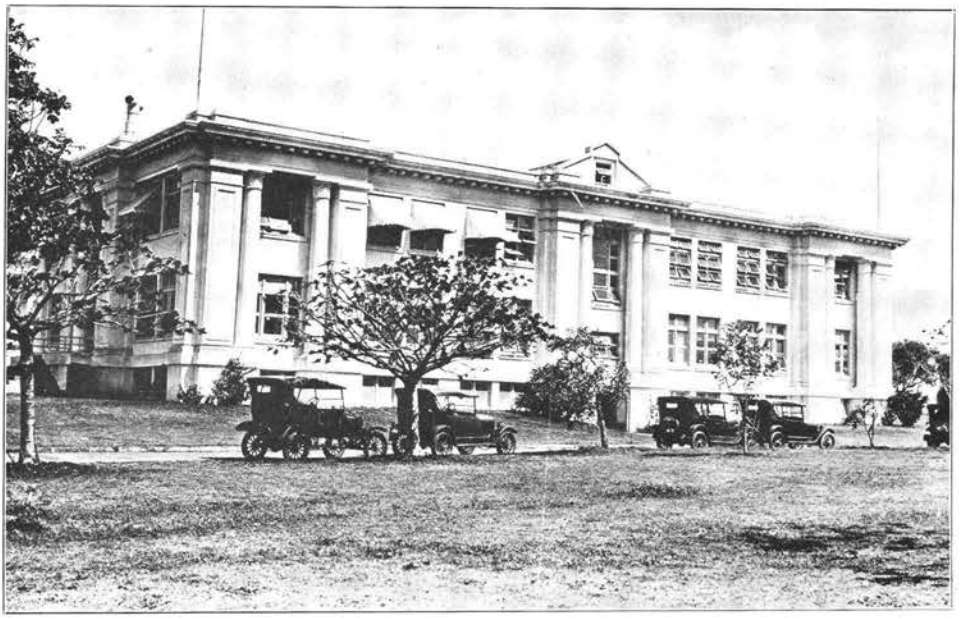
The first question which occurs to



The Honolulu magnetic observatory at Ewa Plantation, near Pearl Harbor.

anyone is, what is the use of magnetic observatories. Since the station is one of forty found in different parts of the earth, it will be well to describe how the work as a whole is carried on. The United States makes an important contribution by operating five magnetic observatories in the following places: San Juan, Porto Rico; Cheltenham, Md.; Tucson, Arizona; Sitka, Alaska, and Honolulu, T. H. Various governments and private institutions operate observatories and in the Pacific region those in Japan, China, Philippine Islands, Java, Australia, New Zealand and Samoa are noteworthy. The Carnegie Institution of Washington through its Department of Terrestrial Magnetism and Atmospheric Electricity, operated observatories in Peru and Western Australia.

These observatories have a twofold function. The first is the practical one of keeping mariners' charts correct as regards magnetic information. The direction of magnetic north toward which the needle points is constantly changing at different rates in different parts of the earth, and the mariners' charts show the difference between magnetic and true north for the date when the chart was issued. Though many of the trans-Pacific liners have gyro compasses and automatic steering, even these have a magnetic compass in reserve and smaller vessels depend entirely on the magnetic compass and are likely to continue to do so. It is, of course, true that magnetic information for the entire ocean cannot be obtained from single observatories. Each country or organization makes magnetic observations at various points both on land and sea, and in certain localities repeat the observations from time to time. The Carnegie Institution has sent its non-magnetic yacht Carnegie into all the oceans, including the Pacific, and made accurate magnetic observations. However, all observations not made at magnetic observatories are corrected to standard values by means of observatory results and the instruments have to be compared from time



Gartley Hall, University of Hawaii, the home of the seismograph.

to time at the observatories. When the Carnegie did its work in the Pacific Ocean its instruments were compared at Ewa.

In addition to the use of magnetic information by vessels, magnetic maps are now needed for the steering of airships of various kinds. These maps are prepared from data obtained at magnetic observatories and stations.

The other purpose of magnetic observatory work is scientific; to find out the laws that govern the changes in the earth's magnetism and, if possible, its source. This is one of the most difficult problems among the sciences relating to the earth, and while progress is being made, it is very slow. For the present, the most important need is to keep on making continuous accurate records. Honolulu has an especially important place in this program not only from its island position in the center of the North Pacific, but because there has been no break in its records since the start in 1902. If the series can be continued without a break, its value will increase with the length. A recent practical use for observatory results is in connection with the location of geological formations containing oil by locating rocks of magnetic character associated with oil formations. Magnetic observatory records are also being used in studying difficulties in radio transmission which appear to come from outside the earth and to be related to the phenomena which cause some of the variations in the earth's magnetism.

Anyone who has visited the Ewa station will ask why it is necessary to have the station so far from Honolulu and in so remote a locality as the coral plain. The answer is that the entire island of Oahu is of volcanic origin and nearly all of its rock is magnetic. Probably the only exception is the coral which in certain places is laid down on the volcanic rock in fairly thick beds. In such cases the magnetic rock is far enough away so that it will not seriously affect the instruments. It is important that there should be little change over the area occupied by the buildings. Investigations in 1902

and others in 1926 show that this site is the best on the island from this viewpoint.

Of all the studies relating to the earth, one of the most important for the Pacific region is earthquake investigation. There is no other portion of the earth where so much densely populated area is subject to earthquakes. It is significant that modern seismology had, to a large extent, its origin in Japan. In taking up her program of scientific development various European scientists were called to Japan, and among these Milne, Gray, and Ewing became greatly interested in seismology. After spending some years in Japan they returned to Europe and started interest in earthquake study which spread throughout the earth, the work in Japan being continued by Omori, Imamura, Yamasaki, Shinjo, Matzuyama and others. The British Association for the Advancement of Science became interested and placed seismographs of the Milne type at many points throughout the earth. One of these was placed at Oahu College and later transferred to the magnetic observatory at Ewa. In 1922 a modern seismograph, the Milne-Shaw, the standard British type, was installed. It is this instrument which has just been transferred to the University of Hawaii.

The Coast and Geodetic Survey will continue its seismological work in the basement of Gartley Hall, of the University of Hawaii, fully equipped with seismograph piers, all of which have been placed at its disposal by the President and Board of Regents of the University. The station will be known as the University of Hawaii Seismological Station of the Coast and Geodetic Survey. President D. L. Crawford and Prof. Kirkpatrick are cooperating in every practicable way and it is believed that this cooperation will have important results for seismological work in the Pacific Region.

The practical side of earthquake investigation—finding means to reduce the great loss of life and property and the destruction of cities—does not at first sight appear to be connected with observations in the Hawaiian Islands, which do not appear to be subject to great earthquakes. However, seismologists agree that the earthquake problem must be studied as a whole and that we cannot solve the local problem without carrying on work at the same time on the transmission of earthquakes to a distance. For this purpose the station at Honolulu is extremely valuable because of the great number of earthquakes in the Pacific Region. Practically its entire rim and a large portion of the island area may be considered as a series of great earthquake factories, with Honolulu so placed as to have them come from every direction. It is for this reason that this station is especially important in the location of earthquakes occurring in the Pacific. It is one of the most important of a chain of stations which are making reports by telegraph to Washington. The Coast and Geodetic Survey, with the assistance of the Jesuit Seismological Association, Science Service, and various individual stations in Canada, Philippines, and Samoa is determining the location of all larger earthquakes within a short time after the earthquake.

It is well known that the Hawaiian Volcano Research Association has a laboratory at Kilauea where, in addition to other activities, seismographs are operated. It should be understood that there is no conflict with the activities in Oahu and that while they are related they are quite distinct. The seismographs there are for the purpose of locating nearby earthquakes associated with the activity of the volcanoes and are not adapted to recording in a satisfactory manner distant earthquakes. There is a definite relation between volcanic activity and earthquakes, but this is far from being clearly understood and theories vary widely.

Irrigated rice lands in Siam.

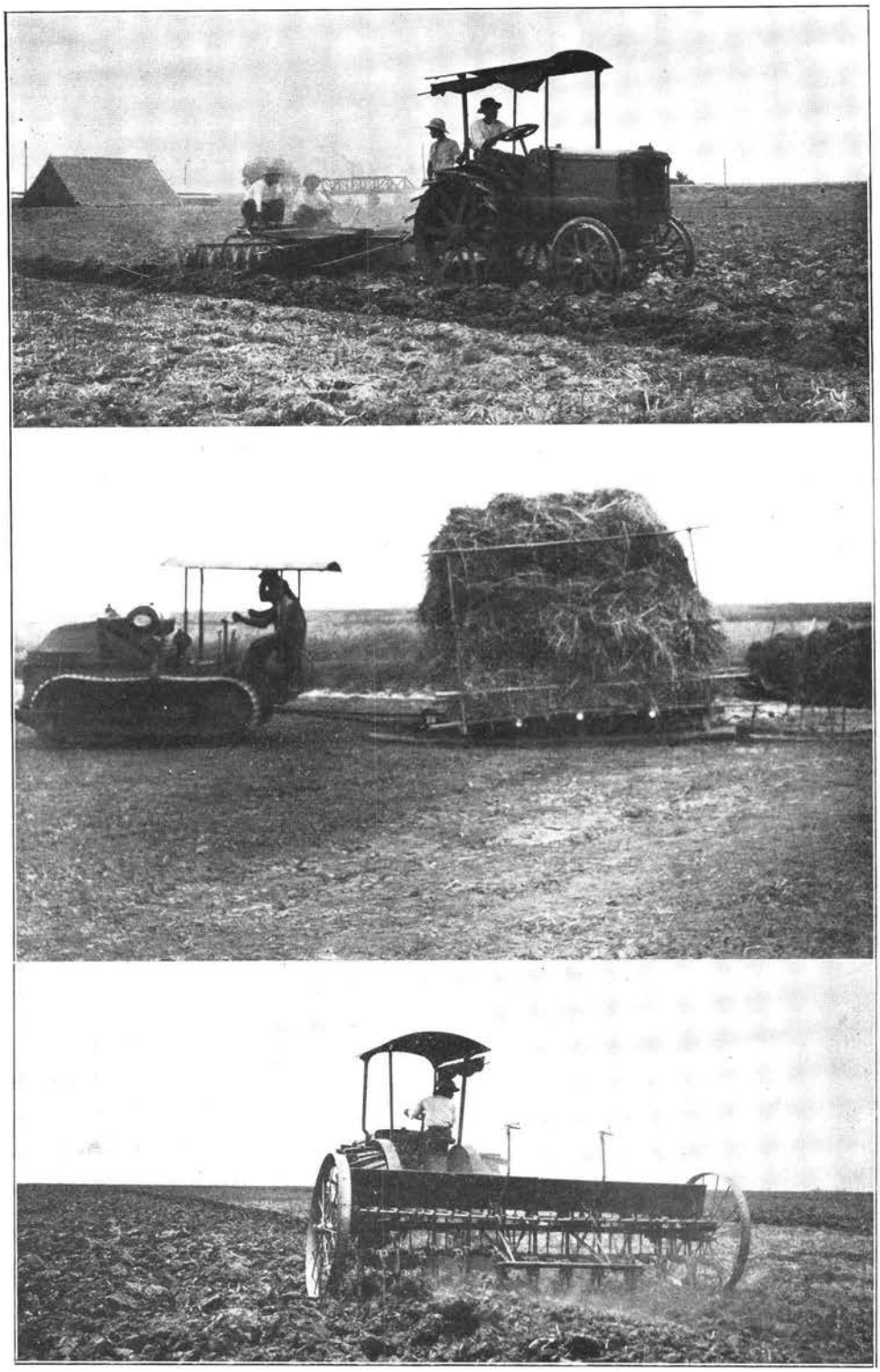
Reclamation and Irrigation in Siam

By SHAO PHYA BALADEB
Minister of Lands and Agriculture

AS this is the first report of its kind to be issued by the Royal Irrigation Department, a brief note is necessary, explanatory of events which led to the establishment, or to be more accurate, the re-establishment, of the Royal Irrigation Department as at present constituted.

The problem of stabilizing, increasing, and improving the rice production of the country, has been one that has been of primary importance for many years past, and the more Siam has advanced towards one of the leading places, as a rice producing country, the more acute has become the necessity for finding a solution to the problem.

The average rainfall of the Central Plain of Siam, which comprises the whole of the deltaic tracts served by the Menam Chao Phya, the Menam Nakorn Nayok, Menam Prachin, and Menam Bang Pakong as well as the lower valleys of the Menam Prasak, the Menam Meklong and the Menam Bhejaburi, and in which area are situated the six inner circles which are responsible for most of the rice produced for export, is only 1052 mm. (41.43 ins.) which compares very unfavorably with the rainfall of its most adjacent



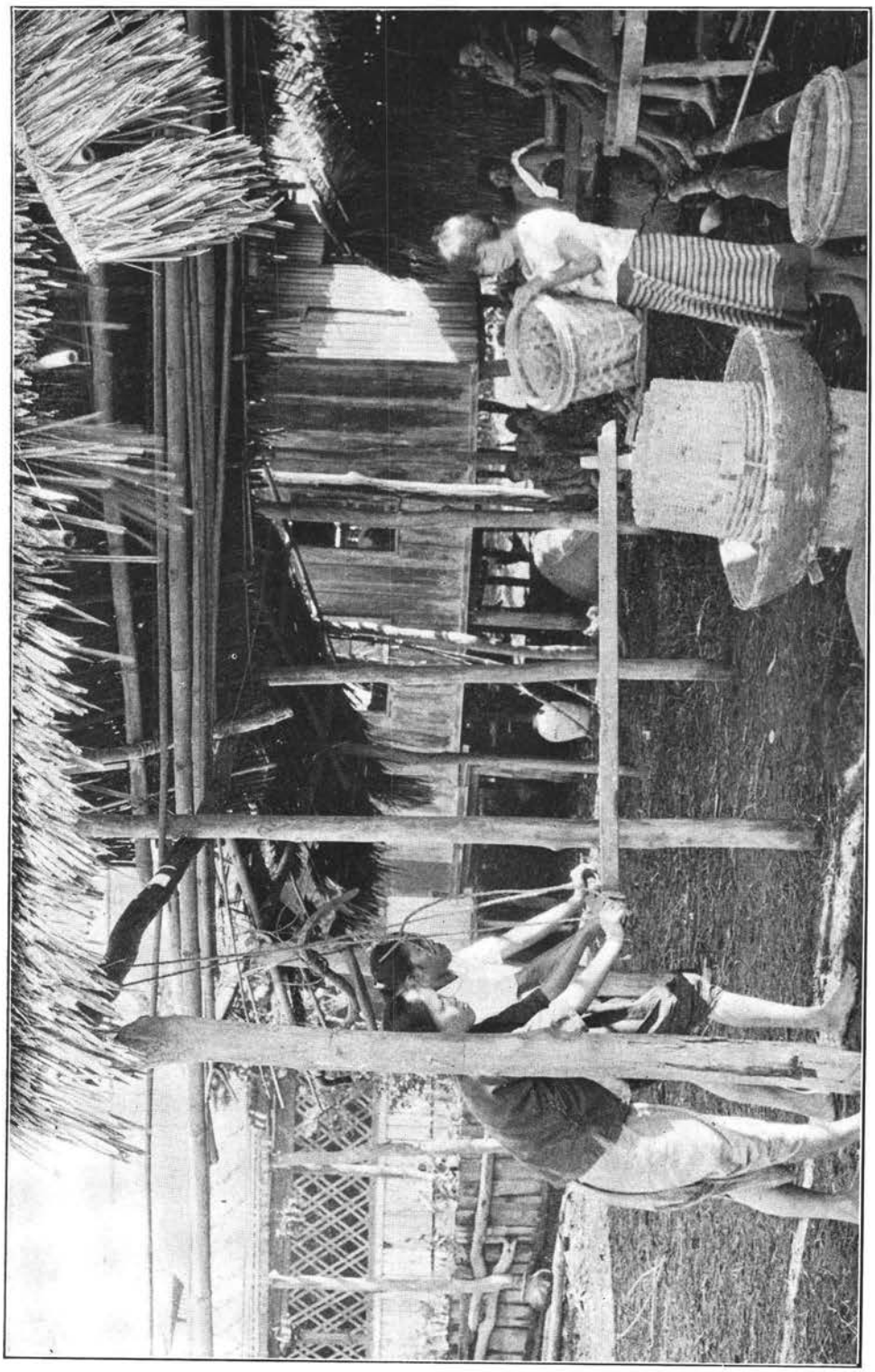
Modern farm machinery is setting a pace to the peoples of Siam, and today every effort is being made to introduce modern agricultural methods and accustom Siam to their uses.

neighbors and competitors in the world's rice markets, viz.: Burma with over 4000 mm. (157.5 ins.), and the plains of Indo-China with an estimated normal of 1800 mm. (70.9 ins.); the average rainfall during the ten years 1906-1915 was in Annam 1850 mm. (72.85 ins.), Cochin China 1520 mm. (59.85 ins.), Cambodia 1550 mm. (61.02 ins.). Actually in the portion of Burma south of the Salween river immediately west of the Central Plain of Siam, there is a normal rainfall for the year of 4658.1 mm. (183.00 ins.) in 141.8 days and a normal for the rice growing period, June to November, of 4032.7 mm. (158.74 ins.) in 116.1 rainy days.

The actual depth of water required to mature a rice crop, based on records obtained from countries (India, Burma, Egypt and Java) where irrigation methods have been brought to a high degree of efficiency, may be taken as 6 feet or 1829 mm. and this quantity is required during the rice growing season say from the 1st of June to the end of November. Now the average rainfall in the Central Plain for this period is 1052 mm. (41.43 ins.) so that the average rainfall falls short of requirements by as much as 777 mm. (30.57 ins.). In years of good rainfall the deficiency is made up by the rivers spilling over their banks, but in years of scanty rainfall, or rainfall coming at the wrong time, it is more than probable that the rivers unassisted will not rise to such a height as will provide for satisfactory inundation of the crops within their spheres of influence, and when these conditions prevail, there is generally damage over wide areas, both in the way of total failure and attenuated outturn of grain.

The first serious attempt in the Central Plain of Siam at anything approaching an irrigation scheme was made by the Siam Canals, Lands and Irrigation Company, which Company some forty years ago obtained from His late Majesty King Rama V, a concession which has since been known as the Rangsit concession. This company dug a series of canals in the concession area, and constructed certain locks and sluices; the object of the works, however, was merely to conserve whatever water came into the area by natural means in time of scarcity of rainfall and low river supply, rather than to provide irrigation works in the true sense, and they could do nothing to ensure that the low river supply could be utilized for the benefit of the growing crops, instead of running uselessly to waste in the sea. Briefly the scope of these works did not go far enough, and the canals dug by the company were simply inundation canals serving the purpose of inter-communication rather than any other purpose, and after a few years it was found that owing to rapid silting, portions of the land opened up by the system became once more cut off and inaccessible. The Rangsit system of canals were completed in the year 2439 B. E. (1896) and the concession lapsed to government in the year 2458 B. E. (1915) when the works were taken over by the Royal Irrigation Department.

It was hoped that irrigation schemes carried out on the lines adopted in the Rangsit Concession would meet all the needs of the country, in stabilizing the rice production, and in providing that exportable surplus of rice, which the growing economic conditions demanded in ever increasing quantity, and that this system might in course of time be extended to cover the whole of the great Central Plain. The inherent defects of the scheme, however, soon made themselves so evident, that it was realized that something very much more comprehensive was required if Siam was to maintain the position she had gained as one of the world's food producers. Though the Rangsit scheme brought under cultivation about 350,000 acres of first rate rice land, the actual matured area was never more than 40% of this total and the high hopes entertained of



In contrast to the modern methods of agriculture being introduced by the government in Siam, we have still the primitive rice husking mills operated by women who supply the cheap labor in Siam.

an increase in productivity as a whole was not equal to expectation.

In November 2442 B. E. (1899) Chao Phya Devesr, at that time Minister of Agriculture, after a tour of inspection through the Rangsit area, submitted a report to His Majesty the late King (Rama V), proposing the appointment of an hydraulic engineer as an adviser to the Ministry of Agriculture. His late Majesty King Rama V was graciously pleased to approve of the proposal and accordingly negotiations were opened with the Government of the Netherlands East Indies for the loan of the services of an irrigation expert for the purpose of investigating the irrigation possibilties of the Central Plain. As a result, the services of Mr. J. Homan van der Heide were placed at the disposal of His Majesty's Government. Mr. van der Heide arrived in Bangkok in June 2445 B. E. (1902), and after spending eight months investigating the possibilties of irrigation, he submitted a report in January 2445 B. E. (1903). The Royal Irrigation Department (Krom Klong) was then constituted in 2446 B. E. (1904) and Mr. van der Heide was appointed the first Director General.

Financial exigencies, however, prevented the realization of any of the main projects put forward by Mr. van der Heide, but at the same time the fine system of locks and sluices projected by him to conserve water in the southern portion of the Central Plain were constructed on both east and west banks of the Menam Chao Phya, and these works while they fell short of the true requirements of irrigation works, added materially to the prosperity of the country by enabling inundation water to be retained until such time as the rice crop had come to full maturity, but like the Rangsit works they could do nothing to assist in drawing in supplies when the rivers themselves did not rise to a sufficient height to inundate.

The old Royal Irrigation Department remained in existence long enough to bring these minor works to a fair measure of completion, when, as funds were not forthcoming to make a start with the major works which had in the meantime been worked out in detail by Mr. van der Heide and staff, the government decided to postpone the construction of irrigation works indefinitely, and at the beginning of the year 2452 B. E. (1909) Mr. J. Homan van der Heide left Siam to take up a leading position in the irrigation service of his own government. On the retirement of Mr. van der Heide, Mr. J. van Tuburgen, Deputy Director, became acting Director General until August 2452 B. E. when Phya Sawasdi Voravithi was appointed Director General, and a few years later on the 3rd of April 2455 B. E. (1912) the Royal Irrigation Department ceased to exist for the time being.

Climatic conditions, following on the decision of government in the year 2452 B. E. (1909) to postpone indefinitely the construction of irrigation works, soon made it evident that this question could not be shelved for very long, and two unfavorable years in succession at the beginning of the reign of His late Majesty King Rama VI, when the supply in the rivers was particular low, again forced the question of irrigation to the front.

His late Majesty was then graciously pleased to order, that, measures should be again considered whereby such recurrent checks upon the advancement of the Kingdom, and upon the well-being and prosperity of His Majesty's subjects might best be avoided in the future. In consequence of these instructions, a commission was formed under the guidance of His Royal Highness the late Prince Rabi, then Minister of Lands and Agriculture. The commission reported that to concentrate upon rice production, and to supplement by scientific irrigation, the natural but capricious supply of water obtained from rainfall and river inundation, was the best means to secure agri-

cultural results necessary for the regular provision of that public and private wealth, without which the welfare of the state and its inhabitants could not be assured. On receiving this report His late Majesty was pleased to instruct the Minister of Lands and Agriculture to prepare irrigation schemes to meet the requirements of the case.

Before starting on another venture for the provision of works of irrigation and drainage, it was decided to obtain the best advice possible, and for this purpose the Government of India was approached and Mr. W. A. Graham, Adviser to the Ministry of Agriculture, in 2456 B. E. (1913), was deputed to proceed to India to negotiate personally for the loan of the services of an irrigation expert, to come to Siam, and to again examine the possibilties of providing irrigation facilities in the Great Central Plain. As a result of these negotiations the Government of India selected Mr. (now Sir Thomas) Ward, C. I. E., M. V. O., M. I. C. E., one of the foremost of living irrigation experts, for the purpose of carrying out the investigations required by the Government of Siam. Sir Thomas, accompanied by a specially selected staff drawn from the Indian Irrigation Service, arrived in Siam in September 2456, (1913), and immediately commenced his investigations.

Sir Thomas Ward's work was greatly facilitated by the preliminary work which had been accomplished and placed on record by the old Irrigation Department under the guidance and direction of Mr. van der Heide, and within the period of eighteen months he had completed the task allotted to him, and had drawn up a complete project, or rather series of projects, for the scientific irrigation of practically the whole of the Central Plain, as well as for some outlying districts which were really outside the scope of his commission. His late Majesty was kept informed of the progress and results of Sir Thomas Ward's investigations by reports submitted from time to time by the Ministry of Lands and Agriculture, and on the successful completion of his task Sir Thomas returned to India in February 2457 B. E.

While Sir Thomas was still in Siam, His Majesty was pleased to order the resuscitation of the Department of Irrigation under the new designation "Krom Thod Nam," and this department was placed under the direction of Mr. R. C. R. Wilson, an enginer of large experience, who had accompanied Sir Thomas from India as chief assistant.

The results of Sir Thomas Ward's investigations for the development of Irrigation in Siam are published in the 4 volumes, which were issued by the Royal Irrigation Department in the year 2458 B. E. (1915), entitled "Project Estimate for Works of Irrigation, Drainage and Navigation to Develop the Plain of Central Siam." These volumes were accompanied by Sir Thomas Ward's report, prefaced by a valuable minute by H.R.H. the late Prince Rabi; in this minute H. R. H. put the case for irrigation in Siam very briefly and clearly, when he stated that "the object the Government had in view in introducing irrigation works was, to enable the farmers of Siam to maintain against the increasing competition of neighboring rice growing states fostered by energetic governments, the position hitherto held by Siam in the rice markets of the world."

After exhaustive investigation and inquiry Sir Thomas Ward arrived at the same conclusion as Mr. Homan van der Heide had done some years before, namely, that the possibilities of scientific irrigation in Siam were very good, and that great benefits might be expected therefrom. He even went so far as to say that Government might envisage a program, the cost of which would not be less than Ticals 100,000,000; as a matter of fact, under present day condition 12 years after Sir Thomas Ward wrote his report, a sum of Ticals 150,000,000, at

least would be required to carry out the full program. This program of course included the works necessary to obtain complete control of the Menam Chao Phya, as unless the supplies of this fine river are harnessed and utilized as required to meet the needs of the country, the immense rice growing tracts of the Central Plain can never be fully developed or even such lands as are already cultivated can never be made to yield, year by year, the outturn of grain which they otherwise might. While thoroughly realizing, however, that the construction of a great barrage somewhere near Jainadh would eventually become necessary, Sir Thomas Ward did not at that time consider that the large expenditure which would be necessary to cover the cost of this work, and the works dependent and connected with it, would be justified. Sir Thomas was of opinion that the population of the country was insufficient to work the large areas of land that would be brought under command, either with profit to themselves or to the state, and further, that the farmers themselves would take time before they would adapt themselves to the new condition of working which scientific irrigation demands, if the best results are to be obtained for the state and for the farmers themselves Experience already gained in the working of the irrigation system just completed has shown that Sir Thomas was entirely right, and that irrigation developments in this country should be gradual and sure, but should in no case run ahead of demand. It will be many years still before the barrage works at Jainadh could even be contemplated; in the meantime, however, all individual schemes which are carried out, should be constructed with a view of one day being linked up into one comprehensive scheme protecting the whole of the Central Plain, and mainly dependent on the waters of the Menam Chao Phya for its supply.

For immediate practical purposes Sir Thomas Ward proposed the execution of a comparatively modest program, the results of which would be:

(1) To extend and stabilize the crops of the lands lying to the east and west of the Suphan river, as far south as Klong Song Bhinong.

(2) To ensure and increase the rice crop in the Petchaburi changwad east of the Petchaburi river, the system to be ultimately extended to the west side also.

(3) To stabilize and incidentally to increase the rice crop of the area already opened up by the Rangsit navigation canals, and of the districts surrounding that area.

(4) To irrigate the plain in the neighborhood of Nakorn Lampang in Mondhol Bayab, thereby greatly increasing as well as stabilizing the rice crop of that area.

(5) By improving the present system of navigation and drainage canals in the districts east and west of the Menam Chao Phya to improve and secure the rice crop of that great area.

