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EDITOR: JAN HAHN

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Bernstein

MEGOLAMANIA!

NOT many general practitioners have the opportunity to listen to a thousand human hearts beating as one; (a supreme example of togetherness). This was given to Dr. Alfred W. Senft while listening to a whale's heart about one thousand times larger than ours. The moribund patient co-operated fully but not freely, while lying exhausted on the beach. (see pp. 7-10)

Our fine cover photo was made by Daniel Bernstein of Provincetown, Massachusetts.

ALTHOUGH some time has passed since the International Oceanographic Congress, we felt that the material in this issue is of interest. The opening and closing speeches deserve a wide audience, and a more complete rendering than was possible in newspaper accounts; while the remarks by some of the participants may be of aid in the planning of a future congress.

The remark: "It was wonderful to be able to meet so many old friends and others who were known by name only", has been omitted. In the texts of the impressions printed here this was repeated by almost all contributors. Oceanography, having still a comparatively few adherents around the world, has indeed a great comradeship. The ocean which divides us, also brings us together.

Much has happened in the past year. Not only scientifically, but oceanography suddenly became 'popular'. But frankly, on our part we are a little tired of the following: "Almost $\frac{3}{4}$ of the earth is covered by water"; "We know more about the face of the moon than we know about the bottom of the ocean"; "The ocean bottom is covered by millions of dollars worth of manganese nodules".

A knowledge of the ocean is important to all mankind, tiresome clichés will not help to obtain this knowledge.



Spooner

Opening Address to the
International Oceanographic Congress

August 30, 1959

ROGER REVELLE, *President*

THIS is a great day for oceanography. Some of us have been scientific sailors since we were very young. I am sure none of us could have imagined then that we would one day hold a great international congress about the oceans.

It is natural that this Congress should be held in the home of the United Nations, for our science is a peculiarly international one. More than half of the countries on earth are represented here tonight. Not only can scientists of every country and every continent contribute to our understanding of the seas, but it is absolutely necessary that they do so if our knowledge is to advance on a broad front.

In our terrible century, when, by the ironies of science, the very existence of our species is threatened, while, at the same time, human populations all over the earth are exploding in size, no one knows how to control or even to predict what will happen to our human society. But it may be that the oceans are the last, best hope of earth. If we are ever to learn to govern our planet, to accept rationally and use wisely the planetary home in which all men

are imprisoned, we must start with the wise and far-seeing government of the oceans. Wise and far-seeing government depends on understanding. Thus we oceanographers have a grave responsibility to the United Nations to achieve that understanding on which an international government of the oceans can be based.

Just as the United Nations is the forum and meeting place for all nations, our science of oceanography is the meeting place of all the sciences. There are many definitions of oceanography, or oceanology as my friends Anton Bruun and Lev Zenkevitch prefer to call it. Some say that it is not a science at all; others that oceanography is what oceanographers do, or simply the science that is done at sea. I have had some success in defining it by pointing out that oceanographers are basically just sailors who use big words. This is rapidly becoming an obsolete definition, because young people who know a great deal about theoretical physics or biochemistry or quantum mechanics or microbial genetics or the modern methods of applied mathematics are becoming interested in increasing numbers in

one or another problem of the oceans. But it is now more true than ever that oceanography is the meeting place of all the sciences, and that much of the fun of it — the sheer excitement of oceanography—comes when people of different backgrounds talk together about common problems, problems in which the ideas and knowledge of biologists, geologists, chemists, physicists, mathematicians, and engineers must be combined if a solution is to be found.

Your Committee on Arrangements had this excitement very much in mind in planning this Congress. On each day, in the morning lectures and the afternoon seminars, we have tried to emphasize interrelationships between the many scientific disciplines that underlie oceanography. We have tried to ensure that biologists and chemists, geologists and hydrodynamicists will talk and listen to each other. The result may not be all we hoped. There may, in fact, be some confusion and misunderstanding. But remember, if you do get confused, the first rule of research — the *sine qua non*, if you please, of scientific progress — which is that the best research is done by people who do not know very much about what they are doing.

Dr. Sears' Congress

Now that I have mentioned the Committee on Arrangements I cannot help speaking of Mary Sears. This is really Mary Sears' Congress. Tonight I feel very grateful to her and infinitely proud of her. Gently, firmly, generously, and wisely she has moulded this Congress close to the heart's desire of all oceanographers everywhere. She has not been alone, of course, Raymond Taylor and Dael

Dr. Revelle is the director of the Scripps Institution of Oceanography. He served as President of the Congress.

Wolfe of the American Association for the Advancement of Science, Gordon Lill of ONR, the entire staff of the Woods Hole Oceanographic Institution, and many others have been her more or less unwilling slaves. But somehow she has made them like their slavery. If this were a football rally I would suggest that four stalwart men pick Mary up, toss her three times in the air, and carry her in triumph around the room.

Looking around I am struck by the youthfulness of the members of this Congress. The average age of the people is certainly under forty. This youthfulness, of course, reflects the fact that our science is a young one. This has both advantages and disadvantages. The disadvantage is that I and many other members of my pre-war generation feel completely out-dated by the younger, better-educated, brighter-eyed, sharper-minded, and more energetic members of the new post-war generation of oceanographers. The advantage is that our science is full of uninhibited young people, full of new men, new ideas and problems, and better ways of attacking and solving those problems.

