

produce whistling and can be made to click-resonate briefly during whistling as well as during nonwhistling periods. Because some of the sacs change size and shape through movements of muscles in their walls, the frequencies of the whistle or of the click-excited resonances, or of both, change. The fixed cavities emit their characteristic click-excited frequencies as the coupling and the internal air path are varied. Records on the sonograph (Fig. 4) show these fixed bands better than they can be seen from Figs. 2 and 3. Figure 3 shows the variable components at middle frequencies (less than 22 and more than 2 kcy/sec) better than the sonograph does. During a rapid train of clicks such changes can be detected on the plot of frequency versus time, as shown in Fig. 3.

Analyses of the sounds produced by a pair of severely restrained animals suggest that the whistles are a form of communication, just as some of the slow trains of clicks may be. Rapid trains of clicks (squawks, quacks, and so on) occur most frequently as a result of human intervention, during intense emotional situations such as in courtship and violent play, and during

electrical brain stimulation in reward (start) systems but not in punishment (stop) systems (7). Thus it appears that trains of clicks express (at least) intense pleasure in various forms, or possibly anger (at times).

That the dolphin has precise and accurate control of these emissions is no longer in doubt. These sounds are classified as vocalizations used for communication. What information is communicated is yet to be determined.

Summary

The sonic emissions of the bottlenose dolphin are remarkably complex. Three classes of these sounds are discussed and presented graphically. The sine-type wave whistles range in frequency from about 4000 to 18,000 cycles per second. The clicks contain components of this same frequency range plus some components of higher frequencies. Complex waves of high amplitude and of many frequencies are also emitted in water or in air. Situations in which sounds of one or more of these classes can be elicited simultaneously from one and from two re-

strained animals are described. The necessity for, and occurrence of, creakings for purpose of navigation, ranging, and recognition (sonar) have been eliminated in the experiments under discussion.

References and Notes

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5. The work under discussion is supported by a contract [NONR 2935 (00)] between the Communication Research Institute of St. Thomas and the Office of Naval Research.
6. We wish to thank J. C. Steinburg and Roger Dann of the University of Miami for the use of an AN/PQM hydrophone set; Herbert Gentry (Precision Instrument Co.) for the use of a tape recorder; William Murphy (Cordis, Inc.) for the use of a Massa graphic recorder; and F. G. Walton Smith (Marine Laboratory, University of Miami) for past use of laboratory space. The frequency analyzer used in this study was devised by one of us (J.C.L.). We wish to thank K. N. Stevens (Massachusetts Institute of Technology) for his help and for the use of a sonograph (Kay Electric Co., Pinebrook, N.J.). The mirror galvanometer oscillograph is a Minneapolis-Honeywell Heiland Model 906-B with M-8000 galvanometers. We also wish to thank William Rolleston and F. G. Wood, Jr., for supplying dolphins in the early stages of the work.
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Science in the News

In the Senate: The Debate on Education; The Internal Security Committee Studies Disarmament

The Senate has been involved in an elaborate debate over the school bill since Tuesday of last week (16 May) and will probably still be at it when this appears. Senator Morse, the floor manager for the bill, made it clear that he felt he had enough votes to defeat any amendment opposed by the Administration. If anything, this encouraged the amenders, who could then propose whatever came to mind without having to worry about its consequences, since

there was no chance of its being adopted.

Senator Blakely, a very conservative Texas Democrat, suggested simply rebating to each state 5 percent of all the income taxes collected within each state, a proposal that would cost the federal government about \$3 billion a year, something over 3 times as much as the Administration bill. Senator Cotton, a conservative Republican of New Hampshire, suggested granting the states 3 cents for each pack of cigarettes sold within the state. Senator Proxmire, a liberal Democrat of Wisconsin, wanted to eliminate the words "federal grants"

from the bill and substitute "income tax sharing." Senator Bush, of Connecticut, offered a Powell-type amendment, prohibiting aid to segregated schools, and Senator Thurmond, of South Carolina, offered a Powell-type amendment in reverse, prohibiting the Administration from holding up aid to segregated schools. Cooper, of Kentucky, and Javits, of New York, liberal Republicans, asked for changes in the formula for allocating the grants among the richer and poorer states.