The cost of these five projects was estimated by Sir Thomas Ward at Ticals 22,750,000 divided as follows:

	Ticals
(1) Suphan River Project.....	7,500,000
(2) Petchaburi East Canal.....	1,500,000
(3) Prasak South Canal	11,500,000
(4) Hill Irrigation at Lam pang Mondhol Bhayab.....	1,000,000
(5) Irrigation and Drainage Works in the flat plain from Ayuthia to the sea on both banks of the Menam	1,250,000
	22,750,000

Of these projects Sir Thomas Ward strongly advised that the project which he named the Subhan Lesser Inundation scheme (No. 1 above) to distinguish it from a more extensive Subhan scheme, should be undertaken first and this was also the opinion of the first Director General, Mr. Wilson. The reasons why these recommendations were made, were

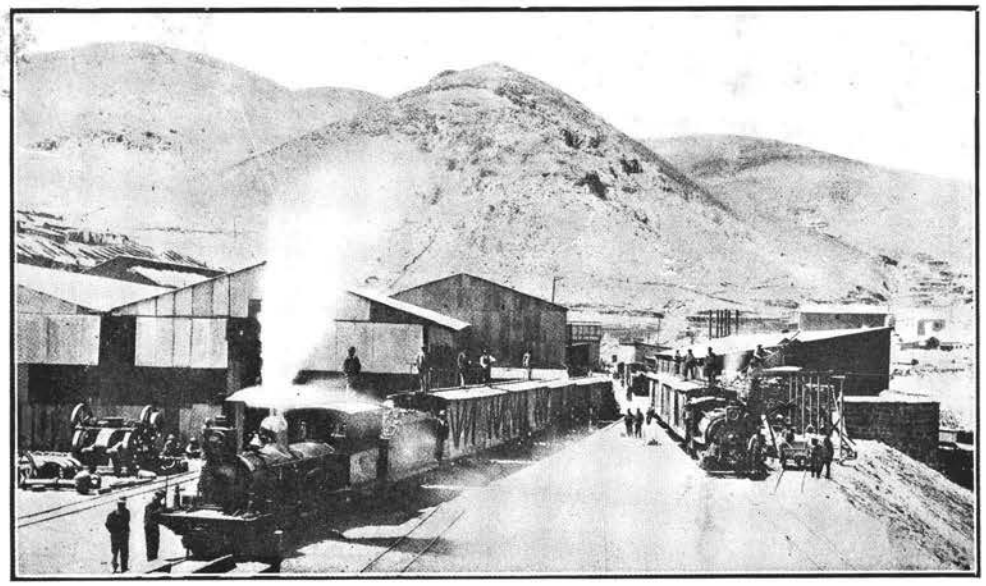
that the scheme was not so expensive as the Prasak South Canal scheme and that in the large area it was proposed to bring under command in which no attempts at irrigation had ever been made, the department would have a free hand in the design and alignment of channels, and that as there was a considerable area of waste state owned land within the scope of the Subhan scheme the land could be divided up into allotments in accordance with modern irrigation practice. Also it was advanced that the Subhan project would offer to the country at large a better example of what an irrigation project should be, than could be expected from the Prasak scheme where the work had to be designed to fit in with existing canals and vested interests, and where the aim is improvement rather than new and original work.

The Government, however, decided otherwise and selected the Prasak South Canal, No. 3 on the list of projects detailed above, on which work should be first undertaken.

The Government took the above course probably because it was considered inadvisable to disturb existing arrangements of landlord and tenant in the Rangsit area and elsewhere, which the opening up of big areas of land in Subhan, free to all, must have done. But this is a contingency that, sooner or later, will have to be faced, because, as any economist knows, it is greatly to the interest of the government to convert as many people as possible from the condition of tenant to that of owner of the soil; and given a chance to acquire private ownership, the tenant class will certainly desert the landlords, who will be compelled to turn to agricultural machinery, or hired foreign labor in order to keep their lands in cultivation.

Sir Thomas Ward's estimate of Tcs. 22,750,000 was based entirely on rates at which work could be carried out prior to the world wide conflagration which broke out in August 1914 (2457 B. E.). Conditions now, owing to the world war and its disturbed aftermath, have been altered beyond all comparison with those which prevailed prior to this event, and at least 35 per cent must be added to Sir Thomas Ward's estimate, to arrive at even an approximate idea as to what the works projected by him in 1914 would cost now, i. e., his estimate of Tcs. 22,750,000 would have to be increased to Tcs. 30,712,500 for the projects included in the statement above.

Sir Thomas, in addition to the recommendations made as described above, also recommended that the Tcs. 1,000,000 included for hill irrigation in Mondhol Bayab should be provided without delay, as although irrigation in the Northern Province was outside the original scope of his inquiries, he knew from his experience as an irrigation engineer, that a comparatively small sum spent in the north would afford a handsome and immediate direct return to government on the money expended. The people in the north have practiced irrigation methods for centuries, they thoroughly appreciate the benefits that they can derive from a scientific irrigation scheme and are quite prepared to pay for the same. Cultivators in the Central Plain, however, are not so sure of the benefits to be derived, as they have never had experience of anything approaching to a proper system of water distribution; the necessary knowledge will only come to them gradually and patience will have to be exercised meanwhile.



The Andes Mountains that are being pierced by tunnel to bring the upper waters of the Amazon to the Pacific side of the continent.

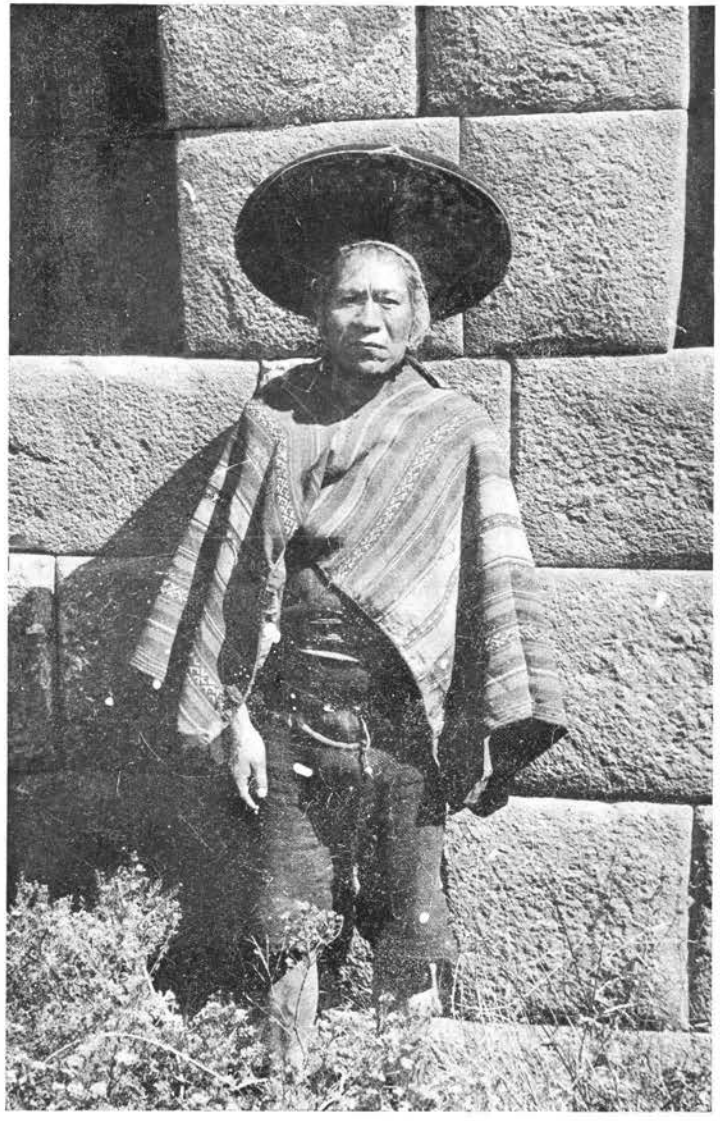
Resources of Peru

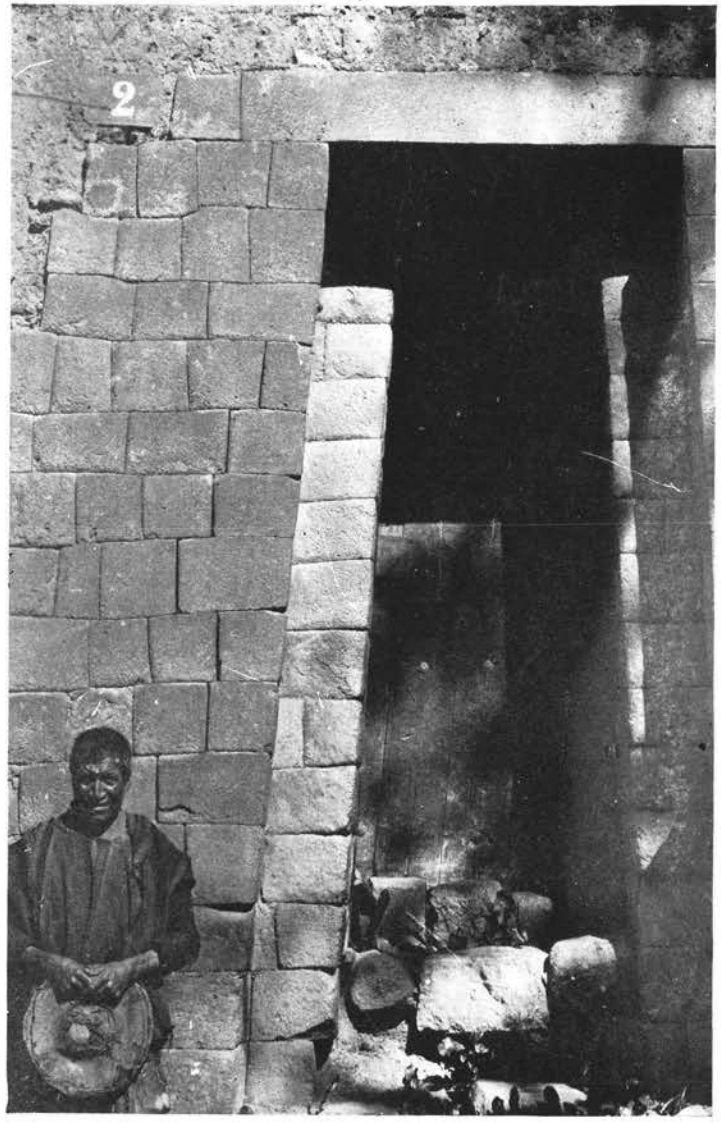
By GERARDO KLINKE
Before the Pan-Pacific Research Institution

I have accepted the invitation to say a few words, but I am handicapped for I know little English. I have lived all my life in a Spanish settlement and, although I have traveled around a great deal, I have never learned to speak English well, because I think in Spanish, and I have had very little time to learn English. I hope you will work hard to try to get something out of my talk.

The principal reason why I have consented to talk here is because I have been really surprised by the wonderful work done by the Institute of which this is a meeting, and would like to see it extended to the South American countries. This would bring about a much better understanding and much better mutual knowledge.

When I was a boy I traveled to different parts of the world, and made a trip to Australia. When I arrived there I was quite a curiosity, because everybody expected I would wear feathers like an Indian. In Brisbane a newspaper reporter came along and asked for the South American fellow. When I said "This is he," the newspaper reporter said, "But you are not black." And many people in my country have the same ideas about foreign countries. We are very prejudiced against other countries, perhaps as much as the countries of northern Europe are against us, and I think





Typical descendants of the peoples of the Incas, the ancient Indian rulersof Peru. These are the peons of today who till the soil as did their ancestors thousands of years ago

work like this would tend to bring together all peoples, which would be a great help, not only for our countries, but for the whole world. The happiness of a community depends upon our understanding of our neighbors and the forgiveness of their faults. If there is any way I can help this work in Peru, I shall be glad to do so. There are many people there who are broad-minded enough to be glad to help out in this work.

The people in South America are very far behind in education, as a rule, but we have many things we might show to others with pride. We have the oldest university in America, founded in the middle of the sixteenth century. I don't say our university is better than yours, but only want to show that our interest in education in Peru is very old. We are very much handicapped by nature. We have high mountains and dry weather, and have to work hard to make a living. For that reason we are developing some things that will mean more in the future.

We have four universities, with all the branches. We have a medical school more than two and a half centuries old which has turned out doctors who can kill and cure as well as doctors in any other place. We have a law school, but I am sorry about that, because I think lawyers make trouble in every country. We have a college of economics, a divinity college, an engineering college seventy-five years old, and an agricultural college forty years old. We have a system of public education which is not what we want, but which shows that we are giving the Indians an opportunity to learn and to become useful citizens.

We have a very small standing army, so small that it is ridiculous, amounting to but 3,000 men. Our army of educators is larger than this, and if we have not put more people to teaching it is because we have not the money. We are trying to increase the material means now to spend more on the public schools.

I think it would be a splendid thing to arrange an interchange of teachers between Pacific countries, so everyone might learn from the other. I hope that you will learn something from my country. I have always thought that I might learn something from every country I have visited, and teach something, too.

Sometimes it is rather difficult for a man who does not speak the language to make a speech. When, in 1920, after nearly 40 years, we had yellow fever in Peru—what we think shall be the last outbreak of yellow fever in my country—we called upon the Rockefeller Institute for help. Among the men sent to us were two highly trained men who came to South America to help, and of whom we were very fond. After the epidemic was over, we tendered them a banquet and one of them thought it was his duty to make a speech in Spanish. He knew a little less Spanish than I know English. We say for "ladies and gentlemen" in Spanish "senoras y caballeros" and "caballeros" (gentlemen) resembles the word "caballos" (horses) so he, inadvertently, said "senoras y caballos," ("ladies and horses"). We enjoyed his talk very much, but we all thought of ourselves as horses. So I want to apologize before I start.

We are probably different from any country in the world, because of our topography and our climate. We have a very big country. Our northern boundary is not settled yet. We will settle it later on with Ecuador. We think it starts with Ecuador and ends at 18 degrees south, and it runs from northwest to southeast. In the middle of our country we have a big range of mountains. It rises to 18,000 feet, and we have two railroads crossing these mountains, one 16,000 feet and one 14,000 feet high. This big range has

One of the tributaries of the Amazon that is being tapped by tunnel to irrigate the waterless Pacific lands of Peru.

determined the future of the country, so we always look up to it.

This range of mountains intercepts the trade winds and compels the air currents to rise 16,000 feet, dropping the moisture on the eastern side of the Andes, where we have a real tropical country. Here we have a river, running by a little town of 30,000, Iquitos, 2,000 miles from the Atlantic coast, to which the biggest steamers go, and we think they could go 1,000 miles still further in the river. This part of our country is the country of the future. We think that later on we will develop it, and within the basin of the Amazon a new humanity will start.

Along the coast, between the mountains and the sea, we hape a strip of desert where there is no life except for a few little oases, where agriculture is carried on by irrigation. No plants of any sort grow there on the desert, not even cactus. On the mountains we have large plateaus, where it is very cold. A kind of grass grows there, which sustains a large population of sheep and cattle. In the deep valleys of this plateau we grow wheat, barley, sugar cane, cotton and all the tropical plants, as the climate varies as the land rises.

Along the coast there is a desert, and that is where our civilization started. We have a little rain in the hills and that comes down in small rivers a few months of the year. By a marvellous system of irrigation thousands of years old, we take that water and direct it on the land. We produce on the small green oases, sugar, rice, tobacco, cotton, and such plants. We do well, because we have the highest yield of cotton in the world, more than the southern part of the United States. We are second to Hawaii in the yield

The cities of Peru follow the Latin style of architecture, as may be seen from this picture.

of sugar. We produce much higher yields than the United States in corn. We have a good yield of rice, which compares with Spain. That is what we do on a small strip of land where there is so little rain.

That is the physical aspect of my country. You can understand how difficult it is to develop such a country, but the people have developed marvellous energy. On the coast, with few exceptions, we have no natural ports, because the mountains come right down to the sea, but work is conquering that natural drawback. The strenuousness of the fight between the desert and man is difficult to realize by an outsider. I used to be in a town where water could not be reached except 300 meters below the surface. In that dis-

trict we raise pigs and goats, and they have learned there is no water there. About twice a week they come down to the wells, and the Indian there waters them. The mountains we are conquering, too. In about 1870 we built a railroad besides others across the Andes, which is still the highest standard gauge railway in the world. It was built in the 70's by a people who had very little money. We borrowed the money to do it, but have since paid it off.

On the deserts of the coast we are building new irrigation works, continuing the work started hundreds of years ago. We have just completed an irrigation works. You may have met the man who had charge of that as he was here a few weeks ako. He is a pure Indian and was the chief manager of these irrigation works. We are starting another big irrigation project which will add 50 per cent to the land actually under cultivation on the coast. We are going to build a tunnel thirty-four kilometers across the Andes and bring a river from the Atlantic to the Pacific. We hope to finish this work in ten years. We will turn the river, raise the water, open the tunnel, and bring the water through the Andes.

We have a wonderful land when it rains, which happens only once in 35 years. It happened in 1892, a few years after I was born, and again in 1925. We then have very thick vegetation. Goats, pigs, donkeys, everything thrives, because after those rains the grass comes very high. That shows the possibilities we have in the desert, which we are trying to conquer still further.

We are conquering the desert in another way also. We are teaching water to produce more; we are teaching the land to produce with less water, and we are going further and further in that work. In this work we are working with live things (plants) which can be taught. We are reaching one of the highest duties of water in the world.

I am manager of a sugar plantation. We have one part of our plantation where we have water but three months

Ruins of one of the ancient Inca palaces of old Peru.

of the year, and here we have a very large sugar yield. We are making the plants grow almost without water. To further the agricultural development of the country we have started an experiment station, for which I am traveling to learn the way other countries are solving similar problems, especially Hawaii, which is really a marvel in this respect.

During the last thirty years we have increased more than three times our yield of sugar, and we hope to increase it five times. We are using more fertilizer than any country in the world. But we have much to learn yet. That is why we are starting an experiment station to study these problems and produce more sugar and more cotton, and make more money. We have begun already the organization of this institution. We have five Americans there now who are studying our problems. We expect in twenty years to produce more sugar per acre than any country. This is very rash to say in Hawaii, who leads the world, but we say in Spanish, "to get a cent you ought to hope for a dollar."

Knowing that in America you know how to handle these things, I have come here to learn your methods, and shall return to my country and tell your story and compel everyone to work together and help to make our country one of the best countries in the world.

A street scene in a South American city.

The late Dr. Yai S. Sanitwongse, Siam's foremost botanist and philanthropist, who passed away in January. He was one of the supporters of the plan for a Pan-Pacific Botanic Garden. He was a member of the Pan-Pacific Research Institution.

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CONTENTS

PUBLISHED QUARTERLY AT HONOLULU, HAWAII
BY THE
PAN-PACIFIC UNION

The Journal of the Pan-Pacific Research Institution

At a recent meeting of the governing body of the Pan-Pacific Research Institution the quality and scope of the papers to be published in the Journal of the Institution was discussed.

It was decided that the Journal of the Pan-Pacific Research Institution will be devoted to the publication of scientific papers only. Various subjects of interest to the countries bordering on the Pacific will be developed.

At the present time, for example, a series of papers is being prepared constituting check lists of the fish of the waters of the Pacific Ocean, including fresh water fish of the lakes and streams in Pacific lands. This work is under the general direction of Dr. David Starr Jordan, President of the Institution. Check lists of the fish of practically all the Pacific countries have either been prepared or are in the course of preparation.

Likewise papers, it is expected, will be written on entomological problems and check lists of the insects of the several Pacific countries prepared. A general survey of economic insects of the Pacific will be published, if possible, at one time, and papers on the activities of single species, perhaps, published from time to time. When such information from various nations is correlated, the possibilities appear to be vast indeed in the way of interest and of economic importance.

Again, plant disease and plant pest problems in general will receive their due share of attention. When more information is completed in all the different countries, who knows what losses may be prevented in the way of depredations brought about by the chance importation of a plant enemy.

Studies now projected on foods of the Pacific countries bid fair to bring about new information of very great value to the health and general welfare of the peoples of the Pacific countries.

These are just a few of the many lines of scientific study that may make the Journal their medium of publication.

The governing body of the Institution has further recommended that the publication Council utilize the Mid-Pacific Magazine once a quarter, in which to publish scientific papers read at the Pan-Pacific Research Institution, in Hawaii or elsewhere, as well as contributed scientific papers of sufficient interest to warrant publication. These papers, mostly of a popular science nature, will be illustrated and the Publication Council will consider contributions. These should be addressed to the Editors, Journal of the Pan-Pacific Research Institution, Honolulu, Hawaii, U. S. A.

A Catalogue of the Fishes of Northeastern China and Korea

By CORA D. REEVES, PH.D. (Michigan)
Professor of Zoology in Ginling College, Nanking, China.

The present paper is a catalogue of the fishes thus far recorded from the streams and shores of Northeastern China and Korea. It is a preliminary list, for the fauna in question is far from completely studied, and many additional species remain to be added, especially from the coasts of China. Probably all the fishes of the West Coast of Japan and Formosa will be noted in time. Moreover, in many cases of species accepted, we are by no means certain as to their correct identification. The classification adopted is essentially that of recent papers of Jordan and Hubbs. The authorities quoted concern the specific names only, not the combination.

It is the purpose of the Pan-Pacific Research Institution to publish from time to time local lists of the fish fauna of the Pacific, as prepared by local observers. For the present, these will be catalogues only, without plates or records of new forms, these lists to be finally combined in a single volume.

The area for which the main list has been prepared is bounded on the north by the great wall west to the longitude of Ichang and a line from Ichang to Foochow. Along the coast there were too many indefinite records to try to use a bounded definite area.

DAVID STARR JORDAN.

ABBREVIATIONS:

B. & S., Schneider's Edition of Bloch. Ichthyologia (1801).
C. & V., Cuvier & Valenciennes, Hist. Naturelle des Poissons. 1830-1843.
J. & S., Jordan & Snyder, various publications.
M. & H., Müller & Henle, Plagiostomen. 1838.
T. & S., Temminck & Schlegel, Fauna Japonica, Poissons.
Ag., Louis Agassiz.
Basil., Basilevsky.
Blkr., Pieter von Bleeker.
Boul., George Albert Boulenger.
Gthr., Albert Günther.
Herz., Herzenstein.
L., Carl Linné or Linnæus.
Lecp., Bernard Germain Lacépède.
Rich., John Richardson.
Steind., Franz Steindachner.

* * * * *

Family 1. BRANCHIOSTOMIDÆ.

1. Branchiostoma belcheri Gray. Coast of S. China; inordinately abundant.

Family 2. EPTATRETIDÆ.

2. Eptatretus burgeri Gray. S. China.

Family 3. PETROMYZONIDÆ.

3. Entosphenus japonicus Martens. Rivers N. Asia.
4. Entosphenus mitsukurii Hatta.

Family 4. HEXANCHIDÆ.

5. Notorhynchus platycephalus Tenore.

Family 5. HETERODONTIDÆ.

6. Heterodontus zebra Gray.
7. Heterodontus japonicus Duméril.

Family 6. SCYLLIORHINDÆ.

8. Halælurus burgeri M. & H.

Family 7. ORECTOLOBIDÆ.

9. Cirrhoscyllium expolitum Smith & Radcliffe.
10. Orectolobus japonicus Regan.
11. Chiloscyllium indicum Gmelin.
12. Chiloscyllium plagiosum Bennett. Amoy.
13. Stegostoma tigrinum Gmelin.

Family 8. CARCHARHINIDÆ.

14. Mustelus griseus Pietschmann.
15. Cynias manazo Bleeker.
16. Triakis scyllium M. & H.
17. Galeorhinus japanicus M. & H.
18. Galeocerdo tigrinus M. & H.
19. Prionace glauca L.
20. Carcharhinus japonicus T. & S.
21. Carcharhinus tjutjot Blkr.
22. Scoliodon acutus Rüppell.
23. Scoliodon walbeehmi Blkr.

Family 9. SPHYRNIDÆ.

24. Sphyrna zygæna L.

Family 10. ALOPIIDÆ.

25. Alopias vulpinus Bonnaterre.

Family 11. LAMNIDÆ.

26. Isurus glaucus M. & H.
27. Carcharodon carcharias L.

Family 12. CETORHINIDÆ.

28. Cetorhinus maximus Gunner.

Family 13. SQUALIDÆ.

29. Squalus mitsukurii J. & S. Shanghai. Ningpo.

Family 14. PRISTIOPHORIDÆ.

30. Pristiophorus japonicus Günther.

Family 15. SQUATINIDÆ.

31. Squatina japonica Blkr.

Family 16. RHINOBATIDÆ.

32. Rhina ancylostoma Bloch & Schneider.

33. Rhinobatos schlegel Müller & Henle.
34. Rhinobatos halayi Forskål.
35. Rhinobatos polyophthalmus Blkr.

Family 17. PLATYRHINIDÆ.

36. Platyrhina sinensis Müller & Henle.

Family 18. RAJIDÆ.

37. Raja kenojei M. & H. Ningpo, Port Arthur.
38. Raja tobai Tanaka.
39. Raja porosa Günther. Chefoo.

Family 19. TORPEDINIDÆ.

40. Narcine timlei. B. & S.
41. Narke japonica T. & S.

Family 20. DASYATIDÆ.

42. Urolophus fuscus Garman.
43. Dasyatis kuhlii M. & H.
44. Dasyatis navarri Steindachner.
45. Dasyatis akajei M. & H.
46. Dasyatis isakurrah.
47. Dasyatis sinensis Steindachner.
48. Dasyatis bennettii M. & H.
49. Anacanthus gerrardi Gray.
50. Anacanthus imbricata Schn.
51. Pteroplatea japonica T. & S.

Family 21. AETOBATIDÆ.

52. Aëtobatus tobijei Blkr.
53. Stoasodon narinari Euphrasen.
54. Aëtomylæus niuhofi B. & S.
55. Aëtomylæus milvus Müller & Henle.

Family 22. MOBULIDÆ.

56. Mobula japonica M. & H.

Family 23. POLYODONTIDÆ.

57. Psephurus gladius Martens. Shanghai.

Family 24. ACIPENSERIDÆ.

58. Acipenser sinensis Gray.
59. Acipenser dabryanus Dumeril.
60. Acipenser kikuchii J. & S.
61. Acipenser mikadoi Hilgendorf.
62. Ichthyocolla daurica Georgi.

Family 25. CHIROCENTRIDÆ.

63. Chirocentrus dorab Forskål.

Family 26. ELOPIDÆ.

64. Elops machnata Forskål. Canton.
65. Megalops cyprinoides Broussonet. Canton, Swatow, Ningpo.

Family 27. ALBULIDÆ.

66. Albula vulpes L.

Family 28. CHANIDÆ.

67. Chanos chanos Forskål.

Family 29. DUSSUMIERIIDÆ.

68. Spratelloides japonicus Houttuyn.
69. Etrumeus micropus T. & S.
70. Dussumieria acuta C. & V.
71. Dussumieria elopsoides Blkr.

Family 30. CLUPEIDÆ.

72. Clupea pallasi C. & V. N. Pacific. Tientsin.
73. Harengula punctata C. & V.
74. Harengula zunasi Blkr. Amoy.
75. Harengula nymphæa Richardson.
76. Sardinella immaculata Kishinouye. Swatow.
77. Sardinella gibbosus Bleeker.
78. Sardinella fimbriata C. & V.
79. Sardinella clupeoides Bleeker.
80. Sardinia melanosticta T. & S.
81. Hilsa kanagurta Bleeker. Amoy.
82. Hilsa reevesii Rich. Amoy, Shanghai, Kiukiang.
83. Hilsa toli C. & V.
84. Clupanodon punctatus T. & S. Swatow, Chefoo, Newchwang.
85. Clupanodon nasus Bloch.
86. Clupanodon thrissa Osbeck.
87. Ilisha elongata Bennett. Chefoo.

Family 31. ENGRAULIDÆ.

88. Coilia mystus Lacep. Swatow, Shanghai.
89. Coilia rendahli Jordan & Seale. Shanghai.
90. Coilia brachygnathus Kreyenberg & Pappenheim.
91. Setipinna telara C. & V.
92. Setipinna gilberti Jordan & Starks. Korea.
93. Setipinna melanochir Rich. Swatow.
94. Thrissocles adelæ Rutter. Swatow.
95. Scutengraulis mystax B. & S. Swatow.
96. Scutengraulis hamiltoni Gray.
97. Stolephorus kammalensis Blkr. Swatow, Chefoo.
98. Stolephorus chinensis Gthr. Swatow.
99. Stolephorus koreanus Kishinouye. Korea
100. Engraulis japonicus T. & S. Peitaiho.

Family 32. SALMONIDÆ.

101. Oncorhynchus keta Walbaum.
102. Oncorhynchus leptosomus Blkr.
103. Plecoglossus altivelis T. & S. N. China, Formosa.

Family 33. OSMERIDÆ.

104. Hypomesus verecundus Jordan & Metz. Korea.
105. Osmerus dentex Steindachner.

Family 34. SALANGIDÆ.

106. Protosalanx hyalocranius Abbott. Shanghai.
107. Salangichthys microdon Blkr.
108. Hemisalanx prognathus Regan. Shanghai, Soochow.
109. Leucosoma chinense Lacep. Shanghai, Kiukiang, Amoy, Swatow.
110. Salanx cuvieri C. & V. Soochow, Ichang.
111. Parasalanx angusticeps Regan.
112. Parasalanx gracillimus Regan. Shanghai.
113. Parasalanx longianalis Regan.

Family 35. AULOPIDÆ.

114. Hime japonica Gunther.

Family 36. SYNODONTIDÆ.

115. Synodus japonicus Houttuyn.
116. Saurida eso Jordan & Herre. Hongkong.
117. Saurida argyrophanes Rich. Yentai, Shantung.
118. Saurida tumbil Bloch. Chefoo, Swatow.
119. Trachinocephalus limbatus Eydoux & Souleyet.
120. Trachinocephalus altipinnis Gthr. Swatow.
121. Harpodon nehereus Hamilton (Buchanan). Swatow, Newchang.