About all the old can offer as a gift to the young is advice. This gift is usually more or less politely rejected. Nevertheless, I cannot resist taking advantage of my seniority to offer you three pieces of advice: As oceanographers you should

1. Ask questions of the ocean
2. Think no small thoughts and dream no little dreams
3. Fan the flames of controversy.

Ask Questions

Every science worthy of the name progresses, once it has passed the pioneering stage, by asking the right questions of nature. Indeed, ninety per cent of a scientific result has been achieved when an answerable question has been properly formulated. In the past we oceanographers have known so little about the oceans that we have had to depend pretty largely on blind exploration and random discovery. But I am convinced that we have now grown up intellectually—grown up to the point where the next great steps ahead will come from deliberate attempts to answer properly formulated questions and to test carefully conceived hypotheses. Much progress will come, especially in biology, from controlled experiments in the laboratory. But for many problems the sea itself must be used as a laboratory, and even though we cannot make a controlled experiment in the oceans we should be able, by carefully choosing the right conditions, to answer well thought-out questions. An example is one of the problems to be attacked by the series of expeditions to the Indian Ocean proposed by the Special Committee on Oceanic Research—the problem of the magnitude and time scale of the changes in wind-driven currents brought about by changing winds. The Indian Ocean with its two wind systems alternating seasonally, would appear to be an ideal laboratory to study this problem.

Although our science is a small one, and our ocean is only a film of water on a small planet, yet we

should not be too modest about what we are doing. The marine sciences are concerned with some of the most profound questions of mankind—questions that men began to ask when they first looked up at the stars and inward toward themselves. We have good reason to believe that the earth is nearly as old as the Milky Way galaxy, and the records of the past preserved on earth, if we could only learn to read them, are the best archive available to us of the history of the galaxy. Most of these records are locked in the sediments and rocks beneath the sea, in the sea water itself, and in the atmosphere above the waters. Even more significant are the problems of the origin and history of living things, and here again we must turn to the oceans for many of our answers.

During the war one of my friends in Washington had a cardboard sign crudely lettered in red over his desk. It said "Fan the flames of controversy." No motto could be more proper for a scientist, for science progresses not only through the thinking of individual scientists but also through scientists talking and thinking together, through the mutual thinking and free interplay of several minds stimulated by a common problem and quickened by each other. This is especially true of oceanography, in which the answers to many questions require the application of more kinds of knowledge than can be held in the mind of one man. The best mutual thinking is done not when our minds are cooled by platitudinous politeness, but rather when they are warmed by a hot discussion. The lasting merit of this meeting will rest in the number of bonfires of controversy that we can light and fan to a bright flame.



by G. O'D. Iselin

The World Ocean

Ownership of ocean "acreage" will have to be settled to make the exploitation of the oceans' resources beneficial to all mankind.

Hahn

WE have heard a great deal of science discussed and argued over during the last 10 days. There is some danger, I think, that some people will leave this congress with the impression that oceanographers really do not yet know very much about the sea. While few of us are ever satisfied about the state of knowledge in our particular area of interest, nevertheless, collectively we really do know a great deal about a great many aspects of marine science.

So rapidly is science advancing these days that in a relatively few years it can be expected that we will know enough about the seas for engineers to begin to make this knowledge of practical benefit to mankind on a considerable scale. It is obvious, I think, that we will soon

be able to exert a significant measure of control on climate. We certainly are in a position today to suggest means whereby the winds could be aided in the overturn of the oceans so that the total biological resources could be increased. After all it is a great deal easier to turn over water than to plow the land.

Thus it is no longer necessary to suppose that fishermen must always remain hunters rather than farmers. As scientists we are glad that until now nobody has seriously suggested that we begin tinkering with nature, but this is something that could obviously happen rather quickly, provided there were some agreed principals of control and monitoring. The disposal of radioactive wastes at sea is a good case in point.

In short, my thesis is that a great deal of thought has gone into marine science. We can expect a considerable acceleration during the next few years. It is high time that some wise and farsighted men begin to think seriously how the potential, vast resources of the oceans can be divided on an equitable basis.

The sea is the only part of the earth that nobody claims to own. The old idea of the freedom of the sea has well served its original purpose. It arose because until now the most important characteristics of the oceans were that they provided for cheap world-wide transport and for national defense. I am afraid that the idea of the freedom of the seas is somewhat incompatible with their efficient and wise exploration.

The economic and social problems that will be encountered as we begin seriously to exploit marine resources seem to me formidable, much more formidable than the remaining unsolved scientific problems. I hope that it is significant that during the last 10 days our discussions have been held at the United Nations. Some very wise agency needs to be developing the ground rules within which the vast marine resources can be developed in an efficient and safe manner for the benefit of all mankind.

Inevitably it will be practical to set up the equivalent of fences in the sea so as to regulate the goings and comings of fish. It will be possible to remove the "weed" forms and to encourage the production of desirable food fishes. But probably nothing will happen in such directions on a large scale until it is decided who will have a right to reap the harvest.

This is such a knotty problem that I do not foresee any widely acceptable solution, but some influential agency should be working on it, both from the standpoint of conservation and from that of efficient exploitation.

Perhaps an even more immediate problem is that of manipulating climate. Nearly all nations could use more rainfall or a better annual distribution of rainfall. As soon as this is attempted on any considerable scale a whole new kind of international law will have to be devised.

Many of us have clear-cut ideas about ways by which the oceans could be exploited and at the same time become more useful to mankind. It is time that the lawyers and the statesmen go to work so that these achievable improvements in the overall economy can become a reality.

The above is the text of a speech given by Dr. Iselin at a banquet closing the International Oceanographic Congress held at the United Nations. Part of this text was also printed as an editorial in *Science*.

The Lifelines Of A Whale

To measure the heartbeat and temperature of the mightiest animal was a mighty task.