The first week of the debate was occupied with these proposals, all of which were easily defeated, and of which only the Cooper-Javits amendment seemed to be taken very seriously. Senator Goldwater, who voted against loans for private schools last year, then proposed loans for private schools. Senator Talmadge offered a more generally worded version of Senator Thurmond's counter-Powell amendment. Senator Dirksen, with the martyr-like air that has been coming over him lately, proposed cutting the bill back to construction grants only, although he assured the Senate

that he knew perfectly well the suggestion would be declined.

In due course, these, and various other proposals, were expected to be voted down; the bill would pass; and attention would shift back to the House, where the real battle would be fought, with the outcome very much in doubt. Last year, the Senate passed an aid-to-education bill substantially the same as the one being debated now, with nothing like the protracted debate that is going on this year. The entire issue was disposed of in just over 2 days of debate. What is causing the long struggle this year is the knowledge that this may well be the last stand of the opponents of federal aid to education. Last year everyone knew that the only bill that stood a fair chance of passing the House, and any chance of avoiding a Presidential veto, would be a bill limited to a temporary program of construction assistance to meet the classroom shortage.

Technically, the current program is also temporary: it will run for only 3 years. But since it includes grants for teachers' salaries, and so is designed to meet a permanent need, rather than a temporary need like the classroom shortage, the program, for all practical purposes, involves a permanent recognition that the federal government has a legitimate role to play in the support of the public schools. The extent of the role will be a matter of continuing debate, but if the Administration bill becomes law it is doubtful that the basic principle of federal aid will ever again be seriously challenged.

Pugwash Conferences

Elsewhere in the Senate, the staff of the Internal Security Subcommittee, the Senate equivalent of the Un-American Activities Committee, has completed a study of the Pugwash conferences on disarmament. The study will be made public this Sunday.

The conferences were begun in 1957 under the sponsorship of Cyrus Eaton, the controversial Cleveland industrialist, and take their name from the location of Eaton's summer home in Nova Scotia, where the first of the conferences was held.

The most recent of the conferences, which consist of informal discussions of disarmament, primarily among American and Russian scientists, was held in Moscow last December. The next is scheduled for Aspen, Colorado, in mid-September.

The makeup of the conferences has changed over the years. The scientists involved now consist almost entirely of men close to the policy-making levels of their nations, and the meetings have taken on a semiofficial character. The Soviet delegation last December included all the members of the presidium of the Academy of the Sciences and two of the leading military theorists. The American delegation included Jerome Wiesner, now Special Assistant to the President for Science and Technology, and W. W. Rostow, now Deputy Assistant to the President for National Security Affairs, and a number of other nationally known figures, including members of the President's Science Advisory Committee. Cyrus Eaton no longer has any connection with the conferences, which have been renamed the Conference on Science and World Affairs.

The Senate Internal Security Subcommittee is chaired by Senator Eastland of Mississippi, who is also chairman of the full Senate Judiciary Committee. Most of the day-to-day work of the subcommittee is under the supervision of Senator Dodd, of Connecticut, who has served as acting chairman at most recent hearings. Senator Dodd has been one of the most outspoken critics of the nuclear test ban negotiations and, last year, of the treaty demilitarizing and internationalizing the continent of Antarctica.

Dodd has been scrupulous in avoiding the sort of broad charges that made Senator McCarthy such a controversial figure. He and the committee have been careful to avoid suggesting that the groups or individuals investigated are in any way disloyal. Where groups favoring disarmament have been concerned he has seen his role as exposing the extent to which communists and communist sympathizers have been active in the movements, which he feels is both a service to the groups involved, in helping them to keep communist influence out of their movements, and a service to the country in making clear the extent to which loyal, well-meaning citizens may be unknowingly paralleling the Soviet propaganda line.

Although the committee has been scrupulous about making charges of disloyalty, it has been considerably less scrupulous about giving a hearing to all sides of a question. It published the testimony, taken in closed hearings, of the two ambassadors to Cuba preceding the fall of Batista, along with a report

accepting at face value their charges that Cuba was pretty much handed over to Castro and the communists through the failure of underlings in the State Department to listen to the ambassadors' reports of what was going on. It did not see fit to hear the men accused of selling out Cuba.

The study of the Pugwash conferences is necessarily the most delicate the committee has handled, involving as it does two of the President's closest advisers and a number of other scientists regularly called on to advise the government on technical questions affecting major policy decisions. The report, consequently, is expected to be doubly careful about avoiding questioning the loyalty of the people who attend the conferences. On the other hand, it is expected to include an extensive review of the activities of such figures as Eaton and Bertrand Russell, who have been involved at one stage or another in the conferences, and who are susceptible to charges of political naivete; to stress the fact that although the Americans have been participating as private individuals, there is no such thing as a private individual in this sense in Russia, and that the participation of Soviet scientists necessarily means that the Soviet government finds the conference in its interest; and to provide documentation for the view that the Russians have been using the conferences as part of their propaganda "peace offensive."