Family 3. PLOTOSIDÆ.

122. Plotosus anguillaris Forskål.

Family 38. ARIIDÆ.

123. Netuma osakæ Jordan & Kasawa. China Sea.
124. (Arius) falcarius Richardson. Ningpo.
125. (Arius) maculatus Thunberg.

Family 39. SILURIDÆ.

126. Parasilurus asotus Linn. Chihli, Ningpo, Ichang.
127. Parasilurus cinereus Dabry. Yangtse.
128. Silurodon hexanema Kner. Shanghai.

Family 40. BAGRIDÆ.

129. Pelteobagrus fulvidraco Rich. Shanghai, Soochow, Grand Canal.
130. Leiocassis naso Garman. Ichang.
131. Leiocassis torosilabris Sauvage. Yangtse River.
132. Leiocassis brashnokowi.
133. Leiocassis argentivittatus Regan.
134. Leiocassis crassilabris Günther. Ichang, Szechuenchang.
135. Leiocassis longirostris Gthr. Newchang, Ningpo, Ichang.
136. Leiocassis tæniatus Gthr. Shanghai W. to Ichang.
137. Pseudobragrus vachelli Rich. Chinkiang, Ichang, Newchwang.
138. Pseudobagrus emarginatus Sowerby. Manchuria.
139. Pseudobagrus tenuis Gthr. Shanghai. Yangtse River.
140. Pseudobagrus nitidus Sauvage & Thiersant. Yangtse.
141. Pseudobagrus eupogon Boulenger.
142. Liobagrus styomi Regan. Hupeh.
143. Mystus macropterus Bleeker. Yangtse, Ichang, Szechuen.
144. Mystus chinensis Steind. Canton.
145. Cranoglanis sinensis Peters. Canton.
146. Rita manillensis C. & V. Ningpo.

Family 41. SISORIDÆ.

147. Glyptosternon sinence Regan. Tungting.
148. Glyptosternon asperum McClelland. Tungting.

Family 42. CLARIIDÆ.

149. Clarias fuscus Lacep. Swatow.

Family 43. COBITIDÆ.

150. Acanthopsis lachnostoma Rutter. Swatow.
151. Cobitis tænia L. N. China.
152. Cobitis xanthi Gthr. Yangtse, Ichang.
153. Cobitis macrostigma Dabry. Lakes of C. China.
154. Botia multifasciata Regan.
155. Botia variegata Gthr. Ichang, Yangtse.
156. Leptobotia elongata Blkr. Yangtse R.
157. Leptobotia fasciata Guichenot. Yangtse.
158. Parabotia tæniops Guichenot. Yangtse.
159. Paramisgurnus dabryanus Guichenot. Yangtse R.
160. Misgurnus decemcirrosus Basilewsky. N. China, Yangtse.
161. Misgurnus anguillicaudatus Cantor.
162. Misgurnus mizolepis Gthr. Ichang, Kiukiang.
163. Misgurnus crossochilus Sauvage.
164. Lefua costata Kessler.
165. Lefua dixoni Fowler. N. Chihli.
166. Gobiobotia pappenheimi Kreyenberg. Tientsin.
167. Barbatula livida Sauvage.
168. Barbatula bleekeri Sauvage. Shensi.
169. Barbatula bipartita Sauvage & Dabry. N. and C. China.
170. Barbatula nuda Bleeker. Mongolia.
171. Barbatula toni Dybowski. Amur R.

Family 44. HOMALOPTERIDÆ.

172. Homaloptera stenosoma Blgr. Ningpo.
173. Homaloptera fimbriata Gthr. Ichang.
174. Homaloptera rotundicauda Martens.
175. Homaloptera caldwelli Nichols.
176. Psilorhynchus fasciatus Sauv. Fukien.
177. Psilorhynchus sinensis Sauv. Szechuen.
178. Crossostoma davidi Sauvage. Fukien.

Family 45. CATOSTOMIDÆ.

179. Myxocyprinus asiaticus Blkr. N. China.

Family 46. CYPRINIDÆ.

181. Cyprinus carpio L.
182. Carassius auratus L.
183. Cirrhina chinensis Gthr.
184. Labo decorus Peters. Hongkong, Swatow.
185. Labeo jordani Oshima. Swatow.
186. Semilabeo notabilis Peters.
187. Discognathus orientalis Nichols. Fukien.
188. Ageneiogarra imberbais Garman. Szechuen.
189. Gymnostomus monticola Gthr. Ichang.
190. Gymnostomus kreyenbergii Regan. Nankacho.
191. Gymnostomus styani Blgr. Ningpo.
192. Gymnostomus fasciatus Steindachner. Shanghai.
193. Gymnostomus macrolepis Blkr.
194. Chilogobio nigripinnis Günther. Ningpo.
195. Chilogobio nitens Günther. Shanghai.
196. Chilogobio sciistius Abbott.
197. Chilogobio imberbis Sauvage. Ningpo, Shensi.
198. Gobio argentatus Sauvage. Yangtse.
200. Gobio wolfterstorffi Regan. Shansi, Nankancho.
201. Paraleucogbio notacanthus Berg. N. China, Ichol.
202. Rhinogobio typus Blkr. Yangtse River, Ichang.
203. Rhinogobio cylindricus Gthr. Ichang, Kiukiang.
204. Rhinogobio ventralis Sauvage. Yangtse.
205. Rhinogobio vaillanti Sauvage. Kiangsi.
206. Saurogobio dumerili Blkr. Yangtse.
207. Saurogobio dabryi Blkr. Yangtse, Kiukiang.
208. Saurogobio guichenoti Sauvage.
209. Pungtungia rathbuni Jordan & Seale. Shanghai.
210. Pungtungia herzi Herzenstein. Korea.
211. Sarcocheilichthys sinensis Blkr. Ningpo, Yangtse.
212. Sarcocheilichthys geei Fowler. Soochow.
213. Sarcocheilichthys maculatus Günther. Ichang.
214. Sarcocheilichthys mori Jordan & Hubbs. Korea.
215. Acanthogobio guentheri Herz. Huangho, Huihsine.
216. Pseudogobio rivularis Basil. Nanking, Soochow. Chinwangta.
217. Pseudogobio productus Peters. Yangtse, Ichang, Hongkong.
218. Pseudogobio filifer Garman.
219. Pseudogobio styani Günther. Ichang, Kiukiang.

220. Pseudogobio esocinus T. & S. Japan, Korea.
221. Aphyocypris chinensis Gthr. Chekiang and Yangtse.
222. Aphyocypris kikuchii.
223. Barbus gerlachi Peters. Ningpo, Hongkong.
224. Barbus simus Sauvage.
225. Barbus sinensis Blkr.
226. Barbus paradoxus Gthr. Amoy.
227. Barbus semifasciolatus Gthr. Chefoo.
228. Zacco platypus Temminck & Schlegel. Japan, Korea.
229. Hemibarbus dissimilis Blkr. Yangtse R., Ichang.
230. Hemibarbus maculatus Blkr. Seoul, Yangtse, Chefoo, Fukien.
231. Hemibarbus longirostris Regan. Manchuria.
232. Zacco temmincki T. & S. Japan, Korea.
233. Pseudorasbora parva Schlegel. Chekiang, Nanking.
234. Pseudaspius leptocephalus Pallas.
235. Acahara semotilus. Jordan & Starks. Korea.
236. Acahara brandti Dybowsky. Korea.
237. Moroco bergi Jordan & Metz. Korea.
238. Xenocypris davidi Blkr. Swatow, Peking, Ichang.
239. Xenocypris lampertii Popta. Peking, Grand Canal, Yangtse R.
240. Xenocypris macrolepis Blkr. Yangtse.
241. Distœchodon tumirostris Peters. Ningpo.
242. Acanthobrama dumerili Blkr. Yangtse.
243. Acanthobrama emmelas Abbott. Tientsin.
244. Paracanthobrama guichenoti Blk.
245. Rhynchocypris variegata Gthr. Kiukiang, Ichang.
246. Osteochilus brachynotopterus Blkr.
247. Gnathopogon coreanus Berg.
248. Gnathopogon tæniatus Gthr. Headwaters Yangtse R.
249. Gnathopogon herzensteini Blgr.
250. Gnathopogon chankanensis Dybowsky. Korea.
251. Gnathopogon tsuchigæ. Jordan & Hubbs. Korea.
252. Gnathopogon majimæ Jordan & Hubbs. Korea.
253. Gnathopogon longifilis Jordan & Hubbs. Korea.
254. Hemitemia lagowskii Dybowsky.
255. Coreius cetopsis Kner. Luchow, Ichang, Shanghai.
256. Mylopharyngodon æthiops Basil. Yangtse R., Peking.
257. Mylopharyngodon fuscus Oshima.
258. Ctenopharyngodon idellus C. & V.
259. Acheeilognathus coreana Steindachner. Seoul.
260. Acheilognathus signifer Berg. Pingtung, Korea.
261. Acanthorhodeus macropterus Blkr. Yangtse, Ningpo.
262. Acanthorhodeus guichenoti Blkr. Yangtse R.
263. Acanthorhodeus hypselonotus Blkr. Yangtse R.
264. Acanthorhodeus dicæus Rutter. Swatow.
265. Acanthorhodeus asmussi Dybowsky. Shanghai.
266. Acanthorhodeus tænianalis Gthr. Shanghai.
267. Acanthorhodeus atranalis Gthr. Shanghai.
268. Acanthorhodeus barbatulus Gthr. Shanghai.
269. Acanthorhodeus imberbis Blkr. Ningpo, Shanghai, Tientsin, Pei Ho.
270. Acanthorhodeus peihoénsis Fowler. Peitai-ho.
271. Rhodeus sinensis Gthr. Yangtse, Chekiang, Szechuen.
272. Rhodeus maculatus Fowler. Pei Ho.
273. Rhodeus ocellatus Kner. Lower Yangtse.
274. Rhodeus chosenicus Jordan & Metz. Korea.
275. Luciobrama typus Blkr. Ichang, Yangtse River.
276. Opsariichthys acanthogenys Boulenger. Ningpo.
277. Opsariichthys bidens Gthr. Ningpo, Newchang.
278. Opsariichthys acutipinnis Blkr. Shanghai.
279. Scombrocypris styani Gthr. Kiukiang.
280. Squaliobarbus curriculus Richardson. Canton to Chihli and Ichang.
281. Squaliobarbus elongatus Kner. Shanghai, Ichang.
282. Squaliobarbus dahuricus Basil. Mongolia, Manchuria.
283. Hypothalmichthys molitrix V. & V. Ningpo, Yangtse, N. China.
284. Hypothalmichthys nobilis Gray. Swatow, Ningpo.
285. Hypothalmichthys microlepis Steindachner. Yangtse to Ichang.
286. Aspius spilurus Gthr. Hongkong.
287. Pseudophoxinus oxycephalus Blkr. Peking, Shensi.
288. Elopichthys bambusa Richardson. Canton, Ningpo.
289. Toxabramis swinhonis Gthr. Shanghai, Soochow, Nanking.
290. Toxabramis argentifer Abbott.
291. Chanodichthys mongolicus Basil.
292. Chanodichthys affinis Vaillant. Foochow.
293. Parabramis terminalis Basil. Swatow, Amur.
294. Parabramis bramula C. & V.
295. Parapelecus argenteus Gthr. Kiukiang.
296. Parapelecus jachærius Abbott. Korea, Tientsin.
297. Parapelecus Eigenmanni. Jordan & Metz. Korea.
298. Parapelecus jouyi Jordan & Starks.
299. Ochteobius lucense Jordan & Metz. Korea.
300. Hemiculter leucisculus Basil. Canton, Amur R. W. to Ichang.
301. Culter alburnus Basil.

302. Culter brevicauda Gthr. Shanghai Yangtse.
303. Culter dabryi Blkr. Yangtse R., Hupeh.
304. Culter crythropterus Basil. Shanghai, N. China to Upper Yangtse.
305. Culter oxycephalus Blkr. Yangtse.
306. Culter abramoides Pappenheim. Hankow.
307. Culter mongolicus Basil. N. China.
308. Culter ilishæformis Steindachner.
309. Pseudolaubuca sinensis Blkr.
310. Pseudoperilampu shondæ Jordan & Metz.

Family 47. MASTACRMBELIDÆ

311. Rhynchobdella aculeata Bloch.
312. Bdellorhynchus maculatus Reinwardt.
313. Mastacembelus sinensis Blkr. Yangtse.

Family 48. FLUTIDÆ

314. Fluta alba Zuiew. Canton, Chihli W. to Szechuen.

Family 49. ANGUILLIDÆ

315. Anguilla bengalensis Gray. Shanghai, Ningpo.
316. Anguilla japonica T. & S. Ningpo, Nanking, Newchwang.
317. Anguilla sinensis McClelland.

Family 50. CONGRIDÆ

318. Astroconger myriaster Brevoort.
319. Conger japonicus Bleeker. Ningpo.
320. Anago anago Schlegel.
321. Uroconger lepturus Richardson. Swatow.

Family 51. OPHICHTHYIDÆ.

323. Ophichthus uniserialis Seale.
324. Chlevastes colubrinus Beddart.
325. Ophichthus cephalozona Gthr.
326. Ophichthus apicalis Bennett.
327. Scytalophis dicellurus Blkr. Amoy.
328. Pisoodonophis boro Ham-Buth. Swatow.
329. Pisoodonophis cancrivorus Kaup. Swatow.
330. Brachysomophis crocodilinus Bennett.
331. Cirrhimuræna chinensis Kaup. Sumatra, China.

Family 52. MURÆNESOCIDÆ

332. Murænesox cinereus Forskål. Chefoo, Ningpo, Swatow, Canton, Hongkong.
333. Murænesox talabon Cuv.

Family 53. ECHELIDÆ

334. Muræniehthys gymnopterus Blkr. Swatow.

Family 54. MURÆNIDÆ

335. Muræna pardalis Schlegel.
336. Gymnothorax reevesil Richardson. Canton.
337. Gymnothorax kidako Schlegel.
338. Gymnothorax reticularis Lacep.
339. Gymnothorax thyrsoidea Rich.
340. Gymnothorax macrosiphon Blkr.
341. Gymnothorax macassariensis Blkr.
342. Gymnohtorax isingleena Richardson.
343. Gymnothorax dorsalis Seale. Hongkong.
344. Pseudechidna brummeri Blkr.

Family 55. MORINGUIDÆ

345. Moringua lumbricoidea Rich. Swatow.

Family 56. CYPRINODONTIDÆ

346. Panchax rubropunctatus Steindachner.
347. Oryzias latipes T. & S.

Family 57. PEGASIDÆ

348. Pegasus volitans L.
349. Parapegasus natans L.

Family 58. SOLENOSTOMIDÆ

350. Solenostomus cyanopterus Blkr.
351. Solenostomus paradoxus Pallas. Canton.

Family 59. SYNGNATHIDÆ

352. Syngnathus acusimilis Gthr. Chefoo.
353. Syngnathus schlegeli Kaup. Shanghai.
354. Syngnathus argyrostictus Kaup.
355. Syngnathus spicifer Rüppell.
356. Syngnathus pelagicus L.
357. Ichthyocampus belcheri Kaup.
358. Urocampus nanus Blkr. Manchuria.
359. Doryichthys boaja Blkr. Sumatra, Borneo, Siam.
360. Syngnathoides biaculeatus Bloch.
361. Hippocampus trimaculatus China Seas, Pinang, Tenasseria.
362. Hippocampus kelloggi Jordan and Snyder.
363. Hippocampus histrix Kaup.

Family 60. AULORHYNCHIDÆ

364. Aulichthys japonicus Brevoort. Korea.

Family 61. AULOSTOMIDÆ

365. Aulostomus chinensis Lacep.

Family 62. FISTULARIDÆ

366. Fistularia serrata Cuv. Swatow.
367. Fistularia petimba Lacep.
368. Fistularia starksi Jordan & Seale. Hongkong.

Family 63. MACRORHAMPHOSIDÆ

369. Macrorhamphosus japonicus Gthr.
370. Macrorhamphosus velitaris Pallas.

Family 64. CENTRISCIDÆ

371. Æoliscus strigatus Gthr.
372. Centriscus scutatus Linn.

Family 65. GASTEROSTEIDÆ

373. Pungitius sinensis Guichenot. Chihli, Yangtse.
374. Gasterosteus aculeatus Linn. Coasts and rivers.

Family 66. BELONIDÆ

375. Strongylura strongylura Van Hasselt. Swatow.
376. Strongylura fasciata Blkr.
377. Strongylura anastomella C. & V. Chefoo, Shangai.
378. Tylosurus schismatorhynchus Blkr.
379. Tylosurus giganteus Blkr.

Family 67. HEMIRHAMPHIDÆ

380. Euleptorhamphus longirostris Cuvier.
381. Zenarchopterus buffonis C. & V.
382. Zenarchopterus microstomus Basilewsky.
383. Zenarchopterus amblyurus Bleeker.
384. Hemiramphus commersonii Cuv.
385. Hemiamphus cantoris Blkr.
386. Hyporhamphus melanurus C. & V. Hongkong.
387. Hyjorhamphus intermedius Cantor. Pei Ho, Tientsin, Canton.
385. Hyporhamphus sajori Schlegel. Chefoo, Chinwangtao.
389. Hyporhamphus gernærti C. & V. Ningpo.

Family 68. EXOCŒTIDÆ

390. Exonautes brachycephalus Gthr. Chefoo, Ningpo.
391. Exonautes nigripinnis C. & V.
392. Exonautes cirriger Peters.
393. Cypselurus agoo Schlegel.
394. Cypselurus pœciloptcrus C. & V.
395. Cypselurus hirundo Steind. Hongkong.
396. Cypselurus arcticeps Gthr.
397. Cypselurus solandri C. & V.
398. Cypselurus spilonotopterus Blkr.
399. Parexocœtus bractopterus Solander.
400. Parexocœtus mento C. & V.
401. Exocœtus volitans Linn. Shanghai.

Family 69. HOLOCENTRIDÆ

402. Ostichthys japonicus C. & V.
403. Holocentrus ruber Forskål. Hongkong.
404. Holocentrus diadema C. & V.
405. Myripristis murdjan Forskål. South Seas.

Family 70. MONOCENTRIDÆ

406. Monocentris japonicus C. & V.

Family 71. OSPHROMENIDÆ

407. Osphromenus gourami Lacep.
408. Macropodus operculatus Gmelin. W. to Ichang.
409. Trichogaster leeri Bleeker.
410. Trichogaster pectoralis Regan. Siam, Malay Pen.

Family 72. ANABANTIDÆ

411. Anabas scandens L. India.

Family 73. OPHIOCEPHALIDÆ

412. Ophicephalus striatus Bloch. So. China.
413. Ophicephalus aspilotus Sauv. & Dabry.
414. Ophicephalus guntheri Sauvage & Dabry
415. Ophicephalus lucius Kuhl & Hasselt. Shanghai.
416. Ophicephalus nigricans C. & V. Ningpo.
417. Ophicephalus marulius B. & S.
418. Ophicephalus grandiosus C. & V. Yangtse, Kiangsu.
419. Ophicephalus argus Cantor.
420. Ophicephalus maculatus Lacep. Swatow, Hongkong.
421. Channa sinensis Sauvage.
422. Channa ocellatus Peters. Nanking, Fukien.

Family 74. ATHERINIDÆ

423. Atherina bleekeri Gthr.

Family 75. MUGILIDÆ

424. Mugil cephalus L. Chingwangtao to Hongkong.
425. Mugil stronglylocephalus C. & V. Swatow, Hongkong.
426. Mugil affinis Gthr. Coast of Amoy.
427. Mugil tade Forskål. Amoy.
429. Mugil hæmatochilus T. & S.
430. Liza waigiensis Day. Shanghai.
431. Liza ceramensis Blkr.
432. Liza troscheli Blkr. Swatow.
433. Myxus analis Kner. Shanghai.

Family 76. SPHYRÆNIDÆ

434. Sphyræna nigripinnis T. & S.
435. Sphyræna obtusata C. & V. Ningpo.
436. Sphyræna pinguis Gthr. Chefoo, Chinwangtao.
437. Sphyræna putnamiæ Jordan & Seale. Hongkong.

Family 77. GEMPYLIDÆ

438. Gempylus serpens C. & V.

Family 78. TRICHIURIDÆ

439. Trichiurus savala Cuv.
440. Trichiurus japonicus C. & V. Swatow, Ningpo, Chinwangtao.
441. Trichiurus haumela Forskål.

Family 79. XIPHIIDÆ

442. Xiphias gladius Linn.

Family 80. CSTIOPHORIDÆ

443. Istiophorus orientalis. T. & S.
444. Makaira mitsukurii J. & S.
445. Makaira mazara J. & S.

Family 81. CARANGIDÆ

446. Scomberoides lysan Forskål.
447. Scomberoides sancti-petri C. & V.
448. Scomberoides orientalis J. & S.
449. Seriola aureovittata J. & S. Chefoo.
450. Seriola purpurascens Schlegel. Ningpo.
451. Seriolina intermedia T. & S.
452. Naucrates indicus C. & V.
453. Elagatis bipinnulatus Quoy & Gaimard.
454. Trachinotus falcatus Forskål.
455. Trachinotus melo Richardson.
456. Trachurus japonicus T. & S. Korea, Ningpo.
457. Trachurops declivis Jenyns.
458. Megalaspis cordyla L.
459. Decapterus fasciatus Blkr.
460. Decapterus muroadsi T. & S.
461. Decapterus maruadsi T. & S. Swatow, Amoy, Ningpo.
462. Gnathanodon speciosus L.
462. Selaroides leptolepis C. & V. Swatow.
464. Trachurops manritiana Quoy & Gaimard.
465. Selar djeddaba Forskål.
466. Selar malam Blkr.
467. Caranx kalla C. & V. Swatow.
468. Selar affinis Rüppell.
469. Citula deani J. & S.
470. Caranx ignobilis Forskål.
471. Caranx sexfasciatus Q. & G.
472. Caranx xanthopygus C. & V.
473. Caranx altissimus Jordan & Seale. Hongkong, Amoy.
474. Citula malabrica B. & S. Swatow.
475. Citula chrysophrys C. & V.
476. Citula armata Forskål.
477. Atropus atropus B. & S. Chefoo.
478. Alectis gallus Linn.
479. Alectis ciliaris Bloch.

Family 82. APOLECTIDÆ

480.1. Apolectus niger Bloch. Swatow.

Family 83. THUNNIDÆ

482. Thunnus orientalis T. & S.
483. Neothunnus macropterus T. & S.
484. Sarda orientalis T. & S.

Family 84. KATSUWONIDÆ

485. Katsuwonus vagans Lesson.
486. Auxis thazard Lacep.
487. Auxis tapeinosoma Blkr.

Family 85. CYBIIDÆ

488. Cybium commersoni Lacep. S. China.
489. Scomberomorus sinensis Lacep. Chefoo.
490. Scomberomorus guttatus B. & S. Swatow.
491. Scomberomorus gracileus Gthr. Chefoo, Chinwangtao.

492. Sawara niphonia C. & V. Ningpo, Peitaiho.

Family 86. ACANTHOCYBIIDÆ

493. Acanthocybium sara Bennett. Korea.

Family 87. NOMEIDÆ

494. Nomeus gronovii Gmelin.

Family 88. CENTROLOPHIDÆ

495. Schedophilus maculatus Gthr.

Family 29. STROMATEIDÆ

496. Psenopsis anomala T. & S.

Family 90. PAMPIDÆ

497. Pampus cinereus Bloch. Port Arthur.
498. Pampus argenteus Euphrasen. Canton, Swatow.
499. Pampus candidus C. & V. S. China.
500. Pampus sinensis Euphrasen.
501. Pampus echinogaster Basilewsky. N. China.

Family 91. LACTARIIDÆ

502. Lactarius lactarius B. & S.

Family 92. RACHYCENTRIDÆ

503. Rachycentron canadum L.

Family 93. LEIOGNATHIDÆ

504. Leiognathus ruconia Hamilton.
505. Secutor insidiator Bloch. Hongkong.
506. Leiognathus argentea Houttuyn. Amoy.
507. Leiognathus rivulata C. & V.
508. Leiognathus lineolata C. & V.

Family 94. CORYPHÆNIDÆ

509. Coryphæna hippurus L.

Family 95. LAMPRIDÆ

510. Lampris regia Bonnaterre.

Family 96. BRAMIDÆ

512. Brama raii L.
513. Brama dussumieri C. & V.

Family 97. MENIDÆ

514. Mene maculata B. & S.

Family 98. PEMPHERIDÆ

515. Pempheris oualensis C. & V.
516. Liopempheris sasakii Jordan & Hubbs.
517. Liopempheris vanicolensis C. & V.

Family 99. APOGONIDÆ

518. Apogonichthys carinatus C. & V.
519. Apogon annularis Rüppell.
520. Apogon bifasciatus Rüppell.
521. Apogon lineatus T. & S. Chefoo.
522. Apogon nigripinnis C. & V.
523. Apogon quadrifasciatus C. & V.
524. Apogon trivittatus Blkr.
525. Apogon monochrous Blkr.

Family 100. SCOMBROPIDÆ

526. Scombrops boops Houttuyn. Tsushima.

Family 101. AMBASSIDÆ

527. Ambassis gymnocephalus Lac.
528. Ambassis vachellii Richardson.

Family 102. KUHLIIDÆ

529. Safole tæniura C. & V.
530. Kuhlia marginata C. & V.
531. Kuhlia rupestris C. & V.

Family 103. LATIDÆ

532. Psammoperca waigiensis.

Family 104. PRIACANTHIDÆ

533. Priacanthus japonicus C. & V.
534. Priacanthus macracanthus C. & V.

Family 105. DIPLOPRIONIDÆ

535. Diploprion bifasciatus K. & H. Hongkong.

Family 106. MORONIDÆ

536. Lateolabrax japonicus C. & V. Hongkong.

Family 107. EPINEPHELIDÆ

537. Bryttosus kawamebari T. & S.
538. Coreoperca herzi Herzenstein. N. China, Korea.
539. Siniperca chuatsi Basil. Manchuria, Shanghai, Ichang.
540. Siniperca chuantsi Basilewsky N. China toNingpo.
541. Siniperca scherzeri Steindachner. Shanghai, Ichang.
542. Siniperca kneri Garman. Ichang.
543. Stereolepis ischinagi Hilgendorf. Korea.
544. Aulacocephalus temmincki Boul. Siam to Japan.
545. Plectropomus maculatus Bloch.
546. Cephalopholis pachycentrus C. & V.
547. Cephalopholis bœnack Bloch.
548. Cephalopholis argus B. & S.
549. Cephalopholis leopardus Lacep.
550. Trisotropis dermopterus T. & S.
551. Epinephelus flavocæruleus Lacep.
552. Epinephelus undulosus Q. & G.
553. Epinephelus chlorostigma C. & V.
554. Epinephelus latifasciatus T. & S. Shanghai.
556. Epinephelus morrhua C. & V.
557. Epinephelus diacanthus C. & V. Shanghai, Amoy, Hongkong.
558. Epinephelus brunneus Bloch. Canton.
559. Epinephelus sexfaciatus C. & V.
560. Epinephelus akaara T. & S. Shanghai.
561. Epinephelus ionthas Jordan & Metz. Fusan.
562. Epinephelus megachir Richardson.
563. Epinephelus fario Thunberg.
564. Epinephelus septemfasciatus Thunberg.
565. Epinephelus awaara T. & S. So. China.
566. Epinephalus moara T. & S.
567. Epinephalus nebulosus C. & V. Ningpo.
568. Epinephalus merra Bloch.
569. Epinephalus fasciatus Forskål.
570. Epinephalus tsirimenara T. & S. Korea.
571. Epinephalus tauvina Forsk. Swatow.
572. Cromileptes altivelis C. & V.

Family 108. NIPHONIDÆ

573. Niphon spinosus C. & V.

Family 109. GLAUCOSSOMIDÆ

574. Glaucosoma fauvelli Sauvage. Swatow.

Family 110. PLESIOPIDÆ

525. Plesiops nigricans Rüpp.

Family 111. LOBOTIDÆ

576. Lobotes surinamensis Bloch.

Family 112. LUTIANDÆ

577. Lutianus gembra C. & V.
578. Lutianus kasmira Forskål. Swatow.
579. Lutianus rangus C. & V.
580. Lutianus russelli Blkr. Hongkong.
581. Lutianus fulviflamma Forskål.
582. Lutianus johnii Bloch. Shanghai, Swatow.
583. Platyginius sparus T. & S.
584. Etelis carbunculus C. & V.
585. Aphareus furcatus Lacep.

Family 113. THERAPONIDÆ

586. Therapon theraps C. & V. Amoy.
587. Therapon quadrilineatus Bloch. Japanese and Chinese seas.
588. Therapon servus Bloch. Swatow, Amoy.
589. Therapon oxyrhynchus T. & S. Swatow.