BY J. KANWISHER

FROM the old testament story of Jonah down through Moby Dick and much of modern fiction, man has shown a recurring fascination for 'God's biggest creature', the whale. This is hardly surprising since few will deny that a beast weighing as much as 300,000 pounds truly is spectacular. Unknown to many people though, the smallest porpoise which is only 1/10,000 the weight of the biggest sulphur bottom or blue whale, is every bit a proper whale. They all belong to an order the biologists call cetacea. Some interesting questions of animal-engineering result when this size range is considered together with the fact that whales are mammals like ourselves. Live porpoises have been studied and used for measurements, especially since, in recent years, these small whales have been kept in Marineland and other aquaria and thus were easily available for study. But the functioning of big whales is largely a matter of conjecture built on anatomical studies of dead specimens and analogies with other animal types. Only measurements made

directly on the live animals can give the answers with the desired certainty.

So what course should one follow to get instruments onto such an animal? A live whale in the water is an imposing experimental subject. The direct approach of pursuing whales in the open sea with oceanographic vessels is too expensive, (this is not a subject like cancer or rockets which attracts ample funds). Such a course also might not work since whales can swim faster than most oceanographic vessels. For some time I have thought that the best opportunity lay in making measurements on a live beached animal. Such strandings occur fairly often on the New England coast and animals have been reported to stay alive for as long as two days. Unfortunately most people view the great mass of potentially putrifying meat as more of a public health hazard than a scientific opportunity. After several disappointments in which the word did not reach me in time I have recently been able to take advantage of such an event.

A 45 foot fin whale, (weight about 40 tons, sex-male, age about 1 year), grounded on the beach at Provincetown in early December. It was towed off several times but swam back. Finally, after it had made the local papers, I received the news late on a cold rainy Saturday night. The necessary instruments had been under my desk for several years so it took only a few hours to check them, find a willing recruit, and drive the 65 mile length in the rain. We located the whale in the dark by the sound of its breathing. It had been left high and dry by the receding tide and fortunately no one was around to ask questions. It blew at regular 20 second intervals and showed no obvious signs of distress. But it was impossible to hear or feel the heart beat as I had expected. I badly wanted to count the pulse rate to check the hypothesis of decreasing heart rate with increasing size that has been found for smaller animals. The only hope lay in using the electrical recording techniques used on humans to obtain an electro-cardiogram.

Over the years I have had half serious discussion about taking a whale's electrocardiogram with my friend and neighbor, Dr. Alfred Senft, a local general practitioner who shares my enthusiasm for research. Sometime after midnight I called him to tell him of the whale's apparent good health and to enlist his aid. The response was immediate and enthusiastic. He spent the rest of the night at the lab sharpening pieces of welding rod for electrodes and gathering long lengths of wire from unknowing donors. Such unorthodox and hurried preparations were to prove successful and it is probably fortunate that we did not have time to consider how technically crude they were. He showed up at dawn with his wife and children, (no baby sitters at such an hour), and a nearly new electrocardiograph from his office.

A Cold Night

Meanwhile I spent the night measuring temperatures rectally, over the surface of the whale, and also

Pushing an electrode into the whale's blubber. Dr. John W. Kanwisher was assisted by Dr. Edward J. Kuenzler

Bernstein





Bernstein

The gallery

through the blubber. The air and water both were only slightly above freezing. My uncomplaining colleague, Dr. Edward Keunzler, held a flashlight and recorded data. He is also a marine biologist but his usual work, ironically enough, is on some of the most minute animals in the sea which are more than a billion times smaller than the whale. Without his presence I probably would not have dared to climb on the heaving animal's back to take temperatures on the dorsal fin and also to draw breath samples. The latter were taken by holding a syringe a foot inside the blowhole which opens for only a few seconds during each breath. Since about 1000 liters of the hot breath come rushing out it was a little like working in a hurricane. Fortunately the whale did not have halitosis. The returning tide forced a halt so we crawled in sleeping bags as a summer resort has little to offer in the way of entertainment in the middle of a December night.

At daylight we were faced with the problem of getting 110 volt

DR. J. KANWISHER of our staff has been to the Arctic to study the survival of seashore animals on frozen tidal levels, has hunted whales for temperature observations off Norway and is working on the CO₂ exchange between the ocean and the atmosphere.

power for the electrocardiograph. A local fireman was awakened and with only slight mutterings he brought an emergency generator down to the beach. Unfortunately the machine wrote a very noisy record with this power source but we thought we could see the heart beat in among all the extraneous wiggles. Then we realized we were only 100 yards from a beach house that was connected to the power mains. A Christmas light display was dismantled for an extension and entry was effected through a window. The machine was reconnected and we now had a moment we will never forget. The interference was mostly gone and the large excursions of the whale's heart beat stood out. We now proceeded with several hours of recording. The electrodes were pushed through the

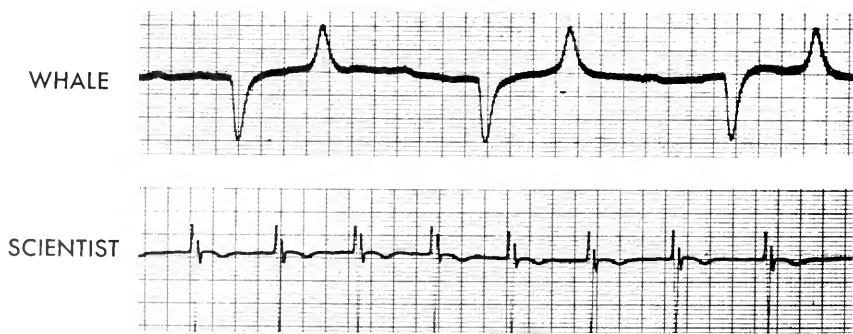
blubber layer into the muscle. Dr. Senft placed them in positions analogous to those used on humans. This required imagination when it comes to those that go on the legs since these organs disappeared in the whale far back in evolution. Eventually we ran out of paper, the whale died, and we started for home to look at our records out of the rain.

So what did we find out? Since these were the first measurements of this nature they were bound to be useful. Thermally the whale behaved pretty much as theory had predicted. The blubber is clearly an insulation as we thought it should be. The dorsal fin was much warmer than the rest of the body surface, indicating it was one of the preferred pathways of heat disposal. The breath samples showed an impaired lung function not unlike pneumonia in humans. A section of the electrocardiogram is shown here along with one taken on myself. The various excursions of the record are electrical signals associated with the contraction of different chambers in the heart. The pulse rate is about 27 per minute compared to my own of 72. The way one beat immediately follows the previous one leads us to speculate that 27 is

probably an upper limit and that the normal rate may be about 10 per minute. The events in each individual beat are stretched out in time twice as long as any ever recorded before. This was expected since the whale's heart was about 1000 times larger than a human's and time can be considered a measure of size from what we know about the workings of the mammalian heart. During the recording we noted many defects such as missed beats that gave us the impression of working on a pretty sick whale. It is not surprising then that the whale died shortly thereafter.

Before we had been home long we were to realize that we had unwittingly performed a stunt of considerable publicity potential and during the following weeks our whale cardiogram became the subject of many news stories. Although some of this reflects a general interest in whales, much of it can probably be attributed to the president's recent heart attack. At the time he was attended by Dr. Paul Dudley White, a heart specialist who in addition has studied the hearts of whales. He has directed some large well publicized expeditions with helicopters, airplanes, and telemetering electronics to record a

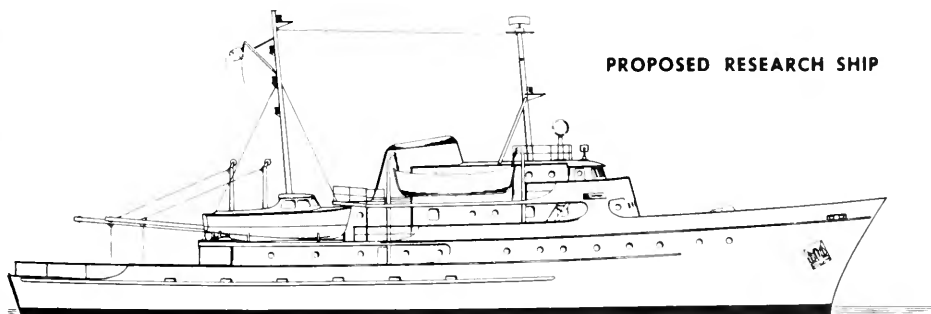
The slow thump of a finwhale's heart compared to the cardiogram of a human heart. For years, scientists have tried to make a cardiogram of the largest known heart, that of the whale. Woods Hole scientists succeeded when a whale beached on Cape Cod stayed alive some 24 hours. The lower cardiogram is that of Dr. Kanwisher.



whale's heart beat and had not succeeded. It is not surprising that he figured prominently in many of the reports although neither of us knew him and he played no part in our plans. Since then we have enjoyed discussing the electrocardiograms with him. He felt that our results should be considered a beginning of whale cardiography and that a record from a healthy whale in the water was still needed. We agreed wholeheart-

edly and regret that we ourselves cannot pursue live whales, but, just in case, I am keeping an electrocardiograph ready with my temperature measuring instruments. Although the general news interest was in the whale's heartbeat, my own interest was in the body temperature measurements.*

*See: "How cold is a whale's tail"? *Oceanus*, Vol. V, 1 and 2.



New ship a reality

Only last August did we "hope" that funds for a new research vessel might be raised. Little did we realize how soon the large sum required would be forthcoming. By late November the National Science Foundation provided a grant of three million dollars to design and build the new ship.

"U. S. oceanographers badly need adequate research vessels," said Dr. Alan T. Waterman, Director of the National Science Foundation, in announcing the grant. In his acceptance, our Director Dr. Paul M. Fye stated: "We believe that this research vessel will prove to be an important stimulus to American oceanography. She will be the best equipped ship afloat and is expected to be the most modern in ship design."

The Institution's Ship Committee, led by naval architect Francis Minot — who was partner in the firm of Owen and Minot when they designed the "Atlantis" in 1930 — is busy with the plans for the final design of the ship.

We deeply regret to announce the untimely death of Mr. Minot which occurred as we went to press.



Jack Pales

Visible heating of the sea by lava flowing from the Hawaiian shore. Upwelling at right may come from the leading edge of an underwater flow.

Lava and the Sea

by A. H. Woodcock

WHAT happens when magma (lava), at a temperature of one thousand degrees centigrade, flows into the sea? Attempts to find some of the many answers to this question caused me to journey ten thousand miles and to make airplane flights through the "steam clouds" from the recent Puna eruption in Hawaii.

Mr. Saul Price of the U.S. Weather Bureau at Honolulu, reported dense haze over vast areas of the North Pacific, following the entrance of the hot lava streams into the sea. The

"steam clouds" formed previously were found to contain large amounts of sea salt. This report caused the speculation that the great heat of the lava* probably forced the sea salt as well as the water into the steam cloud.

The introduction of great numbers of hygroscopic particles into the air can have important effects upon the atmosphere, such as an altered radiation absorption characteristic, a changed temperature lapse rate, and perhaps a modification of some of



Jack Pales

1000° lava entering the Pacific caused a dense cloud which changed the visibility over a vast area of the North Pacific Ocean.