Family 114. HÆMULIDÆ

590. Pomadasys hasta Bloch. Swatow.
591. Pomadasys pihloo Richardson. Canton.
592. Pomadasys japonicus C. & V. Canton.
593. Parapristipoma trilineatum Thunberg.
594. Plectorhynchus affine Gthr.
595. Plectorhynchus pictus Thunberg.
596. Plectorhynchus microlepidotus Peters.
597. Plectorhynchus reticulatus Gthr.
598. Plectorhynchus cinctus T. & S.
599. Hapalogenys nigripinnis T. & S. Chefoo, Ningpo, Canton.
600. Hapalogenys mucronatus B. & S. Canton, Amoy, Ningpo.
601. Scolopsis japonicus Bloch. Chinese Sea.
602. Scolopsis margaritifer C. & V.
603. Scolopsis bimaculatus Rüppell.
604. Scolopsis inermis T. & S. Korea.

Family 115. BANISOBIDÆ

605. Banjos banjos Rich.

Family 116. CÆSIONIDÆ

606. Cæsia lunaris C. & V.
607. Cæsio chrysozona K. & V.
608. Cæsio cærulaureus Lacep.

Family 117. SPARIDÆ

609. Lethrinus nematacanthus Bleeker.
610. Lethrinus hæmatopterus T. & S.
611. Lethrinus chœrorhynchus T. & S.
612. Euthyopteroma virgatum Houttuyn. Ningpo.
613. Euthyopteroma bathybium Snyder.
614. Gymnocranius griseus T. & S.
615. Taius tumifrons T. & S. Shanghai.
616. Evynnis cardinalis Lacep. Swatow, Ningpo, Chinwangtao.
617. Pagrosomus major T. & S. Ningpo, Chefoo.
618. Sparus aries T. & S. Swatow.
619. Sparus latus Hout. Amoy, Swatow.
620. Sparus macrocipholus Basilewsky. Chefoo.

Family 118. GIRELLIDÆ

621. Girella punctata Gray.
622. Girella melanichictys Rich.
623. Girella mezina Jordan & Starks.

Family 119. KYPHOSIDÆ

624. Kyphosus lembus C. & V.
625. Kyphosus cinerascens Forskål.

Family 120. GERRIDÆ

626. Gerres punctatus C. & V.
627. Gerres poeti C. & V.
628. Gerres limbatus C. & V. Hainan.
629. Gerreomorpha japonica Blkr. Swatow, Canton.
630. Gerreomorpha decacantha Blkr. Amoy.

Family 120. MULLIDÆ

631. Upeneus moana Jordan & Seale.
632. Upeneus pleurotænia Playfair. Hongkong.
633. Upeneus spilurus Blkr.
634. Upeneus indicus Lacep.
635. Upeneus barbarinus Lacep.
636. Upeneus chrysopleuron T. & S. S. China.
637. Mulloides flavolineatus Lacep.
638. Upeneoides bensasi T. & S. Swatow, Korea.
639. Upeneoides sulphureus C. & V.
640. Upeneoides tragula Richardson.
641. Upeneoides subvittatus T. & S. So. China.
642. Upeneoides vittatus Forskål.

Family 122. POLYNEMIDÆ

643. Eleutheronema tetradactylum Shaw. Amoy.
644. Polynemus plebejus Gmelin. Swatow, Amoy.
645. Polynemus multiradiatus Gthr. China Sea.
646. Polynemus xanthonemus C. & V.
647. Polynemus sextarius Bloch.
648. Galeoides microps Stein.

Family 123. SILLAGINIDÆ

649. Sillago sihama Forsk. Amoy.
650. Sillago japonica T. & S. Chinwangtao, Swatow.

Family 124. BRANCHIOSTEGIDÆ

651. Branchiostegus japonicus Houttuyn.

Family 125. CEPOLIDÆ

652. Cepola schlegelii Blkr. Swatow.
653. Acanthocepola krusensternii T. & S. Canton.
654. Acanthocepola limbata C. & V. Formosa.
655. Acanthocepola oxylepis Blkr.

Family 126. SCIÆNIDÆ

656. Nibea albiflora Rich. Chefoo.
657. Nibea nibe Jordan & Thompson. Korea
658. Nibea japonica T. & S. Chemulpo.
659. Nibea schlegeli Blkr.
660. Nibea sina C. & V. Chinwangtao, Ningpo.
661. Nibea iharæ Jordan & Metz. Chemulpo.
662. Bola coitor C. & V.
663. Bola diacanthus Lacep.
664. Bola axillaris C. & V. Swatow.
665. Johnius carutta Bloch.
666. Johnius belangeri C. & V.
667. (Johnius) fauveli Sauvage. Swatow.
668. (Johnius) amblyceps Blkr.
669. (Johnius) amoyensis Blkr.
670. Othonias undivittatus Jordan & Seale. Hongkong, Port Arthur.
671. Larimichthys rathbunæ J. & S.
672. Collichthys lucidus Rich. Korea.
673. Collichthys fragilis Jordan & Seale. Fusan.
674. Collichthys nirveatus Jordan & Starks. Port Arthur, Chinnampo.

Family 127. APLODACTYLIDÆ

675. Goniistius zonatus C. & V. Fusan.

Family 128. CIRRHITIDÆ

676. Isobuna japonica Steindachner.

Family 129. OPLEGNATHIDÆ

677. Oplegnathus fasciatus T. & S. Canton.
678. Oplegnathus punctatus T. & S. Canton.

Family 130. EMBIOTOCIDÆ

679. Neoditrema ransonneti Steindachner. Korea.
680. Ditrema temmincki Blkr. Chefoo.

Family 131. POMACENTRIDÆ

681. Amphiprion polymnus Linn. Canton.
682. Amphiprion perculus Lacep.
683. Amphiprion frenatus Brevoort.
684. Amphiprion bifasciatus B. & S.
685. Dascyllus aruanus C. & V.
686. Dascyllus marginatus Gthr.
687. Dascyllus reticulatus Rich.
688. Pomacentrus dorsalis C. & V.
689. Pomacentrus bankanensis Blkr.
690. Pomacentrus trimaculatus C. & V.
691. Pomacentrus nigricans C. & V.
692. Pomacentrus jordani Rutter. Swatow.
693. Chromis notatus T. & S.
694. Chromis analis C. & V.
695. Chromis cinerascens C. &V.
696. Abudefduf sordidus Forsk.
697. Abudefduf septemfasciatus C. & V.
698. Abudefduf saxatilis Linn.
699. Abudefduf bengalensis C. & V.
700. Abudefduf affinis Gthr.
701. Abdefduf sexfasciatus Lacep.
702. Chrysiptera bankieri Rich.
703. Chrysiptera plagiometopon Blkr.
704. Chrysiptera modesta, T. & S.
705. Chrysiptera sinensis Blkr.
706. Chrysiptera zonata C. & V.

Family 132. LABRIDÆ

707. Chœrodon azurio J. & S.
708. Chœrodon cyanostolus Richardson. Hongkong.
709. Chœrodon schoenleini Blkr.
710. Semicossyphus reticulatus C. & V.

Family 133. CORIDÆ

711. Duymæria flagellifera C. & V.
712. Pseudolabrus japonicus Houttuyn.
713. Pseudolabrus gymnogenys Steindachner.
714. Stethojulis interrupta Bennett. Hongkong.
715. Stethojulis renardi Blkr.
716. Stethojulis strigiventer Bennett. Ningpo.
717. Stethojulis kalosoma Blkr.
718. Stethojulis phekadopleura Blkr.
719. Stethojulis trossula Jordan & Snyder.
720. Halichœres minutus, Blkr.
721. Halichœres guttatus Bloch.
722. Halichœeres tenuispinis Gthr. Amoy.
723. Halichœres hyrtli Blkr.
724. Halichœres nigrescens Blkr.
725. Halichœres poecilopterus T. & S.
726. Halichœres chloropterus Bloch.
727. Halichœres trimaculatus Blkr.
728. Coris aygula Lacep.
729. Pseudocoris heteropterus Blkr.
730. Cheilio inermis Forskål.
731. Thalassoma purpureum Forskål.
732. Thalassoma melanochir Blkr.
733. Thalassoma fuscum Lacep.
734. Thalassoma umbrostigma Rüppell.
735. Thalassoma lunare L.
736. Thalassoma dorsale Q. & G.
737. Gomphosus varius Lacep.
738. Gomphosus tricolor Q. & G.
739. Cheilinus oxyrhynchus Blkr.
740. Cheilinus trilobatus Lacep.
741. Cheilinus fasciatus Bloch.
742. Iniistius pavoninus C. & V. Swatow.
743. Iniistius dea T. & S. Canton.
744. Hemipteronotus pentadactyla L.
745. Xyrichthys punctulatus C. & V.
746. Epibulus insidiator Pall.

Family 134. SCARIDÆ

747. Leptoscarus japonicus C. & V.
748. Scarus gracilis Steindachner.
749. Scarus æruginosus Blkr.
750. Scarus limbatus Rich. Hongkong.
751. Scarus chinensis Steindachner.
752. Scarus celebicus Blkr.

Family 135. ZEIDÆ

753. Zeus japonicus C. & V.

Family 136. SCATOPHAGIDÆ

754. Scatophagus argus Gmelin. Swatow.

Family 137. PLATACIDÆ

755. Platax teira Forskål.
756. Platax vespertilio Bloch.

Family 138. DREPANIDÆ

757. Drepane puctata Gmelin. Swatow.

Family 139. CHÆTODONTIDÆ

758. Chætodon setifer Bloch.
759. Chætodon vagabundus L.
760. Chætodon kleinii Bloch.
761. Chætodon chrysozonus Cuv.
762. Chætodon robustus Bleeker.
763. Chætodon fasciatus Forskål.
764. Coradion modestum T. & S. Amoy.
765. Microcanthus strigatus, C. & V.
766. Heniochus macrolepidotus Linn. Canton.
767. Acanthochætodon septentrionalis Schlegel.
768. Holacanthus imperator Bl.
769. Holacanthus annularis Bloch .
770. Holacanthus diacanthus Güuther.

Family 140. ZANCLIDÆ

772. Zanclus cornutus Linn.

Family 141. ACANTHURIDÆ

773. Acanthurus bipunctatus Gthr.
774. Acanthurus triostegus L.
775. Ctenochætus striatus Q. & G.
776. Xesurus scalprum C. & V.
777. Naso unicornis Forsk.

Family 142. TEUTHIDÆ

788. Teuthis fuscescens Houttuyn. Hongkong, Amoy, Swatow.
779. Teuthis oramin B. & S. Amoy.
780. Teuthis virgatus C. & V.

Family 143. TRIACANTHIDÆ

781. Triacanthus strigilifer Gthr.
782. Triacanthus brevirostris T. & S. Swatow, Shanghai.

Family 144. BALISTIDÆ

783. Sufflamen chrysopterus B. & S.
784. Sufflamen capistratus Shaw.
785. Pseudobalistes flavimarginatus Rüppell.
786. Balistes vidua Richardson.
787. Balistopus undulatus Park.
788. Balistapus aculeatus L.
789. Canthidermis rotundatus Procé.
790. Abalistes stellatus B. & S.

Family 145. MONACANTHIDÆ

791. Monacanthus chinensis Bloch.
792. Monacanthus tomentosus C. & V.
793. Monacanthus sulcatus Hollard. Swatow.
794. Paramonacanthus knerii Steind.
795. Monacanthus helleri Steind.
796. Monacanthus japonicus Tilesius. Shanghai.

797. Monacanthus cirrhifer T. & S.
798. Pseudomonacanthus modestus Gthr.
799. Paraluteres prionurus Blkr.
800. Aluterą scripta Osbeck.
801. Alutera nasicornis T. & S.

Family 146. OSTRACIIDÆ

802. Tetrosomus gibbosus Linn.
803. Ostracion immaculatum T. & S.
804. Lactoria diaphana B. & S. Hainan.
805. Lactoria cornuta Linn.

Family 147. TRIODONTIDÆ

806. Triodon bursarius Reinwardt.

Family 148. TETRAODONTIDÆ

807. Chronerhinus naritus Rich.
808. Lagocephalus lunaris B. & S. Swatow.
809. Lagocephalus spadiceus Rich. Canton.
810. Lagocephalus sceleratus Forster.
811. Lagocephalus inermis T. & S.
812. Chelonodon patoca Ham. & Buch. Canton.
813. Sphœroides rubripes T. & S. Shanghai, Yangtse R.
814. Sphœroides xanthopterus T. & S.
815. Sphœroides pardalis T. & S.
816. Sphœroides exascurus Jordan & Snyder.
817. Sphœroides ocellatus Osbeck. Pei Ho, Tientsin, Ningpo.
818. Sphœroides basilewskianus Basil.Chihli.
819. Sphœroides alboplumbeus T. & S. Amoy.
820. Sphœroides vermicularis T. & S.
821. Sphœroides bimaculatus Rich.
822. Sphœroides borealis J. & S.
823. Sphœroides macclellandi Regan.
824. Sphœroides niphobles J. & S.
825. Sphœroides oblongus Bloch.
826. Ovoides honckenii Blgr. Ningpo.
827. Ovoides aerostaticus Jenyus. Singapore to Japan.
828. Ovoides mappa Lesson.
829. Canthigaster margaritatus Rüpp.

Family 149. DIODONTIDAE

830. Diodon holacanthus.

Family 150. MOLIDÆ

831. Mola mola L.

Family 151. SCORPÆNIDÆ

832. Sebastosomus inermis C. & V. Chefoo.
833. Sebastosomus schlegeli Hilgendorf.
834. Pteropodus trivittatus Hilgendorf.
835. Pteropodus mitsukurii Cramer.
836. Pteropodus pachycephalus T. & S. Canton.
837. Sebastocles elegans Steindachnar & Doderlein.
838. Sebastiscus marmoratus C. & V.
839. Scorpæna armata Savage.
840. Scorpænopsis diabolus Renard. Canton
841. Scorpænopsis cirrhosa Thumb.
842. Scorpænopsis gibbosa B. & S.
843. Scorpænodes serrulat Richardson.
844. D43-A Scorpænodes longicapa Rich.
845. Amblyapistus tænianotus Blkr.
846. Synanceja horrida L.
847. Trachicephalus uranoscopus B. & S. Swatow.
848. Hypodytes rubripinnis T. & S.
849. Hypodytes longispinis C. & V.
850. Centropogon urostigma Blkr.
851. Apistus alatus C. & V.
852. Minous inermis Alcock.
853. Minous monodactylus B. & S.
854. Cottapistus leurynnis Jordan and Seale. Hongkong.
855. Cottapistus cottoides Gthr.
856. Vespicula leucogaster Richardson.
857. Vespicula gogorzae J. & S.
858. Vespicula sinensis Blkr.
859. Pterois volitans L. Swatow.
860. Pterois lunulata T. & S.
861. Brachirus zebra C. & V.
862. Choridactylus multibarbis Rich.
863. Inimicus cuvieri Gray.
864. Inimicus sinensis C. & V.
865. Inimicus aurantiacus T. & V. Chefoo, Amoy.
866. Inimicus japonicus C. & V.
867. Inimicus maculatus C. & V.
868. Aploactis aspera Richardson.
869. Trichopleua mollis Richardson.

Family 152. HEXAGRAMMIDÆ

870. Agrammus agrammus Schl.
871. Hexagrammos otakii J. & Starks. Chihli.

Family 153. COTTIDÆ

872. Trachidermus fasciatus Heckel. Ningpo, Chinwangtao.
873. Trachidermus ansatus Rich.
874. Cottus pœcilopus Heckel.
875. Cottus pollux Gthr.
876. Myoxocephalus sinensis Sauv.
877. Furcina dabryi Sauv.
878. Pseudoblennius cottoides Rich.

Family 154. HEMITRIPTERIDÆ

879. Hemitripterus villosus Pallas.
880. Hemitripterus sinensis Sauv.

Family 155. PARABEMBRIDÆ

881. Parabembras curtus T. & S.

Family 156. PLATYCEPHALIDAE

882. Onigrocia macrolepis Bleeker.
883. Wakiyus spinosus T. & S. Swatow.
884. Inegocia japonica Tiles. Chefoo.
885. Insidiator detrusus Jordan & Seale. Hongkong.
886. Cocia crocodilus Tilesius. Chinwangtao.
887. Grammoplites neglectus Toschel. Hongkong.
888. (Inegocia) isacanthus C. and V. Macao.
889. Insidiator meerdervoortii Blkr.
890. Rogadius asper C and V. Swatow.
891. Platycephalus indicus L. Canton to Chihli.

Family 157. TRIGLIDÆ

892. Lepidotrigla alata Houtt.
893. Lepidotrigla burgeri Gthr. Swatow.
894. Lepidotrigla microptera Gthr. Shanghai.
895. Lepidotrigla guntheri Hilgendorf.
896. Lepidotrigla japonica Blkr.
897. Chelidonichthys kumu Lesson and Garnot. Chefoo to Canton.

Family 158. PERISTEDIIDÆ

898. Peristedion orientale T. & S.
899. Peristedion rieffeli Kaup.

Family 159. DACTYLOPTERIDÆ

900. Dactyloptena orientalis C. & V.
901. Daicocus peterseni Nystrom.

Family 160. AGONIDÆ

902. Podothecus sturioides Guichenot.

Family 161. ECHENEIDÆ

903. Remorina albescens T. & S.
904. Remoropsis brachyptera Lowe.

905. Remora remora Linn. Ningpo, Hongkong.
906. Echeneis naucrates Linn. Chefoo.

Family 162. TRICHONOTIDÆ

907. Trichonotus filamentosus Steind.

Family 163. ELEOTRIDÆ

908. Bostrychus sinensis Lacep. Swatow, Ningpo, Shanghai, Riukiu.
909. Valenciennea elegans Blkr.
910. Odontobutis obscurus Schl. Shanghai, Chinkiang.
911. Ophiocara ophiocephalus K. & H. Ningpo.
929. Micropercops dabryi Fowler. Soochow.
930. Micropercops cinctus Dabry. Swatow, Kiangsi, Shanghai.
912. Eleotris xanthi Gthr. Yangtse River, Ichang.
913. Eleotris swinhonis Gthr. Shanghai.
914. Eleotris flammans Cantor.
915. Eleotris potamophila Gthr. Chinkiang, Yangtse River, Ningpo.
916. Eletoris davidi Sauvage. Ningpo.
917. Eleotris balia Jordan & Seale. Hongkong.
918. Eleotris oxycephala Schl. Macao, Ningpo, T. & S.
919. Butis butis Buch.-Ham. Shanghai.
920. Butis koilomatodon Blkr. Canton, Ningpo.

Family 164. PERIOPHTHALMIDÆ

921. Boleophthalmus pectinirostris Gml.
922. Boleophthalmus serperaster Rich. Swatow.
923. Boleophthalmus polyophthalmus Gthr.
924. Boleophthalmus maculatus Oshima.
925. Scartelaos viridis Buch.-Ham. Canton to Shanghai.
926. Periophothalmus barbarus Linn. Hongkong to Shanghai.

Family 165. GOBIIDÆ

927. Gobiodon micropus Gthr.
928. Gobiodon ceramensis Blkr.
931. Gnatholepis deltoides Seale.
932. Gnatholepis calliurus Jordan & S.
933. Gobius ophthalmotænia Blkr.
934. Gobius fuscus Rüppell.
935. Rhinogobius caninus C. & V.
936. Rhinogobius margariturus Rich.
937. Rhinogobius cyanomos Blkr. Swatow.
938. Rhinogobius brevirostris Gthr.
939. Rhinogobius bernadoui J. & S.
940. Rhinogobius similis Gill.
941. Rhinogobius giurinus Rutter. Swatow.
942. Rhinogobius davidi Sauv. Chekiang.
943. Paragobiodon echinocephalus Rüpp.
944. Drombus palackyi J. & S.
945. Drombus ripilepis Rich.
946. Aboma lactipes Hilgendorf. Peitaiho, Soochow.
947. Aboma tsushimæ Jordan & S. Tsushima.
948. Cryptocentrus filifer C. & V. Canton.
429. Cryptocentrus venustus Jordan & Seale. Hongkong.
950. Oxyurichthys cristatus.
951. Oxyurichthys microlepis Blkr.
952. Oxyurichthys amabilis Seale.
953. Glossogobius brunneus T. & S. Macao-North.
954. Glossogobius giuris Ham. Buch. Nanking, Swatow.
955. Glossogobius grammepomus Blkr.
956. Glossogobius abacopus Jordan & Richardson.
957. Chænogobius macrognathos Blkr.
958. Chloea sarchynnis J. & S. Korea.
959. Chasmichthys dolichognathus Hilgendorf.
960. Chasmichthys gulosus Sauv.
961. Pterogobius elapoides Gthr.
962. Lophiogobius ocellicauda Gthr. Chefoo, Shanghai.
963. Acanthogobius flavimanus Schl. Swatow, Chefoo, Newchwang.
964. Acanthogobius hasta Sch.
965. Acanthogobius stigmothonus Rich.
966. Acanthogobius ommaturus Rich. Swatow, Amoy.
967. Parachæturichthys polynemus Blkr.
968. Chæturichthys stigmatias Rich. Swatow, Shanghai.
969. Chaæturichthys hexanemus Blkr.
970. Trianopogon barbatus Günther. Swatow, Shanghai.
971. Tridentiger obscurus T. and S. North China.
972. Tridentiger trigonocephalus Gill. Chefoo, Shanghai, Swatow.
973. Tridentiger tæniatus Gthr. Chefoo.
974. Trypauchen chinensis Sieindachner.

Family 166. TRYPAUCHENIDÆ

975. Trypauchen wakæ J. & Snyder. Ningpo.
976. Trypauchen vagina Blkr. Swatow,

Family 167. GOBIOIDIDÆ

977. Tænioides abbotti Jordan & Starks.

Family 168. PARAPERCIDÆ

978. Parapercis pulchella E. & S. Canton.
979. Parapercis snyderi J. & Starks. Korea.
980. Parapercis cylindrica, Bloch.
981. Neopercis sexfasciata T. & S.

Family 169. URANOSCOPIDÆ

982. Uranoscopus oligolepis Blkr.
983. Uranoscopus japonicus Hout. Swatow, Korea.
984. Uranoscopus bicinctus Tem. & Schl.
985. Uranoscopus chinensis.
986. Ichthyscopus lebeck Schneider.

Family 170. CHAMPSODONTIDÆ

987. Champsodon vorax Gthr. China Sea.

Family 171. CALLIONYMIDÆ

988. Calliurichthys reevesii Richardson.
989. Calliurichthys japonicus Houttuyn. Canton.
990. Callionymus olidus Gthr. Shanghai.
991. Callionymus hindsii Rich.
992. Callionymus lunatus T. & S.
993. Callionymus curvicornis C. and V.

Family 172. CLINIDÆ

994. (Clinus) nematophorus Günther.

Family 173. BLENNIDÆ

995. Blennius sinensis Günther.
996. Petroscirtes anema Blkr.
997. Petroscirtes cyprinoides.
998. Petroscirtes dispar Blkr. Amoy.
999. Petroscirtes bankieri Rich.
1000. Salarias bellus Blgr.
1001. Salarias lineatus C. & V
1002. Salarias nitidus Gthr

Family 174. PHOLIDÆ

1003. Enedrias nebulosus Temm. & Schl. Chefoo.

Family 175. CEBIDICHTHYIDÆ

1004. Zoarchias aculeatus Basilewsky.
1005. Dictyosoma burgeri Van der Hoevem.

Family 176. STICHÆIDÆ

1006. Ernogrammus hexagrammus Schl. Chefoo, Ningpo.
1007. Dinogunellus grigorjewi Herzenstein.

Family 177. ANARHICHADIDÆ

1008. Anarhichas fasciatus Blkr.

Family 178. XIPHASIIDÆ

1009. Xiphasia setifer Swainson.

Family 178. ZOARCIDÆ

1010. Zoarces gilli Jordan & Starks, Korea.

Family 180. OXUDERCIDÆ

1011. Oxuderces dentatus Valenc. Macao.

Family 181. GADIDÆ

1012. Gadus macrocephalus Tilesius.
1013. Eleginus navaga Kölreuter. Korea.

Family 182. MERLUCCIDÆ

1014. Merluccius productus Ayres.

Family 183. GAIDROPSARIDÆ

1015. Gaidropsarus pacificus Temm. & Schl.

Family 184. PSETTODIDÆ

1016. Psettodes erumei Bennett.

Family 185. BOTHIDÆ

1017. Platophrys myriaster T. & S. So. China.
1018. Scaeops grandisquama T. & S.
1019. Arnoglossus tenuis Gthr. Hongkong.
1020. Arnoglossus tapeinosoma Blkr. Hongkong.

Family 186. HIPPOGLOSSIDÆ

1021. Pseudorhombus pentophthalmus Blkr. Canton.
1022. Pseudorhombus arsius B. & H. Swatow.
1023. Pseudorhombus polyspilos Blkr. Chefoo.
1024. Pseudorhombus russelli Grey. Chefoo.
1025. Pseudorhombus cinnamomeus T. & S. Hongkong north.
1026. Pseudorhombus oligodon Blkr. North China to Amoy.
1027. Paralichthys olivaceus T. & S. Hongkong, Amoy, Ningpo. Chefoo.
1028. Verasper variegatus T. & S. Chefoo.
1029. Verasper moseri J . & G. Chihli.
1030. Tephrinectes sinensis Lacep.
1031. Cleisthenes hertzensteini S c h m id t. Chihli.

Family 187. PLEURONECTIDÆ

3032. Pleuronichthys cornutus T. & S. Swatow, Amoy.
1033. Pleuronichthys lighti Herre. Amoy.
1034. Limandella yokohamæ Gthr. Port Arthur.
1035. Kareius bicoloratus Basil. Chefoo.
1036. Clidoderma asperrimum Schl. Chefoo.

Family 188. SOLEIDÆ

1037. Heteromycterus japonicus T. & S.
1038. Microbuglossus ovatus Rich.
1039. Liachirus nitidus Gthr. China Coast.

Family 189. SYNAPTURIDÆ

1040. Zebrias zebrinus T. & S. Shangtung to Canton.
1041. Zebrias zebra Bloch T. & S. Chefoo, Chinwangtao, Swatow.
1042. Zebrias quagga Kaup. Hongkong, Ningpo.
1043. Aesopia cornuta Kaup. Swatow.
1044. Synaptura pan H. & B. Swatow.
1045. Synaptura foliacea Gthr.
1046. Synaptura orientalis Schu.

Family 190. CYNOGLOSSIDÆ

1047. Paraplagusia dipterygia Rüppell.
1048. Rhinoplagusia japonica Temm. & Schl. Amoy, Foochow, Mia Wha.
1049. Cynoglossus puncticeps Gthr.
1050. Cynoglossus lineolatus Steind. Swatow.
1051. Cynoglossus robustus Gthr. Shanghai.
1052. Cynoglossus macrolepidotus Blkr. Swatow.
1053. Cynoglossus melampetalus Rich. Swatow, Ningpo.
1054. Arelia arel B. & S. Hongkong.
1055. Areliscus abbreviatus Gray. Shanghai, Ningpo, Swatow.
1056. Areliscus interruptus Gthr.
1057. Areliscus trigammus Gthr. Swatow.
1058. Areliscus gracilis Gthr. Crefoo, Newchwang, Shanghai.
1059. Areliscus rhomaleus Jordan & Starks. Port Arthur to Swatow.

Family 191. LOPHIIDÆ

1061. Lophius litulon Jordan & Sindo.
1061. Lophiomus setigerus Vahl. Swatow, Ningpo.

Family 192. ANTENNARIIDÆ

1062. Histrio histrio L.
1063. Histrio raninus Tilesius.
1064. Antennarius tridens T. & S.
1065. Antennarius nummifer Blkr.
1066. Antennarius multiocellatus Gthr.
1067. Antennarius biocellatus Blkr.
1068. Halieutæa stellata Vahl.

SUPPLEMENTAL LIST OF RIVER FISHES

In addition to the Catalogue above completed, Dr. Reeves has furnished the following list of river fishes not included in the text, and many of them likely to occur in Northeastern China.

Osmerus dentex Steindachner. Manchuria, Okhotsk.
Parasilurus grahami Regan. Yunnan.
Parasilurus grahami Regan. Yunnan.
Aoria medianalis Regan. Yunnan fu.
Aoria pratti Gthr. River Ya.
Aoria pulcher Chaudhuri. Yunnan.
Hypselobagrus chinensis Steindachner. Canton.
Pseudobagrus emarginatus Sowerby. Yalu. S. Manchuria.
Liobagrus nigricauda Regan. Yunnan.
Liobagrus marginatus Gthr. Szechuan.
Exostoma andersoni Day. Hotha, Pousi (Yuanan).
Exostoma labiatum McClelland. S West China, East Assam.
Exostoma davidi Sauv. Lun ngan fu.
Glyptosternon conirostrum Steindachner. Szechuan, Yangtse River.
Amblyceps marginatus Gthr. River Ya, Szechuan, Tibet, Yangtse River.