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the rain-forming processes as well.

Examination of particle samples taken from aircraft in the steam clouds reveals the presence of enormous numbers of small hygroscopic droplets — several hundred times more than found in the sea atmosphere under strong wind conditions. These are probably sea salt, since drying reveals crystalline structures, many of which contain the cubic crystals characteristic of sodium chloride, the major salt of the sea.

Thus, the ideas of the effectiveness of lava in producing salt nuclei upon contact with the sea seem confirmed. Study of this phenomenon and these results will continue, since they present new facts of significance to add to those already known about the role of volcanism in meteorological processes.

*The quantity of heat in a given volume of lava is about equal to that required to vaporize an equal volume of sea water.

Associates' News

THE EIGHTH ANNUAL DINNER MEETING was held on Thursday March 3 at the American Museum of Natural History in New York. Our guest speaker was Commandant Jacques-Yves Cousteau. Braving the snow storm some 175 brave associates and guests attended.

New Corporate Associates

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Among the many representatives of Corporate Associates visiting Woods Hole was a film group from the Grumman Aircraft Engineering Company. The Company is preparing a motion picture on Anti-Submarine Warfare.

READER'S GUIDE

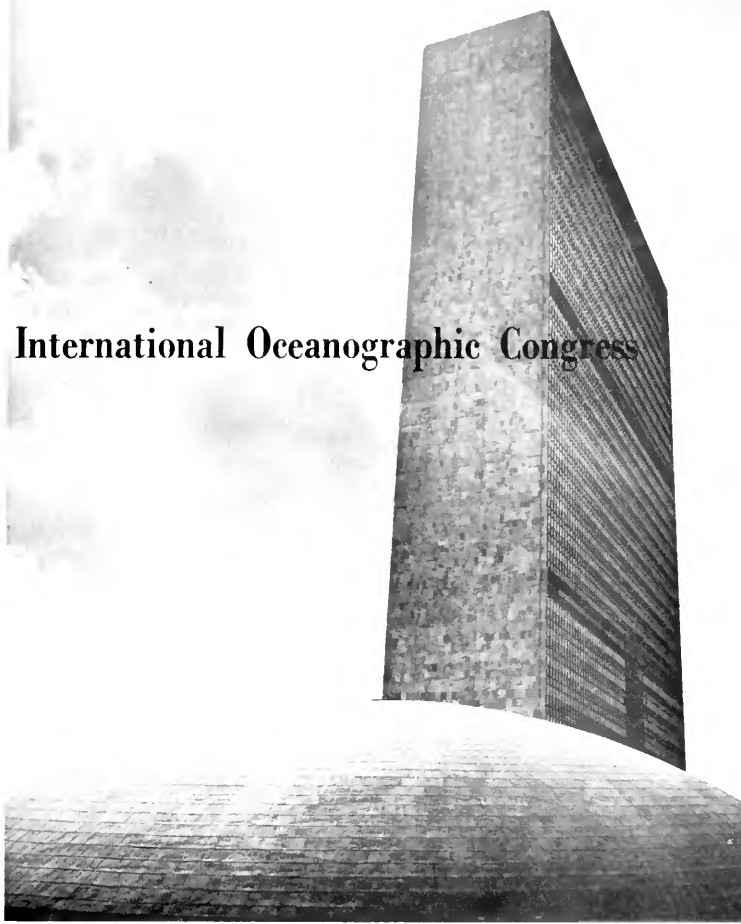
An eight page bibliography: "A reader's guide to oceanography" is available to Associates and their friends. The pamphlet lists many easily available popular articles and books, as well as technical publications.

INDUSTRIAL COURSE

The second course for industry: "Environmental factors influencing the performance of naval weapon systems", was held at the Institution in December. Fifty-four representatives from forty corporations and industries took part in the course. The meetings were closed with a speech by Vice Admiral John T. Hayward, U. S. Navy, Deputy Chief of Naval Operations (development).

Impressions of the

International Oceanographic Congress



Henry Stommel:

It is with diffidence that I have accepted the invitation of the Editor of *Oceanus* to comment upon the Oceanographic Congress at the United Nations in New York. The meetings themselves were very stimulating, and the program well organized. Everyone who attended expressed admiration of Dr. Mary Sears' arrangement of the Congress. And it was certainly impressive to convene in the handsome auditoria — especially the Great Plenary Hall — a marked contrast to the uncomfortably hot streets and stuffy Hotel Commodore.

Two weeks is a long time to sit and listen to talks. Fortunately, the subjects were varied and covered a wide range of topics. The idea of having "feature presentations", or invited formal lectures, in the morning, followed by various shorter papers and round tables in the afternoon was successful in producing variety and maintaining interest. Since it is difficult to get large groups to discuss any connected theme coherently, the round-tables in the afternoon were more in the nature of "selected short subjects" than genuine discussions of a central

theme. But this was probably inevitable, and I think no convenor could have managed a genuine discussion under such circumstances, the interests of the individual participants being what they were.

One of the pleasant consequences of the prolonged two-week period was that there was plenty of time for delegates to renew personal acquaintance with old friends.

Also, there was enough time for everyone to fraternize with Russian colleagues from the splendid research vessel *Michael Lomonosov*. During the first day, I had the impression that we all felt a little awkward but that within a few days the tension eased, and we felt free to discuss most subjects (except politics and Pasternak). At the meetings, some American oceanographers questioned Russian speakers in a slightly hostile manner — unbecoming of hosts and embarrassing to the majority. In some cases, the pertinent answers were already published in the Soviet literature. Indeed, most speakers of all countries essentially amplified previously published researches; even the very important current measurements by Swallow and Worthington in the Atlantic and by Knauss in the Pacific had already been announced in *Nature* magazine. No one of the 1000 odd participants had a fundamentally startling fact or mint-new idea to announce. Though thrills were few, there was a feeling of impressive progress on all fronts. And even more stimulating was the very wide range of topics covered — and the excellent summary lectures — so that many of us felt that we were being re-educated in our own science and our horizons — narrowed by years of specialization — opened up again.

Albatross Award

One important event which was apparently not widely publicized nor a strictly official part of the Congress was the presentation of the American Miscellaneous Society's Albatross Award to Prof. Walter H. Munk late one night. The award signifies recognition of high attainment by an American in the field of oceanography. Unlike the Nobel Prize, the Albatross Award does not rely for its renown upon a large sum of money. Indeed there is no money at all. However, the recipient has the satisfaction of owning for one year a handsome stuffed and mounted Albatross — which he can display in his laboratory or at home. It was announced that the next presentation will be in Helsinki in July 1960, at which time the possession of the Albatross will pass to the next recipient. Of course the distinction of being chosen Albatross Laureate far outweighs the inconvenience of transporting this rather large bird across the ocean by ship, in airplanes, and through various customs. And though it is inevitable that the buffeting of so much travel will, in time, somewhat dim the splendor of the plumage, the accumulated lore and history of this Grand Old Bird will make it the most coveted distinction in our profession.

Dr. P. Tchernia:

In your letter you asked me to give you some of my feelings on the congress and, more precisely, statements which may be useful for future planning of another International Congress in five or ten years.

First of all do not take my statements as a criticism of our last meet-

ing. It was for all the people I know a wonderful achievement, and we are deeply thankful to those, or more precisely to her (Miss Mary Sears) who had the idea and took the tremendous charge upon themselves to prepare such a meeting.

It was necessary I think for the first International Oceanographic Congress to have a mass success, and you got it, but now it appears that there lies a danger.

There were too many papers on too many subjects. It happened frequently in the afternoon seminars that the time allowed to each speaker had to be shortened and that there was not enough time or even no time at all for discussion; however, discussion is the most interesting and useful thing that may take place in such meetings.

The Congress lasted a little too long, there was a feeling of weariness in the last days, and we were less and less numerous in the morning and afternoon sessions.

Too many people in the morning and afternoon sessions read in a monotonous voice too long and stuffy papers which obviously were written for publication and not drafted as a speech should be. Happily, there were some very agreeable exceptions such as, for example, the enthralling speech of W. Munk or Sir Francis Bullard's.

In order to interest as many people as possible, we have, next time, to keep the "general congress formula" but maybe one or two days could be reserved to hold symposia on more limited and definite subjects which would be of interest to specialists in different fields of oceanography. It seems to me that discussion between biologists and physicists by

example were too few during our last meetings and none appears to have led to definite statements or conclusions for the audience to treasure in leaving their seats!

Nothing appears to have been provided as interesting for the future of our science as was for instance the Conference on Physical and Chemical Properties of Sea Water held at Easton in September 1958 (*Publication No. 600, U. S. National Academy of Sciences*).

Maybe it is difficult to find subjects common to physicists and biologists and geologists and perhaps more difficult to have such interesting discussions, even with the help of immediate translations, when the people attending are unable to understand the same language fully and to speak it fluently.

We have also to be aware of the fact that as time goes on, we have more and more national and international committees and meetings (A.I.O.P — S.C.O.R. — I.A.C.O.M.S. — I.C.E.S., etc.) which are taking up more and more of our time, a time which sometimes would be better used in working at sea or in the laboratory! So I do not think it is necessary to have another International Congress before five years hence.



Unations



Spooner

The South Room — From left: Richard S. Edwards, Richard G. Leahy, F. C. Fuglister, A. H. Woodcock and Ray Stevens

SOUTH ROOM

WOODS HOLE OCEANOGRAPHIC INSTITUTION HEADQUARTERS

This sign, strategically placed at the lobby entrance of the Hotel Commodore, served for the two weeks of the I.O.C. as guide to the social nerve center of the conference.

The headquarters room was planned to provide bulletin board information, mail box, Woods Hole information and visitors reservations, and a place to sit, chat, and drink coffee. These are the "bare-bones" facts. It became a haven for scientists looking for their colleagues, their wives and their misplaced possessions; a cool(!) spot in which to sit and read the paper; a meeting place before, during, and after sessions of the Congress; a center of information on how to get to Woods Hole, — also Lamont, The Zoo, the

ships on display, the shuttle subway, and numerous other places. One could sit quietly, alone, or join discussion groups; one could review the paper to be presented at a meeting, or borrow a typewriter (sometimes complete with typist) to reorganize same or make extra copies for translators.

These were the daytime activities, and they quite often carried over until well into the nighttime.

South Room, with its two Woods Hole representatives, played a prominent part in the stimulating scientific atmosphere. It will be warmly remembered by all who used its seemingly numberless services, from unlimited hot coffee and the Institution's airplane service to Woods Hole to the opportunity to meet and chat with a majority of the scientists.

Our thanks are due to Constance W. Chadwick and Eloise M. Soderland for their many tireless hours.

Dr. G. E. R. Deacon:

One of the most obvious features of the Congress was its evidence of rapidly expanding interest of geologists in the ocean. Biology seemed to have less new drive and except for the Soviet expeditions it did not venture so much into the deep ocean. Many physical problems were discussed in growingly precise terms and, almost for the first time, observations had been made to check theories. The purpose of the conference was to get to know and help each other, and although it was still rather difficult for an active member of one group to learn enough about the others, much progress was made. Much unpublished work was discussed and ideas freely exchanged.