Oreinus richardsonii Gray. Nampoung River.
Leptobotia elongata Blkr. Yangtse.
Lepidocephalichthys macrostigma Dabry. Peking, lakes of Central China, Yangtse.
Leptobotia mantschurica Berg.
Bothia patti Gthr. Szechuen, Yunnan.
Bothia superciliaris Gthr. Szechuen. Yunnan.
Lefua coreanus J. & Starks. Korea.
Misgurnus cestoides Kessler. Dalai Nor.
Ussuria leptocephala Nikolski. Ussuri R., E. Manchuria.
Misgurnus crossochilus Sauvage. Mts. of Koaten.
Nemachilus alticeps Herz. Tibet, Szechuen.
Nemachilus nigromaculatus Regan. Yunnan.
Nemachilus oxygnathus Regan. Yunnan.
Nemachilus potanni Blkr. Ya River.
Nemachilus pleurotænia Regan. Yunnan.
Nemachilus robustus Kessler. Kansu.
Nemachilus salmoides Chaudhuri. Yunnan.
Nemachilus sternurus Herz. Sources of Yanytse.
Nemachilus tibetanus Regan. Tibet.
Nemachilus variegatus Dabry. China.
Nemachilus ladacensis Günther. Tibet.
Nemachilus lhasae Regan. Tibet.
Nemachilus grahami Regan. Yunnan. China.
Nemachilus berozowskii Blgr. Hin-Hsian, Kansu, China.
Barbatula stoliczkae Steindachner. Tibet, Szechuen.
Oreonectes platycephalus Gthr. Mts. of Hongkong.
Barilius alburnops Regan. Yunnan.
Leucogobio strigatus Regan. Korea, Chongju.
Cyprinus micristius Regan. Yunnan.
Carassius gibeloides Blkr. Szechuan.
Labeo yunnanensis Chaudhuri. Yunnan.
Hemilabeo notabilis Peters. Hongkong.
Rohita macrochir Blkr.
Banzana davidii Sauv. Szechuan.
Crossochilus monticola Gthr. Ichang.
Gymnostomus moliterella Blkr. Canton.
Oreinus baileyi Lloyd. Tibet.
Ladislavia taczanowskii Dybowsky. North.
Gymnocypris dobula Gunther. Provinces near Tibet.
Gonoproxtopterus mylodon Berg. Korea.
Saurogobio athymius J. & Starks. Korea.
Gnathopogon tæniatus Gthr. Head waters Yangtse.
Aphyocypris ensarca J. & Starks. Korea.
Barbus sarana Ham.-Buch. Yangtse River.
Barbus mosae Ham.-Buch. Nampoung River (Yunnan).
Rasbora philippina Gthr. Hongkong.
Osteochilus brachynopterus Blkr. Hainan.
Acahara brandti Dybowski.
Ptychobarbus kazakovi Nikolski.
Moroco modestus J. & Metz. Korea.
Diptychus crassilabris Steind. Szinning fu.
Barbus margaritanus And. Nampoung R. Kaklyen Hills.
Sinibarbus vittatus Sauv.
Paratylognathus davidi Sauvage. Szechuan.
Gymnostomus lepturus Blgr. Hainan.
Barbus brevifilis Peters. Hongkong.
Barbus gerlachi Peters. Hongkong.
Systomus sinus Sauv.
Barbus melanopterus Blkr. (Puntungia.)
Hemibarbus longirostris Regan. Yalu River.
Barbodes deauratus C. & V. Canton.
Onychostoma laticeps Blkr. Kansu, Ichang.
Schizopygopsis stolickae Steind. Yangtse and Yellow River.
Schizopygopsis pylzovi Kessler. Kansu.
Barilius andersoni Regan. Yunnan.
Barilius platypus Schlegel.
Oreinus grahami Regan. Yunnan.
Hemitremia lagowskyi Dybowsky.
Hemicultrella Warpachowsky.
Hemicultrella sauvagei Warpachowski. W. Szechuan.
Hemicultrella soldatowi Nickolski. E. Mongolia.
Chuanchia labiosa Herzenstein. Amur region.
Gnathopogon coreanus Berg. Korea, Japan, and Amur region.
Mrigala sinensis Blkr. China.
Gymnocypris elloni Herz. E. Tibet.
Gymnocypris gasterolepidus Herz. Chaunche.
Gymnocypris thokonii Stewart. Tibet.
Gymnocypris potanini. Blue River.
Gymnocypris maculatus Herz. E. Tibet.
Gymnocypris roborowskii Herz. Kukumor.
Gymnocypris waddellii Regan. Tibet.
Barbus sara H. B. Szechuan.
Acahara hakonensis Gthr. Japan. Everywhere.
Moroco jouyi J. & Snyder. Island of Tsushima, Japan, etc.
Acahara semotilus J. & Starks. Korea.
Acahara mongolicus Kessler. Dalainor, Mongolia.
Discognathus, Hackel. India.
Discognathus imberbis Vinciguerra. Hainan.
Discognathus yunnanensis. Yunnan.
Discognathus prochilus Sauv. Szechuan.
Schizopygopsis przewalskii Kessler. Szechuan
Acanthogobio oxyrhynchus Nikolsi. Lake Chonca, Kirin.
Acanthogobio paitrhevskii Nikolsi. Lake. Chonca, Kirin.
Acanthogobio peltschevskii J. & Metz.
Pungtungia herzi Herzenstein. Korea.
Pseugobio styani Gthr. Kiukiang, Yangtze-
Megagobio nasutus Prejevalsky. Huang Ho,
Acanthorhodeus grahmi Nichols. Yunnan-fu, Mongolia.
Acanthorhodeus guichenoti Blkr. Shanghai, Yaungtse.
Acanthorhodeus hypselonotus Blkr. Yangtse.
Acheilognathus signifer Berg.
Acheilognathus coreanus Steindachner.
Rhodeus chosenicus J. & Metz.
Pseudoperilampus Londæ J. & Metz. Korea.
Barilius platypus Schlegel.
Moroco chuanchicus Kessler. Huang Ho.
Ochelobius lucens J. & Starks.
Danio kakhienensis Anderson. Kakhyen, Nampoung River (Yunnan).
Parapelecus jouyi Jordan & Starks.
Parapelecus eigenmanni J. & Metz.
Parapelecus paitrhevshkii Nikolsi. Lake.

Hemiculter machærioides Rich. Canton.
Hemiculter warpachowskii Nickolski. E. Mongolia, Lake Buir Nor.
Hemiculter schrencki. Foochow.
Hemiculter andrewski Nichols. Yunnan-fu, Yunnan.
Hemiculter dispar Peters. Hongkong.
Culter recurviceps Rich. Canton, Shanghai, N. China.
Pseudogobio kacjekensis Oshima.
Xenocypris plena Blkr. Canton.
Xenocypris homospilotus Richardson. Canton
Xenocypris nitidus Gar. Sha-shi in Hupeh.
Xenocypris prochilus Sauv. Szechuan.
Ctenopharyngodon laticeps Steind. Hongkong.
Ctenopharyngodon idellus C. & V. Ningpo, Yangtse, Shanghai, Ichang, Canton, Shasi, No. China, Hongkong.
Pseudogobio esocinus T. & S. Korea.
Aspiorhychus sartus Zugmayer. Asia.
Schizothorax potanini Herz.
Schizothorax taliensis. W. Yunnan Fu.
Schizothorax sinensis Herz. Lung-ang-fu, Yangtse.
Schizothorax dolichonema Herz. Yangtse.
Schizothorax argentatus Kessler. Kham.
Schizothorax duinelli Viciquerra. Central Asia.
Schizothorax dipogon Regan. Tibet.
Schizothorax kessleri Herz. Lung-ang-fu.
Schizothorax kozlovi Nikolski. Langtse, Dza Tju, C. Asia.
Schizothorax macropogon Regan. Tibet.
Schizothorax ladaënsis Zugmayer. Tibet.
Schizothorax montanus Zugmayer. Tibet.
Schizothorax connori Lloyd. Tibet.
Schizothorax potanini Gthr. Yangtse, Lung-ang-fu.
Schizothorax stewartii Lloyd. Tibet.
Schizothorax waltoni Regan. Tibet.
Schizopygopsis younghusbani Regan. Tibet.
Schizopygopsis guntheri Herz. Tibet, sources of Yellow R., Yangtse.
Schizopygopsis koslowi Herz. Upper Yangtse.
Schizopygopsis malacanthus Herz. Sources of Yangtse.
Schizopygopsis microcephalus Herz. Sources of Yangtse.
Tylognathus davidi Sauvage. Szechuan Occidental.
Barilius interrupta Day. Hotha, Yunnan.
Barilius mosal Ham. Buch. Kakhyen Hill.
Barbus grahami Regan. Yunnan.
Danio kakienensis And. Kakhyen Hill.
Barbus cogginii Chaudhuri.
Barbus margariatnus And. Yunnan, Nampoung River (Yunnan).
Barbus yunnanensis Regan. Yunnan.
Homaloptera abbreviata Gthr. Szechuan.
Homaloptera rotundicauda Martens. Hongkong.
Diplophysa nasalis Kessler. Dalai Nor.
Diplophysa intermedia Kessler. Dalai Nor.
Diplophysa dalaica Kessler. Dalai Nor.
Diplophysa costala Kessler. Dalai Nor.
Ompok canio Ham-Buch.
Ophisurus spadiceus Rich. Canton.
Gymnothorax dorsalis Seale. Hongkong.

MARINE SPECIES

Fluta cinerea Richardson. Yunnan, Woosung.
Mogurnda obscura Schlegel. Shanghai.
Syngnathoides biaculeatus. China, Canton.
Gasterosteus stenurus Kessler. Mongolia, Dalai Nor.
Mugil ventricosus Rich. Canton.
Caranx melampygus C. & V. Hainan, Kachek R.
Caranx cestus Rich. Canton.
Epinephelus megachi Rich. Canton.
Lujanus bengalenssis Bl. Hongkong.
Lutianus fuscescens C. & V. Canton.
Lutianus crythropterus Bloch. Hongkong.
Otolithes fauvelli Peters. Ningpo.
Otolithes aureus Rich. Chefoo.
Otolithes argenteus Kuhl & Hass. China.
Nibea yeddoensis Doderlund. Port Arthur.
Chætodon auripes J. & Snyder. Hongkong.
Sebastodes ijimæ J. & Metz.
Bostrycheus sinensis Lac. Swatow, Mts. of Kiangsi.
Tridentiger bifasciatus Steindachner. Port Arthur.
Gaidrop pacifica Schl.
Ophidium aculeatumBasil. Chihli Province.
Paralichthys coreanicus Schmidt.

BULLETIN

OF THE

PAN-PACIFIC UNION

An unofficial organization, the agent of no government, but with the good will of all in bringing the peoples of the Pacific together into better understanding and cooperative effort for the advancement of the interests common to the Pacific area.

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New Series No. 90, July, 1927

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W. W. Yen.....Chief Executive of China
W. L. Mackenzie King.....Prime Minister of Canada
Prince I. Tokugawa.....President House of Peers, Japan
His Majesty, Prachatipok.....King of Siam
P. Elias Calles.....President of Mexico

OFFICERS IN HONOLULU

President—Hon. Wallace R. Farrington.....Governor of Hawaii
Director—Alexander Hume Ford.....Honolulu

HONOLULU
Published monthly by the Pan-Pacific Union
1927

AIMS OF THE PAN-PACIFIC UNION

From year to year the scope of the work before the Pan-Pacific Union has broadened, until today it assumes some of the aspects of a friendly unofficial Pan-Pacific League of Nations, a destiny that both the late Franklin K. Lane and Henry Cabot Lodge predicted for it.

The Pan-Pacific Union has conducted a number of successful conferences; scientific, educational, journalistic, commercial, fisheries, and most vital of all, that on the conservation of food and food products in the Pacific area, for the Pacific regions from now on must insure the world against the horrors of food shortage and its inevitable conclusion.

The real serious human action of the Pan-Pacific Union begins. It is following up the work of the Pan-Pacific Food Conservation Conference by the establishment of a Pan-Pacific Research Institution where primarily the study and work will be along the lines necessary in solving the problems of food production and conservation in the Pacific Area,—land and sea. Added to this, will be the study of race and population problems that so vitally affect our vast area of the Pacific, the home of more than half of the peoples who inhabit this planet. The thoughts and actions of these peoples and races toward each other as they are today, and as they should be, for the welfare of all, will be a most important problem before the Union, as well as the problem of feeding in the future those teeming swarms of races, that must be well fed to preserve a peaceful attitude toward each other.

The Pan-Pacific Union is an organization in no way the agency of any Pacific Government, yet having the goodwill of all, with the Presidents and Premiers of Pacific lands as its honorary heads. Affiliated and working with the Pan-Pacific Union are Chambers of Commerce, educational, scientific and other bodies. It is supported in part by government and private appropriations and subscriptions. Its central office is in Honolulu, because of its location at the ocean's crossroads. Its management is under an international board.

The following are the chief aims and objects of the Pan-Pacific Union:

1. To bring together from time to time, in friendly conference, leaders in all lines of thought and action in the Pacific area, that they may become better acquainted; to assist in pointing them toward cooperative effort for the advancement of those interests that are common to all the peoples.

2. To bring together ethical leaders from every Pacific land who will meet for the study of problems of fair dealings and ways to advance international justice in the Pacific area, that misunderstanding may be cleared.

3. To bring together from time to time scientific and other leaders from Pacific lands who will present the great vital Pan-Pacific scientific problems including those of race and population, that must be confronted, and if possible, solved by the present generation of Pacific peoples and those to follow.

4. To follow out the recommendations of the scientific and other leaders in the encouragement of all scientific research work of value to Pacific peoples; in the establishment of a Research Institution where such need seems to exist, or in aiding in the establishment of such institutions.

5. To secure and collate accurate information concerning the material resources of Pacific lands; to study the ideas and opinions that mould public opinion among the peoples of the several Pacific races, and to bring men together who can understandingly discuss these in a spirit of fairness that they may point out a true course of justice in dealing with them internationally.

6. To bring together in round table discussion in every Pacific land those of all races resident therein who desire to bring about better understanding and cooperative effort among the peoples and races of the Pacific for their common advancement, material and spiritual.

7. To bring all nations and peoples about the Pacific Ocean into closer friendly commercial contact and relationship. To aid and assist those in all Pacific communities to better understand each other, and, through them, spread abroad about the Pacific the friendly spirit of inter-racial cooperation.

Hawaii's Appropriation of $15,000

The Legislature of Hawaii has again appropriated the sum of fifteen thousand dollars for the work of the Pan-Pacific Union, this being the amount recommended by the Governor of the Territory and the usual appropriation made by the Hawaiian Legislature.

Besides this about twenty thousand dollars a year is given annually by friends of the Pan-Pacific Union in Hawaii for its support, besides occasional Governmental appropriations from Governments of Pacific Countries.

Each country supports its own Pan-Pacific organizations and sends delegates to the Conferences called by the Pan-Pacific Union.

In June, 1928 there will be a Pan-Pacific Women's Conference held in Honolulu. In July, 1928 a second Panacific Commercial Conference in Los Angeles.

In July 1928, a Pan-Pacific Medical Conference in Honolulu, with several smaller Conferences of Scientists as guests of the Pan-Pacific Research Institution.

The Study of Tropical Sunlight

Around the weekly dinner table at the Pan Pacific Research Institution in Honolulu, many important scientific ventures are launched. Here was born the Hawaiian Academy of Science; here was organized the scientific campaign against the destructive termite in Hawaii, and more recently was begun a scientific investigation of the effects of sunlight in the tropics.

The following from the daily press gives an illustration of the manner in which the Pan-Pacific Research Institution inspires others to work.

With the aid of an award granted by the trustees of the S. N. and Mary Castle foundation the Queen's Hospital will conduct an investigation into the effect of sunshine on the human body, according to an announcement made by Dr. Nils P. Larsen, medical director at the hospital. Mrs. Lois Godfrey has been secured to carry on this investigation in the hospital laboratory.

Mrs. Godfrey, before coming to the islands, worked with Dr. Steenbock on vitamines and the effect of certain light on different foods at the University of Wisconsin.

The present work with sunlight will be an attempt to analyze the sunlight itself and also the blood before and after exposure to sunlight, cooperating with the weather bureau to note the changes on different days and different months. Cooperation with centers on the mainland where sunlight is being studied has also been arranged for, so that all results here can be correlated with the work being done there. It is hoped that the results can be immediately applicable especially to sick and underfed children, Dr. Larsen declared.

Work on sunlight and ultra violet rays contained therein, began with a small fund supplied by the Pan-Pacific Union in connection with the Pan-Pacific Research Institution. These preliminary results have been kept on file. The main work under the Castle Foundation began June 1.

It is expected that much interest will be taken in Mrs. Godfrey's research work with sunlight by local doctors, as there is much difference of opinion as to the actual benefits of sunlight in therapy, Dr. Larsen added. At present it is not known just how much of the ultra violet ray in sunshine should be administered the patient.

A Pan-Pacific Marine Products Parley

The Pan-Pacific Research Institution in every Pacific country is interested in the proposed Marine Products Parley to be staged by the Japanese fishermen in Tokyo in 1929.

Plans to open an International Marine Products Congress and an International Marine Products Exposition in Tokyo in May, 1929, have been supported by the Suisei Club and the Suisei-kai, are steadily taking concrete form, and have been assured the support of the Government.

The costs of the project will be defrayed by the members of the various associations interested and by a Government subsidy amounting to 320,000 yen. The exposition is to be on an elaborate scale and expenses of 3,000,000 yen are anticipated.

Invitations will be extended to about 22 countries, including the United States, Great Britain, France and Germany, to send delegations to the conference.

The principal subjects slated for discussion are biology, oceanography, warehousing, increasing output, protection and propagation of marine animals and plants, financing and the immigration of fishermen.

The Pan-Pacific Research Institution is securing papers on these subjects from scientists in every Pacific land and their efforts can be of great service to the proposed fishery conference.

Topographic Maps and Problems

Topographic maps affect all human activities that deal with the land. The production and conservation of food products depend largely on proper utilization of the land and very often agricultural improvements are planned unwisely simply because full and complete knowledge of the topography of the region is unknown. Maps showing the elevation, slope and character of the ground will indicate to a settler the desirability or undesirability of any particular piece of land for farming, and will assist him in its proper cultivation.

The distribution of food products is one of the most important aspects of the food problem for, unless proper storage and transportation facilities are provided, the benefit of wise production is largely lost. Public expenditure of funds in highway construction reaches hundreds of millions of dollars each year. Projects involving the expenditure of such enormous sums should be most carefully planned and all pertinent facts should be determined in advance of construction. If accurate topographic maps are not available, costly preliminary surveys must be executed, which are of little use for any other purpose.

Perhaps the largest possibility of increasing our food production lies in the development of arid lands. A rational utilization of our water resources in arid regions depends largely on the flow of streams available for irrigation and on the impoundment of flood water in storage reservoirs for distribution through canals. In all these problems careful study of adequate topographic maps is necessary.

The Pacific slopes and the islands in the Pacific Ocean are not adequately mapped and until the basic data regarding topography is known, the production and transportation of food can not be planned with the highest degree of efficiency.

Pan-Pacific Women's Conference, 1928

Many women from Pacific lands who have taken medical and science degrees, will be delegates to the Pan-Pacific Women's Conference. The Pan-Pacific Research Institution will play its part in the entertainment of these.

The following is the tentative program so far decided upon:

Thursday, June 14

Reception in the afternoon by Governor and Mrs. Wallace R. Rarrington at Washington Place. Dinner as the guests of the Pan-Pacific Union at the Pan-Pacific Research Institution, Manoa Valley.

Friday, June 15

Pan-Pacific Pageant, Palace Grounds. Registration and visit kindergartens. Lunch at Normal School. Afternoon, entertainment at Mrs. Walter Dillingham's Waikiki Villa.

Saturday, June 16

Around the Islands with the Women's Clubs. Visit Pineapple Cannery and Sugar Mills.

Sunday, June 17

Special Pan-Pacific Services in Churches.

Monday, June 18

Governor Farrington welcomes the first Pan-Pacific Women's Conference in the throne room of Iolani Palace, turning it over to Jane Addams as chairman. Lunch at the Young Hotel Roof Garden. Governor Farrington presiding. Afternoon session, Honolulu Academy of Arts. Evening, three speakers assigned the Chinese women of the community.

Motion picture films and lectures to the public at the library and at the theatre in Oriental quarters each evening.

Tuesday, June 19

Morning session at the Palace. Luncheon at the Y. W. C. A. building and afternoon session there. Evening, three speakers assigned to women of Japanese community.

Wednesday, June 20

Morning session at the Palace. Lunch and afternoon session at the Queen's Hospital. Evening, three speakers assigned Filipino women of the community.

Thursday, June 21

Morning session at Palace. Lunch and afternoon session at Palama Settlement. Visit Children's Hospital. Evening, three speakers assigned Hawaiian women of the community.

Friday, June 22

Morning session at Palace. Lunch at International Institute and afternoon sessions there. Evening, three speakers assigned the Korean community.

Saturday, June 23

Closing sessions. Morning at Palace. Lunch in private homes as guests. Afternoon, sail for other Islands.

The buildings of the Pan-Pacific Research Institution in Manoa Valley will be turned over to the actual delegates from overseas as residence houses during the Conference. They will be guests of the Pan-Pacific Union.

Solving Pacific Food Problems

Dean H. L. Russell of the College of Agriculture of Wisconsin has returned home from a visit to the countries of the Pacific. He made two interesting addresses at the Pan-Pacific Research Institution in Honolulu.

In commenting on his trip around the Pacific, Dean Russell pointed out that through application of modern systematic methods to a surprising degree, agriculture is making a remarkable advance in the Far East.

There are spots, he said, such as China, where farming development is at a standstill owing to lack of stabilization, but by far the greater number among the Pan-Pacific nations are making rapid progress.

The advance is most pronounced in Java and Japan. The first named was characterized as the most interesting of all the places he visited, and his tour took him throughout the Far East, where he literally went "into the field," lived the life of the natives and got far more deeply under the surface of things than does the general traveler.

"The application of science to commercialized agriculture is transforming Java into a garden," he said. "To an American, the development there is amazing. There on an island about the size of a western state in America lives a population of 35,000,000. Two types of agriculture—commercial and native—are practiced, and both types are going forward by leaps and bounds.

"Sugar, cacao, tea, coffee, rubber and other general crops are grown principally in the large commercialized estates which employ native labor. Each of these large enterprises has its own experiment station maintained at its own expense.

"The finest experiment station I have seen anywhere in the world is one I visited in Java. Its owners are spending more than $500,000 yearly in experimentation on sugar alone and fully 145 men are employed at the plant. As a result of applied science, these growers in Java have learned to produce sugar at an average cost cheaper than that of any other nation.

"Native agriculture is supported by the Government, which aids in keeping the population supplied with food and maintains experiment stations for the natives alone.

"Japan was second among the Eastern nations in point of interest and development. Here also is a case where an enormous population must be supported in a limited area. Rice and fish are the principal products, though dairying is making rapid strides in the northernmost island of Hokkaido.

"Within recent years," Dr. Russell asserted, "the Japanese have so greatly improved the rice seed strains that one can look over a field of the grain and see the pure-line strains just as plainly as one will find in Wisconsin the pure strains of corn, barley, oats and similar crops.

"These methods have so increased production on a limited area available for agriculture that Japan now is able to furnish from its own output all but 8 per cent of the total food requirements of its 55,000,000 people. In other words, Japan has to import only 8 per cent of her food supply and curiously enough this 8 per cent just about represents the amount of rice that goes annually into the production of 'sake,' a popular alcoholic beverage made from this grain.

"That means," Dr. Russell observed, "that if Japan would abolish its 'national drink,' the country would be practically self-supporting from a food standpoint."

New Zealand and Australia likewise are progressing, Dr. Russell found, but Hawaii, he maintains, comes next to Java and Japan in agricultural advance.

Is China's Population Stationary?

Randall Gould of Peking has sent out an interesting statement on the increase of Chinese population that is far different from the long accepted theory. Writing on this subject, he says:

In spite of the fact that China includes about one-quarter of the world's population, Occidental visions of an imminent all-Chinese globe are little more than unfounded nightmares, according to statistics collected by Changheng Chen, associate chief of the statistical division of the Chief Inspectorate of the Salt Revenue Department.

On a basis of carefully gathered figures using post office and customs data and other information of the most reliable sorts obtainable, this authority declares that the Chinese rate of population increase since the year 1801 has not been as fast as that of any other nation or group of nations.

Since the total population of China reached the 400,000,000 mark in 1835, the rate of increase has been less than one per thousand.

Taking the matter in a more general sense, Chen declares that in the 123 years from 1800 to 1923, the increase of the yellow race has constituted only one-seventh of the total world population, while the increase of the white race amounts to two-thirds of the total.

"The Chinese population will take 216 years to double itself at the rate of increase during the period 1800 to 1923," says Chen, "859 years at the rate of the period from 1849-1923, and 113 years at the rate of a period stretching 182 years back."

Statistics compiled by G. K. Knibbs in 1916 show that the White race of European origin would require only 58 years to double itself at the then prevailing rate, while the White race of non-European origin would require but 87 years. The Brown race would take 278 years and the Negro race 139.

Chen divides the interval from 1741 to 1923 into three periods. During the first period from 1741 to 1793 the increase was very rapid, from 143,410,000 population in China to 313,280,000, or a rate of 15.14 persons per thousand. In the second period, ending in 1849, the increase to 412,980,000, was slower, showing a rate of 4.95 per thousand. In the last period ending in 1923 the rate was but .81 per thousand, with a total population of 438,370,000. The last rate was lower than in any country except France during the period 1910 to 1914, when the rate of increase was but .4 per thousand.

Combined, the rate of increase over the whole 182 years was 6.15, and since the year 1800 it has been but 3.22. The rate of increase of nations of the White race since 1800 was 11 per thousand, and of Japan between 1800 and 1910 was the same.

In an article published in the Chinese Economic Journal, Chen remarks:

"The rate of increase of the Chinese population in modern times is not quite one-third as fast as that of other counties. Even the rate in the first two periods, including from 1741 to 1849, when the increase was much faster than in the third period, was only 9.63 per 1,000, which was also lower than the rate in other countries."

Discussing the reasons behind these varying rates of increase, Chen points out that at the beginning of the first period (1741-1793) China was not densely populated. The country was just settling down after the Manchu conquest and the population doubled in less than 50 years, although even then it must be noted that the increase was not much faster than for the White race in the corresponding period, for in Great Britain in the 30 years from 1801 to 1831 the rate was 15 per thousand, or equal to the rate

in China during the Chien Lung reign. In Germany between 1900 and 1910 the rate was 14 per thousand.

During the second period, of slower increase, some outlying territories were lost, while others would not submit meekly to the Manchu rule.

During the third period of even slower growth there have been such catastrophes as the Taiping rebellion, the Nine Bandit outbreaks, several great famines and many civil wars.

"China does not need any large increase of population at present, but high death rates are not healthy factors," says Chen. "It is highly desirable that both birth and death rates should be reduced. Emphasis should be laid on quality rather than quantity."

Studying Over-Population in Japan

Japan is seriously considering her local food and population problems. A Government Commission is being appointed to carry on this work.

For the purpose of forming a national policy to solve the problem of overpopulation confronting Japan, the Government has decided to institute a special commission at an appropriation of 92,000 yen. A plan for establishing the organization which was announced recently is in substance as follows:

Japan's population has been increasing year after year in spite of the lack of natural resources. According to the latest returns, the population of this country with the exception of her colonial territories increased by more than 870,000 persons during 1925. In consequence, Japan has to import an enormous amount of her chief national foods such as rice and wheat from abroad, the importation of which has been increasing yearly. Due to this state of affairs the national life of Japan is becoming unrestful and difficult notwithstanding the fact that there has been striking progress in Japan's industry and and increase in her national wealth. This condition has recently given rise to many social issues of great difficulty.

The establishment of a stable national policy regarding questions of population and conservation of foods is vitally necessary in order to make the national life restful as well as develop the national economy. Therefore, a thorough investigation must be made of the present condition and future of Japan's population, and of the amount of land that can still absorb surplus population in the future. It is also essential that an investigation should be conducted on the present condition of Japanese emigrants in Hokkaido, Chosen, Taiwan, Saghalien, the South Sea Islands and South America, and give assistance to them by due protection of transportation, communications, housing, sanitation and education. Consideration also should be paid to the trend of demand and consumption of the chief national foods in the future and introduction of wheat.

The plans also urge the necessity of a study in the change of the consumption of the chief national foods, reclamation of land by the Government, improvement in agricultural methods, monetary assistance system to farmers, and the introduction of crop insurance.

The organ will be named the Commission for Investigating Population and Conservation of Foods, and will have the Premier as president and the Minister of Agriculture and Forestry and the Minister of Commerce and Industry as vice-presidents. It will be composed of fifty officials, scholars and business men.