Careful studies of the stratigraphy, chemistry, biology, physics and nuclear relationships in the sediments are providing a sounder basis for hypotheses about previous climates, but there is still evidence that paleobiogeographers show less hesitation in making positive deductions about ancient seas than those who deal with living material express in making tentative conclusions about regional relationships and circulation patterns under present conditions. There was plenty of evidence of active movements near the ocean floor, and some insistence on the probable effects of working of the sediments and weathering of the rocks. We do not know whether continental slopes are rubbish tips or weathered rock. It was maintained that more careful studies should be made of rock samples taken in dredges to see whether they might after all be locally derived. We were told not to give them to museums but to find someone to work on them:

they should be dated whenever possible.

The Soviet papers on zonation and biogeography of the Pacific and Antarctic oceans were an important part of the congress. In one or two instances it seemed as if the language difficulty might have prevented study of previous work. There was also much interest in the fauna of the deep trenches. Insistence on an exclusive name for some special approach to the subject seemed perhaps to lessen general interest in it.

There seemed to be much progress in the study of wind drag over the sea surface that it might now be more profitable to try to use what we have learned from wind profiles close to the sea surface to tackle larger-scale problems in the water and in the winds well above the surface. Measurements with the thermistor chain and other methods which allow more detailed and continuous observation are revolutionizing our ideas about the regularity and variability of density and velocity structure in the ocean. One of the most striking contributions was fresh news of the Cromwell current below the equator in the Pacific Ocean, which leaves its mark on the bottom sediments as well as the thermocline. Geologists would like to use shallow boreholes to see whether the equator has moved, and everyone wants to work below the equator in the other oceans. Professor Munk gave a fine account of the spectrum of changes of the sea surface from waves to variations in mean sea level. In the discussion of a Soviet paper on turbulent diffusion, Dr. Stommel made the charming aside that mention of the work of L. F. Richardson in that field provided the only opportunity that might arise in the precincts of the

Congress

United Nations of mentioning his mathematical treatment of foreign policy and disarmament.

For everyone except the organizers the congress was a holiday, but it was also a unique opportunity to form new ideas, correct old ones and think what to do next, and I am sure that many people did this. The overseas visitors carried away very delightful memories of kindness and hospitality. Dr. Sears, the organizing committee and their helpers did much to promote better understanding between scientists of all countries as well as to advance interest and research in the oceans.

William S. von Arx:

In this day of numberless symposia, conferences and international gatherings, a congress scheduled to last for two whole weeks is forbidding. I confess I had well-formed plans to register on the first day, sense the mood of the congress, and then retreat until it came time to give my paper. But the fact is: I stayed through the whole two weeks of the International Oceanographic Congress.

Perhaps the most important single contribution to the congress was made by the atmosphere of the United Nations. An assembly of 1200 people, even if all are of a sympathetic turn of mind, is an overwhelming phenomenon. In muggy weather it becomes unthinkable. But in the quiet and spacious surroundings of the UN the gross bulk of so many people is trifling and the little angles of the corridors and comfortably furnished recesses here and there attract small groups. These little groups

developed with time a certain degree of topical homogeneity so that it was often possible to meet most of the prominent workers in a given field by merely recognizing one of the number as a friend. It is sometimes rather astonishing to see what the authors of certain famous papers look like.

In discussions of the congress, some mention was made of the fact that no strikingly new material was presented. I believe this is more a result of the intensity of communication that exists today than any modern tendency toward intellectual decadence. Were almost anyone to closet himself for a decade before showing his work to the world, he would improve his chances of having an astonishing contribution to make. But as things are now, most of the oceanographic community is aware of who is doing what and with how much success because of the relatively frequent encounters we have with one another in the various national and international meetings and symposia. The value of the I.O.C. in contrast to this was the ease with which it was possible to pick up some inkling of the kinds of effort being made in fields outside the scope of one's major interest.

This broadening influence was also marked in the appearance of our Russian colleagues, and of the scattering of others with whom we have no convenient means for communication. Simultaneous translation is hardly a dream of modern efficiency but it is reassuring to learn—through the agency of one who doesn't even know the subject—that all mankind finds the ocean a difficult object of study and that we are not alone in having much to learn.



Hahn

ATLANTIS REVISITED

By Dana Densmore.

Two weeks in New York were, from the standpoint of the "Atlantis" hosts, extremely interesting, if arduous. "Atlantis" is cramped and many-levelled — five people in any one area constitute a mob — and the heat-humidity ratio the first week was wicked. Just astern lay "Chain", towering over us, crammed with seismic, acoustic and hydrographic gear, underwater cameras, dredges and corers. Yet, day after day came a steady trickle of scientists from all over the world to visit the old ketch. Most had worked from data gathered by her in twenty-eight years of sea-going, many had boarded her in the ports of their countries, and some, who had cruised in her years before, lighted on Hans Cook, the Chief, to yarn about officers and crewmen long gone, sea-miles long since spun out under her counter. The fiction of visiting hours was ignored. When people came, they were shown the ship, and when traffic became heavy,

mates, seamen, and Woods Hole personnel stopping by to say "hello" all helped out; sometimes in French or German. They came, nearly a thousand of them from twenty-seven different countries, to see "Atlantis", fine in fresh paint and cleared decks unlike her usual rust-streaked working rig, decks cluttered like a Cape Verde packet.