Pacific Population Problems

Dr. Macmillan Brown, chancellor of the University of New Zealand, who has attended several of the conferences called by the Pan-Pacific Union, has made a life-long study of race and population in the Pacific. He is recently quoted as follows:

"Around and in the Pacific will be two-thirds of the human race before the present century is out. The East and the West have formed their standards for thousands of years—apart. Their standards wholly differ. The important difference is in the economic standard, because where the East and West meet will be in the markets of the world. If the labor of the East comes into direct conflict with that of the West, I am quite certain which of them will be defeated.

"There is no such virile race on the face of the earth as the Chinese. Nature has there produced a perfect human labor machine, capable of doing the maximum of work with the minimum of sustenance. And the result will be that the West, which has attained a high standard of living, will have no chance in the struggle. Moreover, China is still in the lap of nature—Japan, to a certain extent also. Nature will always keep Chinese labor efficient and virile.

"The problem of the future, therefore, will be: how are we to preserve the existence of a high standard of living among our working people of the West? Of course, we may say that time may amend this—the standard of living in the East may be brought up. In Japan, it may be brought up, to some extent; in China, it will take thousands of years.

"Australia and New Zealand, the most vulnerable points of western civilization in the Pacific littoral, have their own problems and their destiny.

"When I was in the Malay archipelago, I saw Japanese on almost every island. I was told that Australians, who had plantations, had to import Japanese, as Malay labor was inefficient. One Japanese was worth half a dozen Malays. The Chinese are strongly established in Malaysia also. I came across Chinese of the seventh generation who had sent their sons to Holland to be educated. The Chinese adapt themselves to their environment—they become part of the nation in which they live. But the Japanese never loosen. They always retain their nationality and their devotion to Japan. The difference is that China lacks unity, nationhood. The Chinese readily detaches himself from his Chinese roots. Japanese, on the contrary, being islanders, have their national principles and instincts strongly developed. They can never rid themselves of their pride of race and loyalty to Japan. The Japanese peacefully penetrate, as the Germans profess to do, ultimately to obtain the region they settle in, as part of Japan.

"That is why Australia must look to the north. The independence of the Malay archipelago—its occupation by the Dutch—is essential to the safety of Australia. It is perfectly true there is no possibility of colonizing the empty northern part of Australia with Orientals, and having a cordon across the continent to keep them there. No cordon would ever be effective against the invasion of the southern and settled parts of Australia. Orientals make for towns, villages, farms. I have always held that the white Australia policy is essential to Australia's existence. If the sluicegates of the Orient were opened into Australia it would become an Oriental country within a century. White labor would have no chance. Chinese cross easily with whites, although the Japanese do not, so easily. But the misfortune would be that the Orientals would cross with the lowest strata of the white population, and the half-castes would be a very low grade."

Institute of International Relations

K. C. Leebrick of the University of Hawaii and a member of the Pan-Pacific Research Institution, was elected Director of the Institute of International Relations at Riverside, California, and on his return to Honolulu was made secretary of the Pan-Pacific Educational Conference.

The new Institute of Politics in California has the hearty indorsement of the Christian Science Monitor, which says of the meeting:

"With the promise of duplicating for western states the opportunities afforded each summer since 1921 by the Institute of Politics at Williamstown, Mass., the Institute of International Relations opened its first session at Riverside.

Dr. Rufus B. Von Kleinsmid, president of the University of Southern California, and chancellor of the institute, in introducing the program, said:

"The idea of internationalism is not new in our country; but for many years we have been so busy with internal affairs that we have scarcely had time to talk over the back fence with our neighbors. For this reason it is difficult for the world to understand America, and it is equally true that it is difficult for America to understand the world.

"During recent years, however, we have, to a certain extent, begun to understand other countries through our extending commercial relationships; but these contacts and the many meetings of various types in which we have participated have not brought us near enough to our neighbors in understanding. In this age, with all our getting, we must get nearer other nations."

"Conferences of this type have been largely academic and, while in all probability they must so remain for some years, those who come from commercial and professional life are contributing largely to their success. We are here in the plan of 'come let us reason together,' and through the friendly discussion of our different points of view we hope to be able to gain a common focus upon our various problems."

Dr. Karl C. Leebrick, professor of history and political science at the University of Hawaii, and director of the institute, pointed out that delegates have already requested additional round table groups which will probably be formed while luncheon lectures and similar gatherings will be organized to provide opportunities sought by enthusiastic participants in the institute.

Among the many congratulatory telegrams received by the institute was one from Frank B. Kellogg, Secretary of State, which said:

"Being in full sympathy with any worthy movement to promote good will among nations, I am happy on this occasion to extend greetings and good wishes."

Andrew W. Mellon, Secretary of the Treasury, said:

"Conference and round table discussions on subjects such as those listed for study by the institute do much to bring about a better understanding of national and world problems. They are particularly important in this country where the people must be informed on so many and such varied questions if public opinion is to express itself intelligently and achieve a wise solution of the problems which confront us."

L. S. Rowe, director-general of the Pan American Union, pledged the support and co-operation of his organization, while James J. Davis, Secretary of Labor, and James Brown Scott, secretary of the Carnegie Institute for International Peace, sent messages of good wishes and assurances of success.

The Institute of Pacific Relations

(Honolulu July 15th to 29th, 1927)

The Institute of Pacific Relations, which holds its second General Conference in Honolulu July 15-29 of this year, may be called a continuing experiment in international technique. In 1925 the first attempt was made by this group to discover if a more successful method of rational and frank international relations might be found to take the place of the old method of cautious, prejudiced, devious dealing which has failed the world in so many times of crisis.

At that first conference no panacea solutions were sought or found, but it was demonstrated that unofficial, unhampered individuals from the most deeply divided countries of the Pacific area could pool opinions, technical information, and racial points of view with frankness and mutual profit.

Following out the trends of the 1925 session, conference groups from Australia, China, Japan, Korea, New Zealand, the South Sea Islands, Philippines, Hawaii, Canada, Great Britain, and the American mainland, will gather for a two weeks' exchange of Pacific facts. The conference aims at more than a mere "friendship" program. Its purpose is not just the expressing of goodwill but the discovery of the many obscure facts which now militate against goodwill.

Digging for information, then, is the chief aim of the Institute at present, rather than the attempted settling of the many problems whose very elements are not yet clear to the world. For this end the second conference is far better prepared than the first. Research has been in progress in the various countries of the Pacific during the two-year interim, under the direction of those groups which participated in 1925. This research has touched the various fields of cultural, political, geographical and industrial information. The preparation and exchange of preliminary papers on vital questions of inter-Pacific concern has materially facilitated the building of a valuable tentative agenda which will be amplified upon the assembly of the conference membership.

Some of the questions which will occupy the attention of the Institute in the July round tables concern the Culture, Religious, Educational and Social Institutions of the Pacific lands; Resources, Industry, Commerce and Finance; Race and Population; Political Institutions and Functions, Laws, Judicial Procedure, International Relations.

One of the most valuable lessons of the 1925 Conference was that an unofficial membership can speak frankly, freely and helpfully where an official one is inhibited in its expression by diplomatic and governmental considerations. Not to lose the advantages of the earlier meeting, the membership has been kept strictly unofficial in character, and individuals who attend, whatever their position may be, do so simply as individuals and in no other capacity.

These unofficial groups number amongst their personnel outstanding figures in the various cross-sections of national life, in both Occident and Orient. Men and women who will present educational data, for instance, are distinguished leaders in the educational field in the nations from which they come. Those who will discuss international finance are big figures in the financial world. Technical data will be contributed by experts in their respective scientific fields. Labor points of view will find expression through labor leaders from the various countries concerned. Thus the whole process of uncovering facts will be kept upon a high and authoritative though unofficial plane.

Under the chairmanship of Dr. Ray Lyman Wilbur, President of Stanford University, the Pacific Council of the Institute represents the Pacific countries in which Institute groups are active, and governs the policies and plans of the organization. The Council is composed of the following:

Sir Mungo W. MacCallum, Australia; Sir Robert L. Borden, Canada; David Z. T. Yui, China; Frank C. Atherton, Hawaii; Junnosuke Inouye, Japan; Sir James Allen, New Zealand; and Ray Lyman Wilbur, United States, Chairman.

The Central Executive Committee in Honolulu has been deputized by the Pacific Council to carry out its general policies. Mr. Frank C. Atherton of Castle & Cooke Ltd., is chairman of this committee.

The National groups are separate and antonomous within their own spheres, subject to the general policy decisions of the Council. The general affairs of the Institute are transacted at the Honolulu Headquarters, in charge of the General Secretaries, J. Merle Davis and Charles F. Loomis. Dr. J. B. Condliffe, eminent economist of New Zealand, heads the research work of the Institute in Honolulu.

As a fact-finding body, it is expected that the 1927 Conference of the Institute of Pacific Relations will increase its usefulness materially over the experiment of 1925.

A Proposed Food Change in Japan

Dr. Frederic K. Krauss, world known authority on rice genetics, is preparing a paper for the Pan-Pacific Research Institution on the Comparative Crop Value of rice with other food products of the soil.

In Japan Dr. Ko Nasu of the Tokyo Imperial University is suggesting the substitution of potatoes for rice as the main article of diet of the Japanese people. In making the suggestion, however, Dr. Nasu admits that it would be extremely difficult to induce the Japanese people, who have looked upon rice as their main foodstuff for centuries, to turn to the potato.

He traced the history of farming in Japan, touching upon the economic and agricultural policies which have been followed by the governments, and discussed the causes and means of avoiding famines and tenant-farmer disputes.

Although, he points out, Japan is feeding 60,000,000 persons at present while she had only half that number to care for 50 years ago, the total area of cultivated land is by no means increasing. The Government, he says, is encouraging farmers to cultivate more land, especially that which is most fertile and that which is more valuable because of its easy access to markets, but the total area does not show the gains which are considered desirable.

He contends that the Malthusian theory, although it must be amended here and there, still holds good in principle.

Japan's food problem in the future, he said, does not admit of optimism, unless some other food, such as the potato, is substituted as the main article of diet. And there would be great difficulty in educating the people to this change, he said.

He emphasized the importance of the problem of food and population, saying that therein is the root of the social problems which appear in every conceivable form and place. It is a problem which should be given the closest consideration by those concerned primarily with the welfare of the nation, and also by international thinkers for it is a problem which does not know the restraint of frontiers.

Scientific Research in Australia

The press in Japan has given considerable space to Australia's Prime Minister, S. M. Bruce, who is an Honorary President of the Pan-Pacific Union., and believes that the Union should call a conference of Presidents and Premiers of Pacific lands.

Commenting on Mr. Bruce as a business man and a friend of science, the Japan Times says:

One of the first steps of his Government after the election has been to reorganize the basis of scientific research in the Commonwealth, bringing State and Federal activities into closer touch, and mobilizing the scientific brains of Australia for applied research on the foundation of a grant of £350,000. The next step was the creation of the Development and Migration Commission, a small body of highly-paid experts, who are to confront the twin problems of population and development, through the co-ordination of all existing schemes for the increase of national productivity, and through the initiation of fresh ones. The stress throughout has been laid by Mr. Bruce on the side of development, for he claims that if this problem is solved, migration will present no serious difficulty.

Then came the Northern Australia Act, an attempt to deal with the perennial problem of Australia's tropical north by placing the Territory under the control of an Executive Commission. The Act also foreshadowed the long-desired change in the Territory's system of land tenure from leasehold to freehold, and it was laid down that development should begin with a strong emphasis on pastoral production.

The announcement that the Government proposed to send to America an industrial mission representing employers and employes was another sign of the earnest thought which was being given to the question of the volume of the national income. Mr. Bruce did not prejudge the question of the value of the American example, but his announcement of the mission made it clear that he personally believed that the Australian high-wage policy was compatible with a great increase in production, which would necessitate a change of heart on the part of employers as well as employes.

As the last link in this chain came the proposal to increase the statutory powers of the Federal Parliament over industry. This was regarded by Mr. Bruce as an integral part of his program of national efficiency. He maintained strongly that the state of industrial regulation in Australia was a severe handicap to production and a direct hindrance to the formation of that new spirit in industry which he desired to create.

But other factors entered in. The constitutional proposals could be made to bear the interpretation that they were an attack on the authority of the States, and it was tactically unfortunate that they were brought forward more or less simultaneously with the proposal to abolish the Commonwealth's per capita payments to the States and with the scheme for a Commonwealth subsidy to the States for road construction on a basis which, in effect, taxed the smaller and wealthier States for the benefit of the larger and more sparsely populated.

The cumulative effect of these measures, added to the food for criticism which the constitutional proposals themselves inevitably provided, was too great for the success of the Referendum, but, though the prestige of the Government was temporarily lowered, the effect of the series of measures passed earlier in the Session will be a continuing one, and Mr. Bruce's gospel of efficiency,

when the first of its practical results have become apparent, is likely to outweigh in the minds of Australians any minor mistakes of strategy or procedure.

To the Imperial aspect of his Australian policy since the election Mr. Bruce has frequently referred. This aspect is clear enough in the case of the Development and Migration Commission, whose very nature demands co-operation with administrative and scientific brains in this country in the solution of a problem which is as much Imperial as Australian. But in general Mr. Bruce has put in the forefront the importance of national development if Australia is to play a worthy Imperial part. He referred to the importance of the British market to Australian primary producers, and to the need for more effective methods. This achieved, Australia's case for a forward policy of Imperial economic co-operation is immensely strengthened. It is more than possible that in the policy of co-ordinated speeding up, as he has begun to apply it in Australia, Mr. Bruce sees the germ of the idea of Empire development which he has persistently sought in substitution for, or in addition to, the policy of Imperial preference.

A Canning Food Research Laboratory for the Pacific

The preservation of food products was one of the main topics at the Pan-Pacific Food Conservation Conference. As this problem is one of the main studies of the scientists of the Pan-Pacific Research Institution, the following statement will therefore prove of interest to the men of the Pacific who are studying the food problems:

The American Can Company has made a magnificent gift to the canned food industry of the Pacific Coast and Hawaii. The company has built and completely equipped a canning research laboratory in San Francisco at a cost exceeding $100,000, and the laboratory has been presented to the National Canners' Association.

The building is a three-story-and-basement structure, facing 30 feet on Battery street and 70 feet on Commercial street, directly in the rear of the Federal Reserve Bank building. The basement, second and third floors are fitted out with all of the latest laboratory apparatus and equipped for biological, chemical and bacteriological research investigation. The first floor is the canning plant, provided with all manner of temperature and pressure control apparatus, boilers to supply live steam, electric refrigeration, autoclaves, vertical retorts, continuous cookers, closing machines, and automatic control devices.

The building has electric incubators in the basement and on each floor, with an aggregate capacity of 1200 cubic feet, for the storage of canned foods at any desired temperature. Attention has been given to the lighting and ventilation of the building, all interior partitions being steel and glass. Exhaust fans on the roof provide artificial draft for the hoods in the chemical laboratories.

There are photographic dark rooms; a well stocked technical and scientific library; study rooms and every convenience which could be provided.

This plant, complete, has been deeded in fee simple to the National Canners Association. The American Can Company, the donor.

Australian Trees for Hawaii

R. E. Boardman of Australia, authority on trees and fruits of the Antipodes, was a delegate to the Pan-Pacific Educational Conference and a guest at the Pan-Pacific Research Institution. While at the Institution he suggested a number of trees that might be sent from Australia to Hawaii for the Pan-Pacific Botanical Garden, these to be planted in the proper soils and at the needed elevation above sea level.

Speaking to the scientists, he said:

The black wattle (acacia decurrens) is a familiar friend, growing freely from seed and root cuttings. On worked out mining claims, where gold was obtained from alluvial soil, lands were left bare, stark, dreary and desolate and the planting of acacia decurrens and other varieties of wattle was suggested by a tree-lover. The result is that these areas are now green and pleasant; the soil is regaining its fertility, the bark is of great value for tanning purposes. The Tanners' Association is continuously offering free seeds to any person who will plant them, so as to make available increased quantities of bark for use in the process of tanning skins and hides.

Acacia decurrens nodmalis (the green wattle) is a handsomer tree than the first mentioned, bearing wonderful showers of golden yellow bloom.

Here let me state that Australia is nature's fairyland in the spring, the whole countryside being a blaze of glory with the rich yellow blossom of our loved wattle trees. Special trains are run from the cities to the hills and valleys to view the majestic spectacle.

Sprigs of wattle, pressed, formed the connecting link between the Australian soldiers at war and the "old folks at home." These "little pieces of Australia" brought a lump to many a throat when the mails arrived.

We have over 400 varieties of wattle in Australia. A large number of them would probably be suitable for Hawaii.

Acacia podalyriaefolia is the Queensland silver wattle and wonderfully handsome, too. Acacia dealbata is generally known as the silver wattle in the southern states.

Acacia dealbata is generally known as the silver wattle in the southern states.

A. melanoxylon is the famous "blackwood" tree, the timber of which is so highly prized for timber and choice cabinet work and is the noted "fiddleback" wood. Varieties of wattle can be planted to produce bloom all the year round.

Australian eucalypti (gum trees) are already growing successfully in Honolulu.

E. globulus is the Tasmanian blue gum. Here again there are hundreds of varieties from which a selection could be made to suit Hawaiian conditions.

E. ficifolia is the scarlet flowering gum of western Australia. They are used as lawn specimens and street trees. Visitors go miles to see them. *E. calophylla* (white) and *E. calophylla rosea* (rose pink), *E. priessiana* (yellow) make delightful specimens.

So far I have not seen here many pine trees (*Pinus insignis*) and none of the *Araucaria bidwillii* (bunya-bunya pine), although the closely allied *Araucaria excelsa* (Norfolk island pine) does very well here.

The jacaranda thrives in Honolulu; so also should the Australian native *Tristania conferta,* a handsome evergreen shade tree. Cypress trees in the green and golden varieties, tamarisc (deciduous, the flowering "summer cypress") *Podalyria, Virgelia capensis,* hakea, *Cerlistemon,* currajong, camphor laurel, *Crotolaria laburnifolia* (the bird flower) and many others—all hardy handsome trees and shrubs would add glory to these lovely islands of Hawaii.

Balboa Day, September 17th

(At the Pan-Pacific Research Institution, Honolulu)

Annually in lands about the greatest of oceans the 17th of September, the anniversary of the "discovery" of the "Southern ocean" by a European, is observed at the Pan-Pacific Clubs. In Honolulu several days are given over to functions of Balboa week. Following is a press account of the manner in which Balboa Day, 1926, was observed at the Pan-Pacific Research Institution in Honolulu.

The Balboa Day Banquet of the Pan-Pacific Union was held in the spacious main building of the Pan-Pacific Research Institution in Manoa Valley, more than a hundred and fifty of the scientists and distinguished men and women of Hawaii sitting down at the table with Governor Farrington and the trustees of the Pan Pacific Union.

Governor Farrington read a number of cablegrams from heads of Pacific countries who are honorary presidents of the Union, as well as from presidents of local Pan-Pacific Clubs about the ocean.

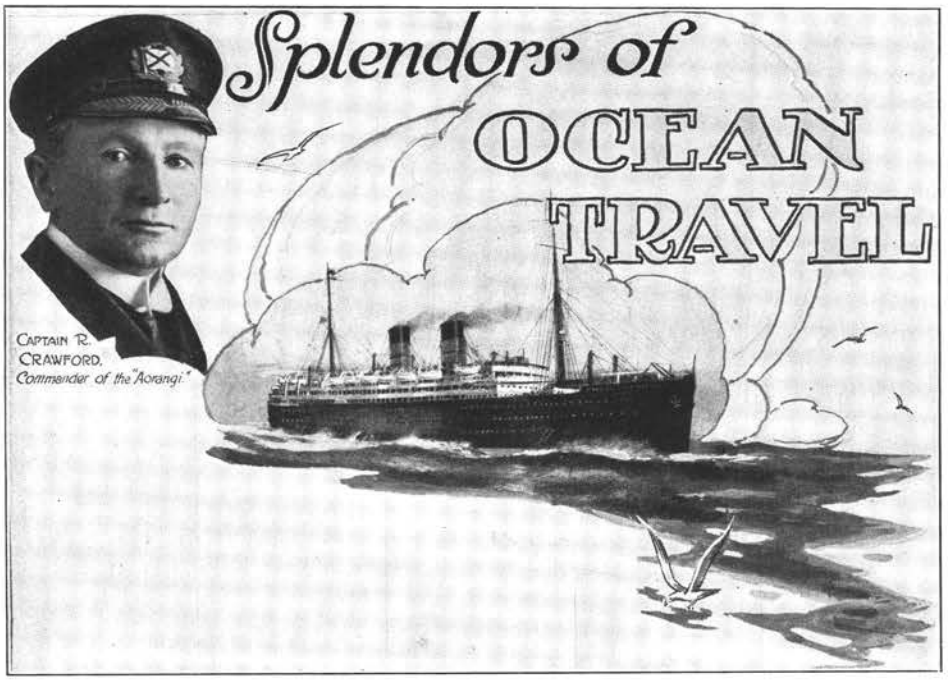
Dr. Frederick Muir, chairman of the Pan-Pacific Science Council, and Dr. Nils P. Larsen, chairman of the Pan-Pacific Research Institution, told of the scientific work undertaken by the Union. They described the weekly dinners of the research scientists of Hawaii that have been held every Friday night for the past two years at the Institution, and told of the distinguished scientists from almost every Pacific land who have made the Institution their home for a greater or longer period, organizing there fishery and other scientific conferences. Dr. David Starr Jordan, President of the Institution, writing two books on science during his three months' stay helping to establish the Journal of the Pan-Pacific Research Institution, and heading up the work of securing and publishing a check list of the fish of the Pacific to be followed by kindred check lists of the economic insects of the Pacific area, as well as one of the plants of that area and their diseases.

It was announced that the Institution would keep open house for actual scientific research workers from Pacific lands, and that the corps of student assistants on the grounds taking science courses was growing.

Mr. Merle Davis, Secretary of the Institute of Pacific Relations was a guest, and said in part:

"I have been sitting here listening and it occurred to me that while Balboa discovered the Pacific, it remained for another man to discover something great and that is the way of bringing the people of the Pacific together and of the two jobs I think that is the greatest. After all, Balboa rather stumbled upon this ocean. I haven't expected to speak, but I want to say that it is always stimulating to come back to Hawaii. It is a stimulus for me to come back, because in my work I like to be among people to get things done, especially in dealing with other people, and here is an education in getting things done that has been going on through a long period of years of getting people to work together. I think that is the greatest thing in the world. The world's troubles have always been because of that inability of getting together, becoming acquainted and getting different views and coming to know each other's background, not only to get together but to talk over their problems. Speaking for the Institute of Pacific Relations, the privilege of working in the same town with the Pan-Pacific Union is a very great privilege, and I hope that it will always be so that we will have the privilege of working side by side."

There were speakers of the several races and from the Women's Pan-Pacific Conference.



M.S. "Aorangi," Queen of the Pacific.

From Vancouver via Honolulu, Suva, Auckland to Sydney

The Canadian-Australasian Royal Mail line of steamers maintains a regular four-weekly service by palatial steamers between the Canadian-Pacific Railway terminus at Vancouver, B. C., and Sydney, Australia, via Honolulu, Suva, Fiji, and Auckland, New Zealand.

In itself this is a South Sea cruise de luxe, but at Suva one may rest a bit, cruise by local steamer among the Fijian Islands, then take a Union Steam Ship Co. of New Zealand palatial flyer for a visit to Samoa, Tonga, and New Zealand, or if the trip by the Canadian-Australasian vessel is continued to Auckland, here again by the Union Steam Ship Co. vessels are cruised to every part of New Zealand, to the Cook Islands, or to Tahiti. In fact, one may return by these steamers to San Francisco via Papeete, Tahiti, with a stop-over at the famous French possession.

If the trip from Vancouver is continued to its terminus, Sydney, here again one may secure bookings on the Union Steam Ship Co. boats for other cruises.

The Niagara of the Canadian-Australasian Royal Mail Line is one of the finest vessels afloat on the Pacific. The M.S. "Aorangi," the largest motorship in the world, makes the trip from Vancouver to Sydney in about three weeks.

Either from Australia or Canada there are tempting visits across the Pacific via the South Sea Islands. From Australia this is the richest and most comfortable route to London and the European Continent.

Both the Canadian-Australasian Royal Mail Line and the Union Steam Ship Co. of New Zealand have offices in the chief cities of the Pacific. In Honolulu, Theo. H. Davies & Co., Ltd., are the agents. The steamers of these lines are famous for their red smokestacks. In fact, this affiliated company is known as the Red Funnel Line. The red funnel is familiar in every port of Australia and the South Seas, to say nothing of California and Pacific Canada.

AROUND ABOUT HONOLULU

The Moana Hotel at Waikiki

The Territorial Hotel Company, Ltd., maintains the splendid tourist hotel at Waikiki Beach, the Moana, facing the surf, as well as the Seaside family hotel nearby. Down town it conducts the world-known Alexander Young Hotel.

The Honolulu Rapid Transit Co. maintains an electric train system to practically every portion of the city. The cars pass all of the hotels, so that visitors may reach the city, mountains, or the beach by the commodious open cars of the company, from which there is an ever-moving panorama of mountain, sea, and valley, besides visions of the loveliest city in the Pacific.

Ishii's Gardens, Pan-Pacific Park, on Kuakini street, near Nuuanu avenue, constitute one of the finest Japanese tea gardens imaginable. Here some wonderful Japanese dinners are served, and visitors are welcomed to the gardens at all times. Adjoining these gardens are the wonderful Liliuokalani gardens and the series of waterfalls. Phone 5611.

The City Transfer Company at 833 Nuuanu Street has its motor trucks meet all incoming steamers and it gathers baggage from every part of the city for delivery to the out-going steamers. This company receives and puts in storage, until needed, excess baggage of visitors to Honolulu and finds many ways to serve its patrons.

The Honolulu Motor Coach Co., Ltd., has brought Schofield Barracks within hourly service of Honolulu. The busses leave on schedule time from the office in the yard of the Army and Navy Y. M. C. A. on Hotel Street, stopping at the Young Hotel. These spacious safety coaches are splendidly equipped and travelers enjoy every comfort and security during the delightful ride. Round the island and other trips can be arranged by calling phone 3666.

The Oahu Ice & Cold Storage Company has spacious buildings at Hustace and Cooke streets. It receives all kinds of fruit, meats and vegetables, where they may be kept in perfect condition for months at negligible cost and always ready to be drawn upon. This Company has erected buildings for its cold storage service that are a credit to any city and are well worth a visit. Telephone No. 6131.

About the Big Island

Twice a week the Inter-Island Steam Navigation Company dispatches its palatial steamer, the "Haleakala" to Hilo, leaving Honolulu at 4 P.M. on Tuesdays and Fridays, arriving at Hilo at 8 A.M. the next morning. This vessel leaves Hilo every Thursday and Sunday afternoon at four for Honolulu, a fifteen-hour run. From Honolulu, the Inter-Island Company dispatches almost daily excellent passenger vessels to the island of Maui and three times a week to the island of Kauai. There is no finer cruise in all the world than a visit to all of the Hawaiian Islands on the steamers of the Inter-Island Steam Navigation Company. The head offices in Honolulu are on Queen Street, where every information is available, or books on the different islands are sent on request. Tours of all the islands are arranged.

Connected with the Inter-Island Steam Navigation Company is the palatial Volcano House overlooking the everlasting house of fire, as the crater of Halemaumau is justly named. A night's ride from Honolulu and an hour by automobile, and you are at the Volcano House, the only truly historic caravansary of the Hawaiian Islands, recently reconstructed and turned into a modern up-to-date hotel of luxury for the tourist and those from Honolulu and Hilo spending vacations at the Volcano.

Should you wish to continue at leisure your sightseeing or business trip around the Island of Hawaii, there are hotels every few miles.

Building on the Island of Hawaii.—The Hawaiian Contracting Company maintains working offices at the great Hilo pier, where all steamers discharge their freight for Hilo and the big island. This concern, with branches throughout the Territory, has for its aim building for permanency. It contracts for buildings and highway construction, having a corps of construction experts at its command. In Hilo, Frank H. West is in charge of the company's affairs.

ADVT.

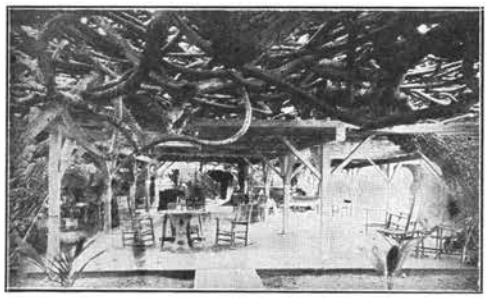
The Hilo Boarding School, Levi C. Lyman manager, is a school for boys which combines academic and industrial training. The afternoons are given to the learning of blacksmithing, carpentry, wood-turning, automobile polishing, printing, some crafts and agriculture. This is a forty acre farm. A crafts shop is maintained at 130 Kamehameha Avenue, and sales rooms of Hawaiian goods in koa, where the output of calabashes, ukuleles, trays and novelties in koa may be obtained. Prices of these or information about the school is sent on request.