Mathematicians, chemists, biologists, geologists, electronics experts, those who loved to sail and those who had never been to sea, students, wives and children passed through Pier 34 to visit the Wood's Hole ships, the "Gibbs" and the "Lomonosov". All had questions — Lord! the questions — and a remarkable agility on vertical ladders regardless of age, sex or high heels. Friends appeared from Brazil and Argentina, from South Africa, Egypt, Scandinavia and every European country. "Is it true?" they wanted to know. "Is the "Atlantis" retiring?" Not for

Congress

a while, we said; there's life in the old girl yet.

There was considerable coming and going between "Atlantis" and her Russian neighbor which, I think, left a pleasant taste in everyone's mouth. They had by far the largest ship at the Congress, had nothing for which to apologize on that score, and were rather sociable, all things considered. When their scientific people from the "Vityaz" on the West Coast descended on us one evening, hardly a rivet was left unexamined, and there was nearly an oceanographic crisis over a mysterious, compact instrument in the darkroom — which turned out to be

a plastic ice-tray.

Each ship mounted an official party; the "Lomonosov's" had more space, caviar and dignity, but the "Atlantis" was perhaps more conducive to relaxation of international tensions. A high point, ship-to-ship, came one night when the Russians all gathered on their afterdeck under the soaring lights of New York to see WHOI's film "Science of the Sea", topped off with Jan Hahn's movies of "Aries" coming up from Bermuda in a Spring gale.

"All right", they said afterwards, shaking their heads, "But you're either crazy or heroes to work at sea in those little ships!"



The Daily Shuttle from Woods Hole to New York by our R4D was used by many visitors and staff members

David H. Frantz Jr.:

It seemed too bad that there was no opportunity at the Congress for any formal discussion of instrumentation as such; to be sure, after-hours' conversations did deal extensively with this subject but I feel that even though the emphasis was quite rightly on the purely scientific aspects of oceanography, there could well have been at least one session devoted to instrumentation. While such a session might not be of general interest to oceanographers, as long as descriptive oceanography is important, so long will the means of acquiring the data be important, and cross-fertilization of ideas is just as vital to the instrument engineer as it is to the oceanographer.

◀ *Dr. William S. Von Arx*

Gifts and Grants

The following grants were received:

Esso Education Foundation

for: 1959-60 education program \$ 3,500

National Science Foundation

for: "Environmental Physiology of Marine Plankton Algae",
under the direction of Dr. John H. Ryther..... \$53,300

"Nitrogen Cycle in the Sea", under the direction of
Dr. Bostwick H. Ketchum..... \$41,600

"Energy Requirements of Benthic Marine Communities",
under the direction of Dr. John W. Kanwisher..... \$45,600

"Composition of Ocean Deep Scattering Layers",
under the direction of Dr. Richard H. Backus..... \$80,600

"Feeding Metabolism and Growth of Zooplankton",
under the direction of Dr. George L. Clarke..... \$41,600

"Geophysical Survey of North Rim, Puerto Rico
Trench", under the direction of Drs. J. B. Hersey
and Richard G. Leahy \$53,700

"Summer Program of Theoretical Studies in
Geophysical Fluid Dynamics", under the direction
of Dr. Willem V. R. Malkus..... \$11,500

"Productivity of the Benthos of Coastal Waters",
under the direction of Dr. Gordon A. Riley..... \$14,500

"Environmental Influences on Reproductive Cycles of
Benthic Marine Invertebrates", under the direction
of Mr. Harry J. Turner \$34,100

A 29 foot Egg Harbor type sportfishing boat was given to the Institution by a Falmouth summer resident. The twin-engine, fully equipped boat may be retained or sold by the Institution. The donor stated that he "was pleased to aid such a worthwhile activity".

Currents and Tides

Nature has a way of playing tricks on those who wish to understand it. Mr. A. H. Woodcock flew to Hawaii, but as soon as he arrived the volcano stopped "blowing its top". Dr. Richard Backus flew to the Virgin Islands to spend two weeks of shark catching in the "shark infested Caribbean" and did not see a single one.

Some 35 scientists from 18 countries visited Woods Hole after the International Oceanographic Congress. The Soviet scientists were not allowed to come, as Woods Hole, in common with Brooklyn, is to the east of the line over which Russians may not trespass.

Dr. G. Veronis, Research Associate in Mathematics, is at the International Meteorological Institute at Stockholm under a Guggenheim Fellowship. Dr. Alan J. Faller, Research Associate in Meteorology, will depart shortly for a year stay at the same Institute.

Dr. J. M. Moulton, Associate in Marine Biology, has been awarded a Fulbright scholarship. He is Acting Chairman of the Bowdoin College Department of Biology. Dr. Moulton will spend nine months at the University of Queensland, Australia to study the acoustical behavior of marine animals. An article on his work appeared in 'Oceanus', Vol. V, nos. 1 and 2, 1956-57.

Dr. Bostwick H. Ketchum, Senior Oceanographer, has been appointed Lecturer in Biological Oceanography at Harvard University. Dr. Ketchum is an authority on the mineral nutrition of marine plants and animals. He is the tenth staff member holding a Harvard appointment.

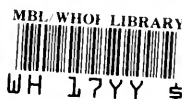
Films.

The United Nations TV program "U. N. Review" filmed two 15 minute shows at the Institution in January. The shows were shown on some 200 educational TV stations in the U.S.

A series of ten motion pictures on the earth sciences will be released in the near future by the National Academy of Sciences — National Research Council. The films were produced by Lothar Wolfe of Louis de Rochemont Associates. The oceanography film in this series contains many scenes made at sea by Oceanus' editor.

We also co-operated in the making of two hourly shows for CBS "Conquest" and are working on an hour long show for NBC.

The next issues of Oceanus will again be published at quarterly intervals. The editor has divested himself of some of his Public Information duties to be able to provide more time to Oceanus.



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