The Bank of Bishop & Co., Ltd., has its Hilo branch at 12 Waianuenue Street with sub branches at Kealakekua and at Alaa and Pahoa. Le Baron Gurney is the branch manager at Hilo, and the Bank of Bishop & Co. serves the Island of Hawaii through its branch at Hilo, as it does the entire group, from its palatial quarters in the modern up-to-date Damon building in Honolulu, named after the long-time president of the Bishop Bank.

The Honolulu Dairymen's Association, Ltd., is represented by Russell L. Ransom as manager in Hilo, with dairy at Piopio and Kamehameha Streets.

Hawaii's Famous Coffee.—The Captain Cook Coffee Company produces and handles the standard coffee of Hawaii, and this product, "Kona" Coffee, has become known the world over for its delicious mildness. The Captain Cook Coffee Company selects and ages its coffee beans until they are ready to give forth that delicious aroma that makes coffee grown within the radius of the spot where Captain Cook was slain, known to all devotees of good coffee. The agency for the Captain Cook Coffee Company in Honolulu is with the Henry Waterhouse Co.

HOME HOTELS IN HONOLULU



The Halekulani Hotel and Bungalows, 2199 Kalia Road, "on the Beach at Waikiki." Famous hau tree lanai along the ocean front. Rates, from $4.00 per day to $100.00 per month and up, American plan. Clifford Kimball.

At Child's Blaisdell Hotel and Restaurant, at Fort Street and Chaplain Lane, Child's Hotels and Apartment Service accommodations are masters at getting you settled in real home-like style. If you wish to live in town there is the Child's Blaisdell Hotel in the very heart of the city, with the palm garden restaurant where everything is served from a sandwich to an elegant six-course dinner.

Then on one of the choice spots of Waikiki Beach there is the Child Marigold Apartments, which are completely furnished little beach homes in themselves.

Vida Villa Hotel and cottages are on the King street car line above Thomas Square. This is the ideal location for those who go to the city in the morning and to the beach or golfing in the afternoon. The grounds are spacious and the rates reasonable. This hotel has been under the same management for a score of years, which speaks for itself. Both transient tourists and permanent guests are welcomed.

ADVT.

The Donna Hotel, 1286 S. Beretania, is delightfully situated within ten minutes' ride from the center of Honolulu. Here, amidst the surroundings of a subtropical park, one may enjoy all the comforts of home. The rooms in the main buildings or in one of the attractive screened cottages are cheery, well-furnished, and have hot and cold running water. The delicious home cooked meals are served at little cozy tables which are grouped about an artistically decorated open lanai. Permanent rates are $65 a month or $3.00 a day and up.

Gray's by the Sea is one of the most delightful estates facing the surf at Waikiki, a desirable family hotel in tropical surroundings. Cottages for two, three or four may be had at moderate prices, with the very best of sea bathing right at the door. Tourists as well as permanent guests receive a cordial welcome. La Vancha M. Gray, proprietor.

The MacDonald Hotel is a stately mansion surrounded by cottages amid sub-tropical foliage. It is located at 1402 Punahou Street in the great residence district of Honolulu. There are tennis courts on the grounds, and the transient as well as the permanent resident has here all the comforts of home at the reasonable rates of $3 a day or $65 a month. The guests enjoy delicious home-cooked meals, which are also served to outsiders. This hotel is near Central Union Church and Oahu College.

The Colonial Hotel and cottages on Emma street are in the midst of a delightful residence park district, on the car line, but within a moment's walk of the business center of the city. An excellent cuisine under skilled direction is maintained. Historic Honolulu is also but a moment's walk from the Colonial, and it is but a brief stroll to the hills.

WONDERFUL NEW ZEALAND

Scenically New Zealand is the world's wonderland. There is no other place in the world that offers such an aggregation of stupendous scenic wonders. The West Coast Sounds of New Zealand are in every way more magnificent and awe-inspiring than are the fjords of Norway.

New Zealand was the first country to perfect the government tourist bureau. She has built hotels and rest houses throughout the Dominion for the benefit of the tourist. New Zealand is splendidly served by the Government Railways, which sell the tourist for a very low rate, a ticket that entitles him to travel on any of the railways for from one to two months. Direct information may be secured by writing to the New Zealand Department of Tourist and Health Resorts, Wellington, New Zealand.

An ancient Maori stockade

SOUTH MANCHURIA RAILWAY COMPANY

South Manchuria Railway Company Cheap Overland Tours

Travellers and Tourists journeying between Tokyo and Peking should travel via the South Manchuria Railway, which runs from Antung to Mukden and passes through magnificent scenery. At Mukden the line connects with the Peking Mukden Line and the Mail line of the South Manchuria Railway, running from Dairen to Changchun where connection is made with the Chinese Eastern Railway for Harbin.

The ordinary daily trains have sleeping accommodation. Steamer connections between Dairen, Tsingtao and Shanghai by the Dairen Kisen Kaisha's excellent passenger and mail steamers. Wireless telegraphy and qualified doctors on board.

ADVT.

Modern Hotels under the Company's management are established on foreign lines at Mukden, Changchun, Port Arthur, Dairen and Hoshigaura (Star Beach).

Illustrated booklets and all information post free on request from the South Manchuria Railway Company.

DAIREN

Branch Offices: Tokyo, Osaka, Shimonoseki, Shanghai, Peking, Harbin and New York.

Cable Address: "MANTETSU" or "SMRCO." CODES: A.B.C. 5th, 6th Ed., A1., Lieber's and Bentley's.

LEADING AUTOMOBILES IN HAWAII

The P. M. Pond Company, with spacious quarters on Beretania and Alapai streets, act as distributors of the sturdy, low-priced car for the tropics, of the finest quality, the Studebaker Standard Six Duplex Phaeton, the most powerful car for its size and weight, with roller side enclosures giving protection in stormy weather by a move of the hand. The cash price of this exclusive car in Honolulu is $1,485.00

The Universal Motor Co., Ltd., with spacious new buildings at 444 S. Beretania street, Phone 2397, is agent for the Ford car. All spare parts are kept in stock and statements of cost of repairs and replacements are given in advance so that you know just what the amount will be. The Ford is in a class by itself. The most economical and least expensive motor car in the world.

The Schuman Carriage Co., besides handling the Ford car, is agent for the Essex car, Honolulu price $1,105, and the Hudson Super-Six, Honolulu price $1,575. The Hudson-Essex is now the largest selling six-cylinder car in the world. On the island of Maui the Schuman Carriage Co. is represented at Wailuku by the Maui Motors Co., and on Kauai by the Garden Island Motor Co., Lihue.

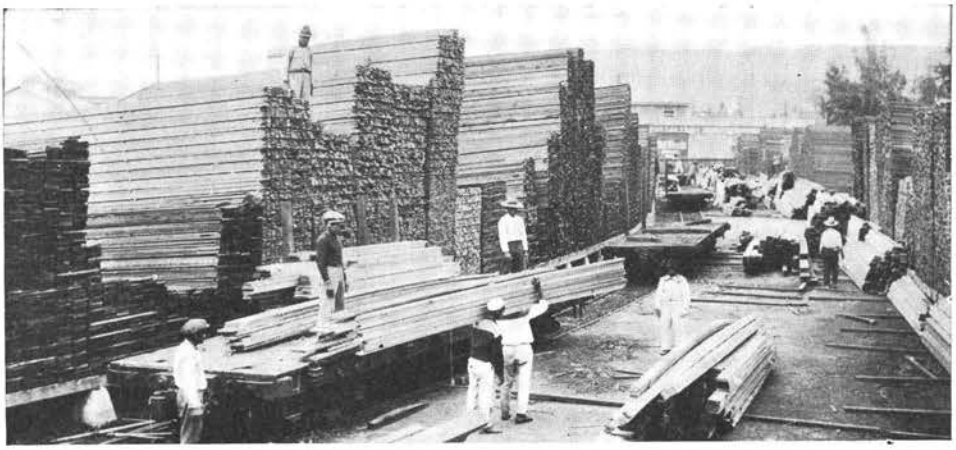
The Chrysler Four and Six Cylinder Cars, the culmination of all past experiences in building automobiles, is represented in Hawaii by the Honolulu Motors, Ltd., 850 S. Beretania street. The prices of Four Cylinder Cars range from $1200 to $1445 and those of the Six from $1745 to $2500. The Chryslers are meeting with remarkable sales records as a distinct departure in motor cars.

The von Hamm-Young Co., Ltd., Importers, Machinery Merchants, and leading automobile dealers, have their offiecs and store in the Alexander Young Building, at the corner of King and Bishop streets, and their magnificent automobile salesroom and garage just in the rear, facing on Alakea Street. Here one may find almost anything. Phone No. 6141.

The Royal Hawaiian Sales Co., with agencies in Honolulu, Hilo and Wailuku, has its spacious headquarters on Hotel and Alakea streets, Honolulu. This Company is Territorial Distributors for Chevrolet, Oakland and Pontiac passenger cars, all products of General Motors. They are Territorial Distributors also for International Motor Trucks, Delco-Remy service and Goodyear Tires.

The Graystone Garage, Ltd., at Beretania and Punchbowl streets, is agent for several exclusive cars: the Paige, the most beautiful car in America; the Jewett, "in all the world no car like this"; the Willys-Knight, a marvel of engineering in every detail, and the Overland, with bigger engine, bigger power, bigger comfort and bigger value than any. All of these cars may be seen and examined at the spacious warerooms.

The Hupmobile, fours and eights, is represented in Honolulu by Burgess & Johnson, Ltd., 237-243 S. Beretania Street. This is the first time Hupmobile has made a Six Cylinder and the motor-car buying public should see this car before making a decision on another make of car in its class. This firm also represents the Pierce-Arrow Motor Car Co. and the Reo Motor Car Co. In tires they find Mohawk Heavy-Duty Cords go farther.

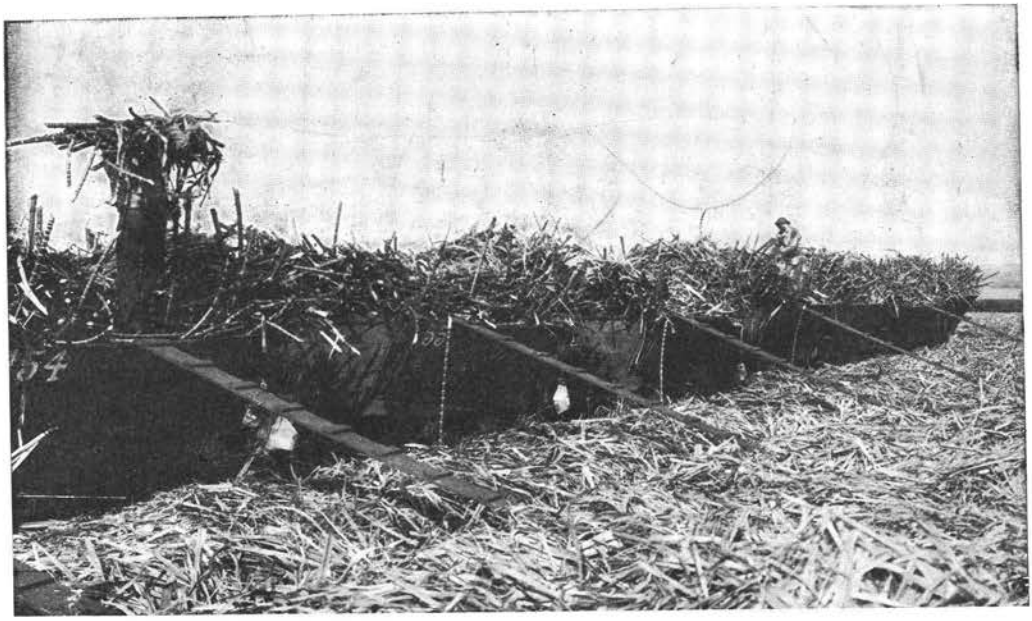


Lewers and Cooke, Ltd., Iwilei Yard

Lewers & Cooke, Limited, have, since 1852, been headquarters for all varieties of building material, lumber, hollow tile, cement, brick, hardwoods, oak flooring; as well as tools of the leading manufacturers, wall papers, Armstrong linoleums, domestic and oriental rugs, and the superior paints made by W. P. Fuller & Co.

They are also agents for many building specialties, Celotex, Colormix, Bishopric Stucco, corrugated Zinc, Los Angeles Pressed Brick Company products and architectural Terra Cotta, United States Metal Products Company Steel Windows, the Kawneer Company line, and prepared roofings and roofing tile.

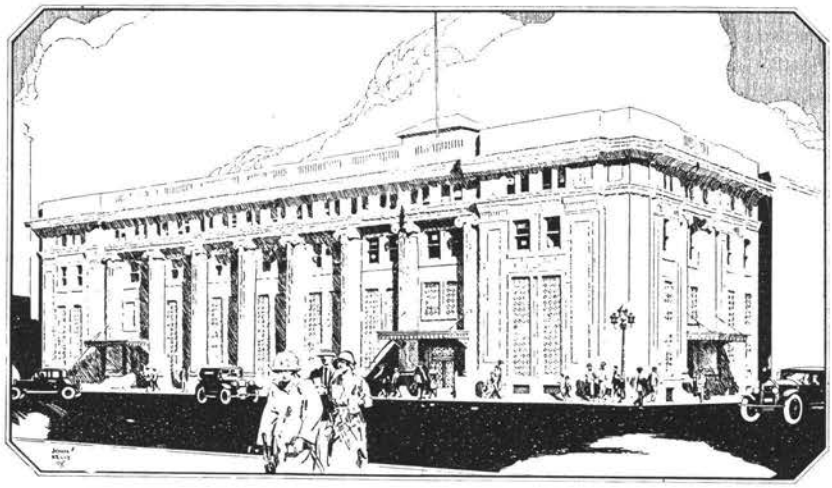
OAHU RAILWAY AND LAND COMPANY



Loading sugar cane on one of the plantations on the line of the Oahu Railway—the scenic route around the island from Honolulu

ADVT.

MODERN BANKING IN HONOLULU



NEW HOME BANK OF BISHOP & CO., LTD.

The S. M. Damon Building pictured above is occupied by the Bank of Bishop & Co., the oldest bank in the Territory. Organized in 1858, the name Bishop & Co. has long been known by travelers for its service and welcome. Bishop Street, Honolulu, T. H.

The First National Bank of Hawaii demonstrates the many ways in which a bank can serve. It has recently moved into its own building, one of the architectural splendors of Honolulu, on Bishop and Fort Streets, where both the First National Bank of Hawaii and the First American Savings and Trust Company of Hawaii, Ltd., closely affiliated with the First National Bank and functioning as a savings bank, are continuing their growing business in a home built to meet their exact requirements.

It was less than four months after Hawaii became a territory of the United States that the First National Bank of Hawaii opened its doors. During the war the First National Bank played a prominent part in furthering the interests of the government in the various Liberty Loan drives and thrift campaigns in which its President, Mr. L. Tenney Peck, served as chairman of the Territorial Central Committee.

The Bank of Hawaii, Limited, incorporated in 1897, has reflected the solid, substantial growth of the islands since the period of annexation to the United States. Over this period its resources have grown to be the largest of any financial institution in the islands. In 1899 a savings department was added to its other banking facilities. Its home business office is at the corner of Fort and Merchant streets, and it maintains branches on the islands of Hawaii, Kauai, and Oahu, enabling it to give to the public an extremely efficient Banking Service. It will shortly erect on Bishop street, opposite the Alexander Young Hotel, a new bank building to become its permanent home.

ADVT.

THE WORLD'S MOST DELICIOUS PINEAPPLE

Canned Hawaiian Pineapple is considered by epicures to possess the finest flavor in the world. Because of exceedingly favorable conditions in soil and climate, and remarkable facilities for canning immediately the sun-ripened fruit, the Hawaiian product has attained a superiority enjoyed by no other canned fruit.

Crushed Hawaiian Pineapple is meeting favor because of its convenience in cooking. It is identical with the sliced in quality and is canned by the same careful sanitary methods.

Many tasty recipes for serving Hawaiian Pineapple in delicious desserts, salads and refreshing drinks are suggested in a recipe book obtainable without cost at the Association of Hawaiian Pineapple Canners, P.O. Box 3166, Honolulu. Readers are urged to write, asking for this free book.

FERTILIZING THE SOIL

Millions of dollars are spent in Hawaii fertilizing the cane and pineapple fields.

The **Pacific Guano and Fertilizer Company,** with large works and warehouses in Honolulu, imports from every part of the Globe the many ship loads of ammonia, nitrates, potash, sulphur and guano that go to make the special fertilizers needed for the varied soils and conditions of the islands. Its chemists test the soils and then give the recipe for the particular blend of fertilizer that is needed.

This great industry is one of the results of successful sugar planting in Hawaii, and without fertilizing, sugar growing in the Hawaiian Islands could not be successful.

This company began operations in Midway Islands years ago, finally exhausting its guano beds, but securing others.

ADVT.

Banking and Business in Honolulu

The Hawaiian Trust Company, Limited, of Honolulu, is the oldest and largest trust company in the Territory of Hawaii. How successful it has become may be gathered from the fact that it has real and personal property under its control and management with a conservative, approximate value of $50,000,000. The resources of this organization as of December 31, 1926, amounted to $3,655,673.81 with a capital of $1,250,000; surplus, $750,000; special reserve, $50,000, and undivided profits, $235,634.66, making the total surplus of resources over liabilities $2,285,634.66. The full significance of these figures will appear when it is remembered that the laws of Hawaii provide that a Trust Company may not transact a banking business. Mr. E. D. Tenney is president and chairman of the board and Mr. J. R. Galt is senior vice-president and manager.

The International Trust Company, with offices on Merchant street, is, as its name indicates, a really Pan-Pacific financial organization, with leading American and Oriental business men conducting its affairs. Its capital stock is $200,000 with resources of over $300,000. It also conducts a real estate Department.

The Union Trust Company, Ltd., occupying a building on Alakea street, between Hotel and King (1025 Alakea street), was incorporated in 1921, engages in all lines of trust business, and as agents for individuals, firms and corporations, invites correspondence. Its resources are well over a million.

The Trent Trust Company, with spacious offices on Fort street, grew from the real estate and general agency business established in 1904 by Richard H. Trent, known as the Trent Company. It was incorporated in 1907 under its present name. With it is closely associted the Mutual Building and Loan Society, which promotes and finances the building of homes.

ADVT.

The Bishop Trust Company, Limited, is one of the oldest and largest Trust Companies in Hawaii. It now shares with the Bishop Bank its new home on Bishop, King and Merchant Sts., known as the S. M. Damon Building, jointly owned and occupied by the Bishop Trust Company, Ltd., and the Bank of Bishop & Co., Ltd. One of the many attractive features of its new quarters is the Safe Deposit Vaults which are the largest, strongest and most convenient in the Territory.

The Henry Waterhouse Trust Co., Ltd., was established in 1897 by Henry Waterhouse, son of a pioneer, incorporated under the present name in 1902, Mr. Robert Shingle becoming president, and Mr. A. N. Campbell treasurer of the corporation. The company now has a paid-up capital of $200,000 and a surplus of an almost equal amount. The spacious quarters occupied by the Henry Waterhouse Trust Co., Ltd., are on the corner of Fort and Merchant streets.

The Liberty Investment Company Ltd., at 942 Bethel Street, does a business in real estate, insurance loans and investments. It has successfully handled some of the choicest divisions in Hawaii including beautiful seaside coconut groves that have been cut up into choice building lots as well as city tracts that have been transformed into new residence areas for those who wish to own their own homes at a moderate price.

Pacific Trust Company, Ltd., in Honolulu, and the Baldwin Bank, Ltd., Kahului and Wailuku, Maui, are allied institutions. The combined assets of these two institutions amount to over four and a half million dollars. Pacific Trust Company, Ltd., has its offices at 185 S. King Street, in the Lewers & Cooke Building, and is growing rapidly under the careful mangement of a number of Honolulu's leading business men.

The Home Building in Honolulu of the American Factors, Ltd., Plantation Agents and Wholesale Merchants.

Tasseled sugar cane almost ready for the cutting and crushing at the mills.

ADVT.

ON FASHIONABLE FORT STREET

The commodious and palatial salesrooms of **Jeffs Fashion Co., Incorporated,** Honolulu's leading establishment for women who set the pace in modern dress, is at the Mauka (Mountainward) Ewa corner of Fort and Beretania Streets, where all cars pass. This is the head and beginning of Honolulu's great shopping area on Fort Street. At "Jeffs" the fashions in women's dress in Honolulu are set, and here the tourist and visitor may outfit and be sure of appearing in the latest styles.

Diagonally across the street from "Jeffs" is **The Hawaii Photo Materials Co.,** the home of the "Brownie Camera," and every supply in films and photographs which the purchaser can conceive. Here may be secured the wonderful color photos of Hawaii that have made the islands famous.

The Office Supply Co., Ltd., on Fort street near King, is as its name denotes, the perfectly equipped store where every kind of office furniture and supplies are on display. This is the home of the Remington typewriter and of typewriter repairing. Offices are completely outfitted at quickest notice. The Company also maintains an up-to-date completely stocked sporting goods department.

There is one East Indian Store in Honolulu, and it has grown to occupy spacious quarters on Fort Street, No. 1150 Fort, Phone No. 2571. This is the headquarters for Oriental and East Indian curios as well as of Philippine embroideries, home-made laces, Manila hats, Oriental silks, pongees, carved ivories and Indian brass ware. An hour may well be spent in this East Indian Bazaar examining the art wares of Oriental beauty.

Bergstrom Music Company, the leading music store in Hawaii, is located at 1140 Fort Street. No home is complete in Honolulu without an ukulele, a piano and a Victor talking machine. The Bergstrom Music Company, with its big store on Fort Street, will provide you with these; a WEBER or a Steck piano for your mansion, or a tiny upright Boudoir for your cottage; and if you are a transient it will rent you a piano. The Bergstrom Music Company, Phone 2294.

Hawaii Music Co., 1021 Fort Street, handles high grade pianos and Sonora Phonographs, together with a full line of Victor, Vocalion and Odeon Records by the best orchestras in Europe; but its specialty is the new Pathex Motion Picture Camera and Projector. The Pathex Camera takes motion pictures just as easily and at no greater cost than taking photographs, and you can screen them in your own home with your Pathex Projector. Camera and Propector complete with tripod and carrying case, $102.50.

The Bailey Furniture Co., Ltd., are now displaying at their store, 1180 Fort Street, the finest line of furniture and draperies that Honolulu has ever seen. Their drapery department is under the able management of Mr. Moreido. He is a master Interior Decorator and is always pleased to submit plans for making your home "A Better Home." The famous Nachman Mattress is also a feature of this store. Try a Nachman for better sleep.

The "Flower Shop," at 1120 Fort Street, is Honolulu's leading floral establishment. It is a complete palace of flowers and well worth a visit, or you may call No. 2690 and have the choicest flowers sent to departing friends on the boat, or to acquaintances at home or in the hotels, or to weddings or funerals. The choicest gardens in Hawaii supply "The Flower Shop," and any flowers grown in the islands may be ordered.

E. O. Hall & Son, Hawaii's oldest and most reliable establishment, carries a large selection of golf and sporting goods, athletic outfitting, general hardware, household goods, and are distributors for the Sherwin-Williams line of paints. Their fishing tackle department carries a very fine line of deep sea rods, reels and lines of the finest manufacture. The big retail store is at the corner of Fort and Merchant Streets.

ADVT.

ALEXANDER & BALDWIN

A canefield in Hawaii years ago when the ox team was in use.

The firm of **Alexander & Baldwin, Ltd.,** (known by everyone as "A. & B.") is looked upon as one of the most progressive American corporations in Hawaii.

Alexander & Baldwin, Ltd., are agents for the largest sugar plantations of the Hawaiian Islands and second largest in the world, namely, the Hawaiian Commercial & Sugar Company at Puunene, Maui. They are also agents for many other plantations and concerns of the Islands, among which are the Maui Agricultural Company, Ltd., Hawaiian Sugar Company, McBryde Sugar Company, Ltd., Kahului Railway Company, Kauai Railway Company, Ltd., Baldwin Packers, Ltd., Kauai Fruit & Land Company, Ltd., Haleakala Ranch Co., and Ulupalakua Ranch, Ltd.

In addition to their extensive sugar plantations, they are also agents for the following well-known and strong insurance companies: American Alliance Insurance Association, Ltd., Commonwealth Insurance Company, Home Insurance Company of New York, Newark Fire Insurance Company, Springfield Fire and Marine Insurance Company, Union Insurance Society of Canton, Ltd., New Zealand Insurance Co., Ltd., Switzerland Marine Insurance Co.

The officers of this large and progressive firm, all of whom are staunch supporters of the Pan-Pacific and other movements which are for the good of Hawaii, are as follows:

Officers: W. M. Alexander, President; H. A. Baldwin, Vice-President; J. Waterhouse, Vice-President: W. O. Smith, Vice-President; C. R. Hemenway, Vice-President; J. P. Cooke, Treasurer; R. T. Rolph, Assistant-Treasurer; R. G. Bell, Assistant-Treasurer; R. E. Mist, Secretary; D. L. Olsen, Assistant-Secretary; G. G. Kinney, Auditor. Directors: W. M. Alexander, H. A. Baldwin, J. Waterhouse, W. O. Smith, C. R. Hemenway, F. F. Baldwin, J. R. Galt, H. K. Castle, E. R. Adams, R. T. Rolph, S. S. Peck, J. P. Winne, J. P. Cooke.

Besides the home office in the Stangenwald Building, Honolulu, Alexander & Baldwin, Ltd., maintain offices in Seattle, in the Melhorn Building and in the Matson Building, San Francisco.

ADVT.

INFORMATION ON HAWAII

Honolulu Paper Company, successor to "The Hawaiian News Co.," deals in Books of Hawaii. At Honolulu's largest and most fashionable book store, in the Alexander Young Building, all the latest books may be secured, especially those dealing with Hawaii.

Here the ultra-fashionable stationery of the latest design is always kept in stock together with the Royal and Corona typewriters, Merchant calculators and Sundstrand Adding Machines.

Here, also, music lovers will find a home for a complete line of musical instruments, including the Edison Phonograph and records.

This store is one of the show places of Hawaii in the very center of the great shopping district.

The Hawaii and South Sea Curio Store on Bishop street, in the Young Hotel is the largest and most varied curio store in Hawaii. It is open day and night, convenient to visitors, and has branches in both the Alexander Young Hotel and in the Moana Hotel at Waikiki.

The Island Curio Company, at 170 Hotel street, opposite the Alexander Young Hotel, is the home of Hawaiian curios, stamps, coins, souvenirs and post cards. This spacious art store is well worth a visit.

Sharp Signs have been known for half a century in Hawaii. "Tom" Sharp, as he is lovingly known to his thousands of friends, is an artist of no mean order, and has done many paintings in oils that have been used for advertising purposes. What more natural than that "Tom" Sharp should be elected president of the "Ad" Club of Honolulu.
ADVT.

Every kind of sign is painted, built, or manufactured in the work shop of Tom Sharp at Punchbowl and Beretania streets.

Love's Hawaiian Fruit Cake is the output of **Love's Bakery** in Honolulu. Its fame extends around the world. Made of Hawaiian fresh tropical fruit it has a distinctive flavor that recalls the papaias, mangoes, guavas, and pineapples that it contains. It is mailed in five pound tins at $6.50 domestic and $7.50 foreign purchasers.

The Honolulu Dairymen's Association supplies the pure milk used for children and adults in Honolulu. It also supplies the city with ice cream for desserts. Its main office is in the Purity Inn at Beretania and Keeaumoku streets. The milk of the Honolulu Dairymen's Association is pure, it is rich, and it is pasteurized. The Association has had the experience of more than a generation, and it has called upon science in perfecting its plant and its methods of handling milk and delivering it in sealed bottles to its customers.

Stevedoring in Honolulu is attended to by the firm of **McCabe, Hamilton and Renny Co., Ltd.,** 20 South Queen Street. Men of almost every Pacific race are employed by this firm, and the men of each race seem fitted for some particular part of the work, so that quick and efficient is the loading and unloading of vessels in Honolulu.

Brown's Shoe Repairing Store on Union, off Hotel street, is the one absolutely responsible place of its kind in Honolulu. Mr. Brown, a shoe man of a quarter of a century's experience, is in personal charge and is known to all of Honolulu's leading residents and to visitors who have need of shoe repairing.

CASTLE & COOKE

The Matson Navigation Company, maintaining the premier ferry service between Honolulu and San Francisco, have their Hawaiian agencies with Castle & Cooke, Ltd., and here may be secured much varied information. Here also the tourist may secure in the folder racks, booklets and pamphlets descriptive of almost every part of the great ocean.

Castle & Cooke, Ltd., is one of the oldest and most reliable firms in Honolulu. It was founded in the early pioneer days and has been a part of the history of the Hawaiian Islands. It acts as agent for some of the most productive plantations in the whole territory and has been marked by its progressive methods and all work connected with sugar production in Hawaii. It occupies a spacious building at the corner of Merchant and Bishop Streets, Honolulu. The ground floor is used as local passenger and freight offices of the Matson Navigation Company. The adjoining offices are used by the firm of their business as sugar factors and insurance agents; Phone 1251.

C. BREWER & COMPANY

C. Brewer & Company, Limited, Honolulu, with a capital stock of $8,000,000, *was established in* 1826. *It represents the following Sugar Plantations: Olowalu Company, Hilo Sugar Company, Onomea Sugar Company, Honomu Sugar Company, Wailuku Sugar Company, Pepeekeo Sugar Company, Waimanalo Sugar Company, Hakalau Plantation Company, Honolulu Plantation Company, Hawaiian Agricultural Company, Kilauea Sugar Plantation Company, Paauhau Sugar Plantation Company, Hutchinson Sugar Plantation Company, as well as the Baldwin Locomotive Works, Kapapala Ranch, and all kinds of insurance.*

ADVT.

The Honolulu Construction & Draying Co., Ltd., Bishop and Halekauwila Sts., Phone 4981, dealers in crushed stone, cement, cement pipe, brick, stone tile, and explosives, have the largest and best equipped draying and storage company in the Islands, and are prepared to handle anything from the smallest package to pieces weighing up to forty tons.

The Waterhouse Co., Ltd., in the Alexander Young Building, on Bishop street, make office equipment their specialty, being the sole distributor for the National Cash Register Co., the Burroughs Adding Machine, the Art Metal Construction Co., the York Safe and Lock Company and the Underwood Typewriter Co. They carry in stock all kinds of steel desks and other equipment for the office, so that one might at a day's notice furnish his office safe against fire and all kinds of insects.

Allen & Robinson have for generations supplied the Hawaiian Islands with lumber and other building materials that are used for building in Hawaii; also paints. Their office and retail department are in their new quarters at the corner of Fort and Merchant Sts., Honolulu, where they have been since June 1, 1925. The lumber yards are located at Ala Moana and Ward Sts., where every kind of hard and soft wood grown on the Pacific Coast is landed by steamships that ply from Puget Sound, and other Pacific and East Coast ports.

The Thayer Piano Co., Ltd., at 148 Hotel St., is "Honolulu's grand piano headquarters." On Hotel St. facing Bishop, the business block of Honolulu, it is convenient to all. Here may be tested the Steinway and other makes of pianos, as well as the "Piano Players." The company is agent for the Brunswick Phonograph with its superb records, as well as the Victor records. A visit to this music store is worth while.

Honolulu is so healthy that people don't usually die there, but when they do they phone in advance to **Henry H. Williams,** 1374 Nuuanu St., phone number 1408, and he arranges the after details. If you are a tourist and wish to be interred in your own plot on the mainland, Williams will embalm you; or he will arrange all details for interment in Honolulu. Don't leave the Paradise of the Pacific for any other, but if you must, let your friends talk it over with Williams.

ADVT.

Honolulu as Advertised

The Liberty House, Hawaii's pioneer dry goods store, established in 1850; it has grown apace with the times until today it is an institution of service rivaling the most progressive mainland establishments in the matter of its merchandising policies and business efficiency.

The Mellen Associates, Successors to The Charles R. Frazier Company, oldest and most important advertising agency in the Pacific field, provide Honolulu and the entire Territory of Hawaii with an advertising and publicity service of a very high order. The organization, under the personal direction of George Mellen, maintains a staff of writers and artists of experience and exceptional ability, and departments for handling all routine work connected with placing of advertising locally, nationally or internationally. The organization is distinguished especially for originality in the creation and presentation of merchandising ideas.

The Honolulu Star-Bulletin, 125 Merchant Street, prints in its job department the Mid-Pacific Magazine, and that speaks for itself. The Honolulu Star-Bulletin, Ltd., conducts a complete commercial printing plant, where all the details of printing manufacture are performed. It issues Hawaii's leading evening newspaper and publishes many elaborate editions of books.

ADVT.

The Honolulu Advertiser is Hawaii's oldest newspaper and maintains a job department that has been built up with seventy years of effort of experience behind it. The Honolulu Advertiser gets out all kinds of half-tone and color work, prints books and publishes a number of periodicals. The leading morning newspaper of Hawaii, it holds a unique position.

The Honolulu Gas Company has been the pioneer in heating and in lighting the city. Honolulu is now a city of nearly a hundred thousand population and more than ever the people of the city cook with gas. The mains and pipes have been laid even in the outlying districts so that the Honolulu Gas Company helps the city to grow.

The main office of this company is on Hotel Street near Fort, with extensive warehouses and repair shops in other parts of the city. Gas is less expensive in Honolulu than in almost any other city of its size in America. The gas is made from oil brought from California and develops splendid lighting and heating qualities.

The Architects and Engineers of Hawaii

The Architects Society of Hawaii has organized that the people of the Territory may be kept informed as to what the architects established in Hawaii have done, what they are capable of doing, and why employment of their services should be profitable to those who build in Hawaii.

Examples of the work of Honolulu architects may be seen in the city and throughout the islands. Call 4476 or 4468 for a list of residences and commercial buildings designed and decorated by local architects and see for yourself what they are doing.

The architects of Hawaii are sincere in their stand that the difference between a house and a home is decoration. Four walls and a roof make a house. When they are arranged and augmented in a decorative way that subtly expresses the personality of the family, they become a home.

Architects in Honolulu become acquainted with you. They can and will consult with you on every development of the house that is to be your home, not only in its larger phases, which make it suitable to the island climate and habits of life, but in its decorative features.

Many of the finest residences and business and public buildings in Hawaii are the creation of those who constitute the Architects Society of Hawaii. They will be glad to meet you, and information regarding the society may be had by phoning to 4468 or 4476.

In the Architects Society of Hawaii are Herbert Cohen, Damon Bldg.; Davis & Fishbourne, Boston Bldg.; C. W. Dickey, Damon Bldg.; Emory & Webb, James Campbell Bldg.; Furer & Potter, Hawaiian Trust Bldg., Rothwell, Kangeter & Lester, 82 Merchant St.; Hart Wood, Castle & Cooke Bldg.

The Pacific Engineering Company, Ltd., construction engineers and general contractors, is splendidly equipped to handle all types of building construction, and execute building projects in minimum time and to the utmost satisfaction of the owner. The main offices are in the Yokohama Specie Bank Building, with its mill and factory at South Street. Many of the leading business buildings in Honolulu have been constructed under the direction of the Pacific Engineering Company.

Wright, Harvey & Wright, engineers in the Damon Building, have a branch office and blue print shop at 855 Kaahumanu Street. This firm does a general surveying and engineering business, and has information pertaining to practically all lands in the group, as this firm has done an immense amount of work throughout the islands. The blue print department turns out more than fifty per cent of the blueprinting done in Honolulu.

Walker & Howland, with offices in the new First National Bank Building on King and Bishop streets are chiefly fire protection engineers. They represent Grinnell Company of the Pacific, with its main offices in Los Angeles, this firm producing automatic sprinklers, pipes, valves, and fittings, needed in architectural engineering work, and suited to a climate that has no winter and is ever gentle spring.

Lewis Abshire, consulting engineer in the Lincoln Building, is developing much needed lines of work in connection with landscape engineering, construction, and surveying, as well as building. The office is at 178 South King Street, room 2 Liberty Building, telephone 2453, with 79311 as a home number. With his past experience of many years in Honolulu, Mr. Abshire is well acquainted with local conditions and needs in building in Hawaii.

The J. L. Young Engineering Co., Ltd., acts as consulting engineers and contractors, with offices at Kawaihao and King Streets—telephone 2842 and 6247. J. L. Young is president and general manager. The firm has a long career of successful building for the Army, Navy, Government, and private corporations and individuals.

ADVT.

Some of Honolulu's Leading Business Firms

The Hawaiian Electric Co., Ltd., with a power station generating capacity of 32,000 K.W., furnishes lighting and power service to Honolulu and to the entire island of Oahu. It also maintains its cold storage and ice-making plant, supplying the city with ice for home consumption. The firm acts as electrical contractors, cold storage, warehousemen and deals in all kinds of electrical supplies, completely wiring and equipping buildings and private residences. Its splendid new offices facing the civic center are now under course of construction and will add another bit of architectural beauty to the business section of Honolulu.

The Consolidated Amusement Company, as its name implies, is a consolidation of all the leading theaters in Honolulu, featuring two of the most luxurious theaters in the Pacific, the New Princess and the Hawaii Theater, where the latest first-run films are shown to the Honolulu public. The Consolidated Amusement Company supplies practically all of the movie theaters in Hawaii with their films and brings to the island everything that is worth bringing, showing the great run pictures while they are still being seen in New York and Chicago. Visitors can always reserve seats at the theaters of the Consolidated Amusement Company by phoning to the theater selected.

The Honolulu Music Company, 1107 Fort Street, is the home of the Mason and Hamlin pianofortes in Hawaii. Here Dame Nelly Melba purchased two of these superb instruments. The superb Knabe piano also has its home here. Mr. Bergstrom, of Hawaii's one great family of music dealers, is manager of the Honolulu Music Company and here one may be advised by experts as to the kind of musical instruments suited to Hawaii, as well as the kind of music to secure.

ADVT.

Harte's Good Eats is the name of the restaurant in the Wolters Building on Union Street, famous for its home cooking. Miss Edna B. Harte has built this resturant up to its landmark position in Honolulu by carefully supervising every department in person.

Alton J. Cohn, Realtor, 316-317 Hawaiian Trust Bldg., 116 South King Street, has entered the real estate field with the up-to-date modern ideas of this business, handling the best properties and satisfying the customer. Choice properties in every part of Honolulu to suit every income are listed by this realtor, who has found that he had had to take others into partnership to take care of the increasing business.

The Ben Hollinger Co., Ltd., with Ben Hollinger as President and Manager, owns and operates the Hollinger Garage, and is disbursing central for the Vesta Battery Corporation, and representatives for The Fisk Tire Company, Inc., in the Territory of Hawaii. The main offices of the company are at Alakea and Queen Streets, adjoining the garage.

The Rycroft Arctic Soda Company, on Sheridan Street, furnishes the high grade soft drinks for Honolulu and Hawaii. It manufactures the highest grade ginger ale—Hawaiian Dry—from the fresh roots of the native ginger. It uses clear water from its own artesian well, makes its carbonated gas from Hawaiian pineapples at the most up-to-date soda works in the Territory of Hawaii.

A monument to the pluck and energy of Mr. C. K. Ai and his associates is the **City Mill Company,** of which he is treasurer and manager. This plant at Queen and Kekaulike streets is one of Honolulu's leading enterprises, doing a flourishing lumber and mill business.

Honolulu Business Items

The Honolulu Planing Mill, of which John Lucas is President and Manager, is the only planing mill in the Territory electrically equipped, and it manufactures its own electricity. This pioneer planing mill of Hawaii, established in 1864, has its workshops at Ala Moana, Coral and Keawe Streets, Honolulu, where it manufactures mouldings and every conceivable need in building the house and home.

The World's Dairy Farm is a title which New Zealand, the greatest exporter of milk products, has truly earned. A mild, equable climate, careful herd selection, scientific manufacture and a rigorous grading system, account for New Zealand's pre-eminence. "Anchor" Brand Dairy Products represent the cream of the Dominion's output and in 30 countries are acclaimed as the world's best.

Bailey's Groceteria is the big success of recent years in Honolulu business. The parent store at the corner of Queen and Richard Sts., has added both a meat market and a bakery, while the newly constructed branch building at Beretania and Piikoi is equally well equipped and supplied, so that the housekeeper can select all that is needed in the home, or, in fact, phone her order to either house.

The Metropolitan Meat Market on King street, near Fort, is the most completely equipped meat market in the Territory of Hawaii, and the most sanitary. It occupies its own building, which is built and equipped on successful principles of sanitation. Its splendid meats are carefully selected and supplied by the Hawaii Meat Company, which operates its own cattle steamers between the islands, so that fresh and perfectly fed beef is always on the counters, under glass, at the Metropolitan Meat Market.
ADVT.

Howard W. Laws, at Ala Moana Avenue and Ward St., is the general roofing contractor in Hawaii, being distributor for Carey's roofing and building materials, telephone 5949. Before putting on your roof in Hawaii, it is wise to secure expert advice on the kind of roof the section you build in needs. Howard W. Laws can give this advice with years of experience behind his opinion.

L. Fullard-Leo, the building contractor, with a factory at Queen and Ward streets, is Honolulu's manufacturer of hollow concrete building tiles, as well as of roof tiles and French floor tiles. A specialty is made of fibrous plaster cement plate walls and of every kind of ornamental plastering, modeling, imitation stone, etc. Excellent examples of this work may be seen in the new Castle & Cooke Building and in the Bishop Bank building now nearing completion.

The Hub Clothing House, at 79 S. Hotel Street, is just around the corner from Fort Street and in the busiest portion of the city. Quick sales make it possible to dispose of the constantly arriving stock of men's clothing and apparel at the lowest prices in the city for the high class gentlemen's wear.

Walker & Olund, Ltd., with headquarters at 820 Piikoi St., build with Walker & Olund's concrete tile, and build permanently. This firm has contracts for many of the big new business and other buildings now being erected in Honolulu. Their feature of concrete tiling saves the trouble of double walls and makes the home absolutely water-proof, bug-proof, and by actual test more fireproof than the imported clay tile. Walker & Olund's concrete tile is slightly cheaper laid up in the wall than good double board construction, and a great deal more weather resisting.

Maui No Ka Oi

(Maui is the best)

The Maui Chamber of Commerce is behind the plan for an auto road to the summit of Haleakala, earth's vastest crater, situated on the island of Maui, its summit ten thousand feet above the sea from which it will be distant, when the auto road is completed, scarce fifty miles of easy riding. The Chamber also advocates the round-the-island auto road that now connects Wailuku and Lahaina with Hana with the plan now to push the building of this auto route entirely around the island of Maui. It was the Chamber that got behind the Maui Annual Fair, the best of its kind in the islands. All of the business men of Maui are members of their Chamber, and it stands for the progress of Maui No Ka Oi (Maui, Best Of All).

The Wailuku Hotel is the delightful caravansary conducted by Mrs. George K. Trimble, enlarged from year to year until it is now one of the really up-to-date hotels in the Territory with every convenience for the visitors. This hotel has a clientele of many years standing, drawing to itself the best of the traveling public to which it caters.

The Haleakala Ranch Company, with head offices at Makawao, on the Island of Maui, is as its name indicates, a cattle ranch on the slopes of the great mountain of Haleakala, rising 10,000 feet above the sea. This ranch breeds pure Hereford cattle and is looking to a future when it will supply fine bred cattle to the markets and breeders in Hawaii.

The Kahului Railroad Company, with its main offices at Kahului on the Island of Maui, serves the island both as regards passenger and freight service, with regular trains running to the Haiku district, Paia, Puunene and Wailuku. The company is agent at Kahului for the Inter-Island Steam Navigation Company and for the firm of Alexander and Baldwin, Ltd. William Walsh is general manager.

The Kahului Store, Wm. A. Sparks manager, is conducted by the Hawaiian Commercial and Sugar Company. The immense store in Kahului carries everything that is needed in plantation or home life, it maintains branches at Puunene, Spreckelsville, and at Kihei. The plantation store is an institution in Hawaii, bringing everything that is needed direct to the laborer and to workers of all kinds.

The Hawaiian Cooperative Poultry Association with its poultry ranch and head offices at Wailuku, supplies the island with its dressed poultry and eggs. It sometimes sends its produce to Honolulu, where there is a quick demand. This is an enterprise of Wm. F. Pogue and his son. Mr. Pogue is also proprietor of the Homelani Ranch with his sons, who give it their personal service.

The Paia Store, which is conducted by the Maui Agricultural Co., Ltd., is managed by Fred P. Rosecrans. This is one of the very big plantation department stores in Hawaii. Every conceivable need of the housekeeper or homemaker is kept in stock. The store covers an area of more than a city block in a metropolitan city, and is the department store adapted to the needs of modern sugar plantation life.

The Honolulu Dairymen's Association, Ltd., is represented on Maui by Fred Lamb at Wailuku.

ADVT.

Hilo, Hawaii's Second City

Locate in Hilo.—The Chamber of Commerce of Hilo has its spacious quarters in the Old Bank Building at the corner of Keawe and Waianuenue Streets, the very center of Hilo's business district. Those desiring information concerning Hilo and its opportunities are invited to call at the Chamber, which represents the interests of a city of ten thousand inhabitants, as well as the general business interests of the Island of Hawaii, the largest island of the group forming the Territory of Hawaii. Those who contemplate visiting Hawaii or doing business in Hilo are invited to correspond with the Chamber of Commerce of Hilo, Milton Rice being vice-president and manager. Hilo has many important business houses, and from Hilo the various points of interest on the Island are visited.

The Hilo Hotel is the rendezvous of the tourist and the visitor. Almost hidden in a tropical garden facing the sea, its bungalow cottages afford the maximum of comfort. At the Hilo Hotel rooms with or without baths may be secured at moderate rates, and in the great dining hall the delicacies of Hawaii are served. The Hotel is conducted on the American plan.

Hawaii Consolidated Railway, Ltd., Hilo, Hawaii, the Scenic Railway of Hawaii, one of the most spectacular trips in the world, thirty-four miles, costing nearly $4,000,000; it crosses 10 sugar plantations, 150 streams, 44 bridges, 14 of which are steel from 98 to 230 feet high and from 400 to 1,006 feet long, and many precipitous gorges lined with tropical trees, and with waterfalls galore; sugar cane fields, villages, hundreds of breadfruit and coconut trees and palms along the way, and miles of precipices. W. H. Hussman, general freight and passenger agent.

Motor Service from Hilo.—The Peoples Garage maintains a regular daily automobile service to the Volcano of Kilauea, thirty odd miles distant from Hilo. It also sends passengers by auto around the island of Hawaii or to any part of the island. Its cars meet the steamers at the wharf, or can be secured at any time by phoning either 82 or 92. John K. Kai is president and manager. A letter or a wireless message to the Peoples Garage, Hilo, will assure prompt service and waiting cars.

Hilo as a Manufacturing Center.—The Hawaiian Starch Co. is a Hilo enterprise that has the support of the entire territory. This company puts out a starch made from the edible canna that has twice the strength of other food starches, so that only half the amount usually specified in cook books may be used. This is the starch par excellent for a dull laundry finish. Hawaiian sugar and Hawaiian pineapples are known the world over as the highest standard, and it now seems that Hawaii will lead in producing a perfect starch.

Hilo as a Cattle Market.—The Hilo Meat Co. at 12 Keawe Street is the town end of the Shipman ranch, V. D. Shutte, manager. This company supplies Hilo and sometimes Honolulu with meat from the famous Shipman ranch, of which Mr. W. H. Shipman has been the experienced head for more than a generation. Hawaii has made herself independent of the mainland for meat of all kinds, and in the Hilo market there is a choice of the very best cuts from home raised cattle from the Shipman ranch.

The Moses Stationery Co., Ltd., Hilo, Hawaii, of which E. Moses is president, has its main office and store at No. 55 Kamehameha Avenue. They also control and operate the Hawaii Music Co. in Hilo. In Honolulu two more stores are controlled—the Moses Office Equipment Co., Ltd., at 72 South King Street, also the Sonora Shop at 1158 Fort Street, where the famous Sonora phonographs and the Baldwin Piano are featured.

ADVT.

Establish Your Business in Hilo

The First Trust Company of Hilo occupies the modern up-to-date building adjoining the Bank of Hawaii on Keawe Street. This is Hilo's financial institution. It acts as trustees, executors, auditors, realty dealers, guardians, accountants, administrators, insurance agents, and as your stock and bond brokers. You will need the services of the First Trust Company in Hilo whether you are a visitor, or whether you are to erect a home or a business block.

Own Your Home In Hilo.—The home or business builder in Hilo will need Charles H. Will, the foremost general contractor of the big island of Hawaii. He is the first aid of the builder, with an office in the Old Bank Building on Waianuenue Street. His work is in road building, reinforced steel and concrete buildings, a builder of bridges and wharves, streets and highways. Agent for the Polk System of Reinforced Concrete, Charles H. Will erects the concrete chimneys, an important thing in a lond of sugar mills. Estimates are furnished on every class of construction work.

Hilo's Department Store.—The E. N. Holmes Department Store on Waianuenue Street, near Kamehameha, is one of the business landmarks of Hilo. Here more than a generation of Hiloites has bought its groceries, dry goods, men's furnishings, crockery, household furniture, and all that goes to make home happy. Mr. Holmes is now assisted by his son in the management and the business still expands and keeps up with the times, keeping to the front as Hilo's one big department store.

Own Your Own Car in Hilo.—The Volcano Stables and Transportation Company, J. W. Webster, president; and A. L. Ruddle, secretary and manager, is proprietor of the Volcano Garage. At Kamehameha and Pauahi Streets it has three acres of buildings and is agent and distributor for the two cars that stand alone in their separate classes,—the Ford for everybody and the Studebaker for those who desire a high-class car at a moderate price. The company is also distributor for the Ford and White trucks, Fordson tractors, and the Goodyear and Federal tires.

A cattle ranch on the Island of Hawaii.

ADVT.

AUTOMOBILES GO HIGH

The highest motor highway in the world is a new attraction for Colorado this summer. It is now a simple matter to start from Denver in the morning and be on the crest of Mount Evans by the middle of the day.

This great rangy mountain that rises 14,259 feet above sea level, is just west of Denver and the road leading to the summit is an extension of the famous Denver Mountain Parks system. The road, recently put into commission, is double width all the way and has a grade that is easy for any car.

Leaving Denver in an automobile, you strike out due west, over the paved road, to the famous Lariat Trail up Lookout Mountain. Reaching the summit of this part of the ride you arrive at the last resting place of Colonel Cody ("Buffalo Bill"), where Johnny Baker, Cody's adopted son, conducts the museum and refreshment casino of Pahaska Tepee.

Going on toward the west over smooth roads, you enter immediately into a land of surprising and beautiful vistas. You pass the wild animal preserve with the great herds of elk and buffalo grazing quietly on the mountain sides. You turn to the right at Bergen Park and start the climb over the Mount Evans road to Echo Lake, passing over Squaw Pass and scaling Chief Mountain. Even in midsummer there is a tang of cool (often cold) crispness in the air as you rise higher and higher and see farther and farther, and behold more and more beautiful views.

A short decline in the road brings you to beautiful Echo Lake, nestling in the pines at the very foot of Mount Evans.

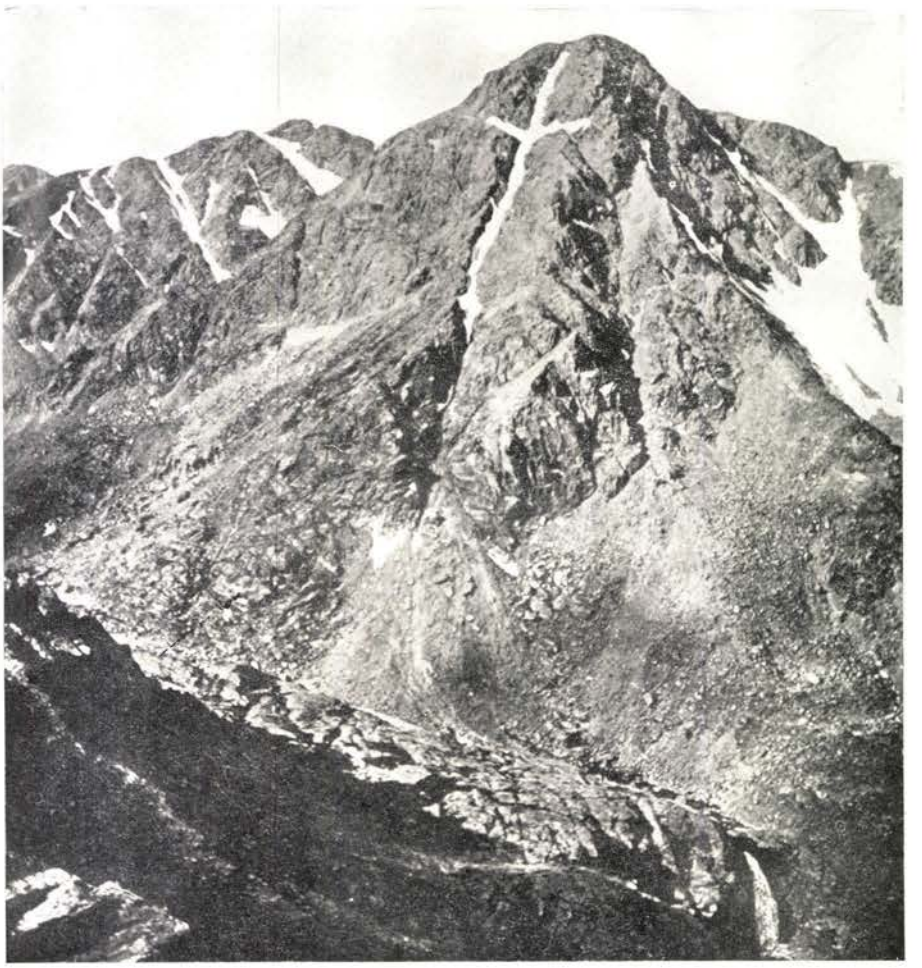
From here you go on to the thrilling ride up the sides, around the turns and over the tops of the various rises in the great mountain. You will see the timberline trees, valiant soldiers that have struggled for centuries against losing odds, but standing firmly, with their stark limbs, blanched and barkless, in contorted beauty before the winds.

Far above timberline you skirt the granite side of the mountain and look down its precipitous sides to little dots of lakes, fed by the snows that melt all during the summer, but never disappear. These lakes are above timberline but off in the distance are dots, no bigger than tear drops, that are reservoirs and lakes out on the plains. You come to Summit Lake and get a close-up of the above-timberline, glacier-fed water pools. A little further on and you reach the present end of the road.

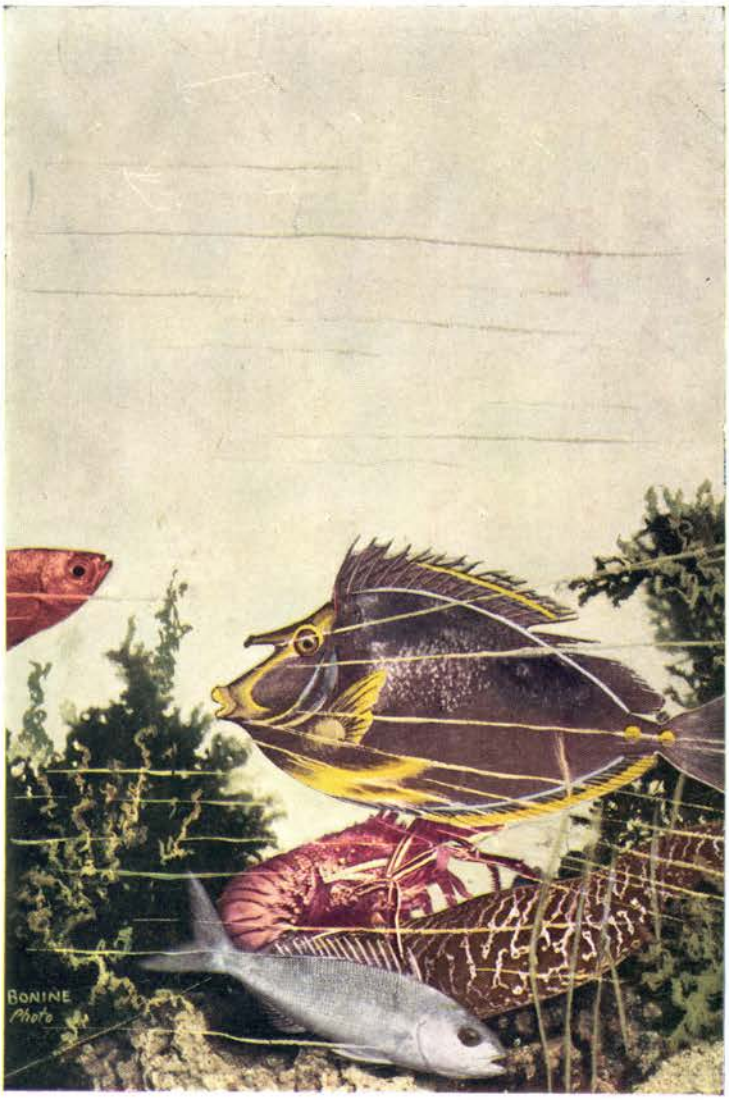
You step out of the car, walk a few rods and stand on the very top. You know that no mortal ever rode in an auto to a greater height, but you probably will not think of that. Your emotions will be in such a state you will hardly have any controlled thoughts. You may gasp or cry out in amazement or may even say "Beautiful!" But you will not express your emotions; you will simply receive an impression that will last throughout your life.

Colorado has many such tours, and all add reasons for accepting the hearty invitation of the Denver Tourist Bureau to "Come Up to Cool Colorado."

ADVT.



The Mount of the Holy Cross, one of Colorado's monuments.



Some of the Hawaiian fish in the Aquarium, Honolulu.