The report is based mainly on the early conferences. The most recent conference, in December 1960, took place while the report was in preparation, and will be treated separately. But the report apparently will not attach much significance to the dropping of Eaton's sponsorship and the changes in the makeup of the delegations.

The report is expected to stress such points as that many of the Soviet delegates were members of the Communist Party; that the American delegates, in the view of the committee, were politically unsophisticated; that the Soviet delegation used the conferences to try to indoctrinate the Americans with their point of view; and that the proceedings of the conferences, although not made public, were made available to Soviet Premier Khrushchev.

Many of the charges, of course, would apply to Soviet-American contacts generally. The verbatim transcript of the Kennedy-Khrushchev meeting will be available to Premier Khrush-

shchev; the intention of Premier Khrushchev will be to try to impress the Soviet point of view on the President; and Khrushchev is well known to be a member of the Communist Party.

The criticisms, then, only take on significance on the assumption that the American scientists are babes in the woods dealing with the shrewdly calculating Russians. The report apparently will suggest that a major Soviet interest in the conferences is to weaken the will of American scientists to resist Soviet aggression, and possibly to seduce the scientists, who, the report will apparently imply, are especially susceptible to such seduction, to actual subversion.

The report apparently will avoid even mentioning the connections of members of the American delegation with their government, and thus will avoid explicitly raising such questions as whether the President himself was unwittingly aiding the communists when, as President elect, he permitted Jerome Wiesner and W. W. Rostow, two of his closest advisers, to attend the conference, or whether the President, lacking the subcommittee's understanding of the nature of the communist conspiracy, has been looking for advice from men who are easily taken in by the Russians. But it is not difficult to guess that others will not be slow in picking up where the subcommittee leaves off, and the question then arises: If the President has chosen such men as advisers on the extremely delicate matter of disarmament, whether other presidential advisers are not equally open to question.

Other policies quickly come to mind as almost equally unpalatable to a good many people as taking seriously the Russians' claims of interest in disarmament: the view, for example, that American foreign aid commitments should be conditioned on a nation's willingness to go through with social and political reforms more than on its willingness to adhere to pro-American military alliances.

Thus, although the report apparently will concentrate its fire on such easy targets as Cyrus Eaton and Bertrand Russell, its implications, by no very indirect route, lead to the highest levels of the Administration, and it is difficult to see how the view reflected in the report can avoid, sooner or later, requiring an answer by anyone of lesser stature than the President himself—H.M.

Announcements

A **Russian drug index**, containing a comprehensive listing of drugs currently in use in the Soviet Union for therapeutical and experimental purposes, has been published by the National Library of Medicine. The index (PHS Publication No. 814) is designed to "overcome obstacles to understanding Russian scientific literature presented by the language barriers, since Russian drug names often have no relation to the generally accepted names used for medical purposes in other parts of the world." (Superintendent of Documents, GPO, Washington 25, D.C. \$.60)

Meetings

The Inter-American Conference on **mathematical education**, under the direction of the International Commission on Mathematical Education and the Organization of American States, will be held in Bogotá, Colombia from 4 to 9 December. The conference will cover the present status of mathematical education at the secondary and university levels in each of the countries, the needs for improved mathematical instruction, and procedures each country can initiate to progress in mathematics, especially in preparing teachers and research workers. Attendance will be limited to invited participants and persons sent as delegates from their governments, scientific organizations, and sponsoring bodies. The conference was made possible by grants from the Ford Foundation, UNESCO, OAS, and the Colombia Government.

An international symposium on **microchemical techniques**, conducted by Pennsylvania State University's College of Chemistry and Physics and Continuing Education, will be held from 13 to 18 August. Subjects for technical sessions will include organic and inorganic chemistry, organic functional groups, microscopy, microsynthesis, microphysical methods, instrumentation, titrimetry, microbiology, nucleonic methods, trace analysis, and general topics. (Pennsylvania State University, University Park.)

The 7th Inter-American Congress of Psychology will be held in Monterrey, Mexico, from 19 to 23 December. Papers on the understanding of human

behavior in cross-cultural situations are being solicited from members of any of the **behavioral sciences**. The congress will be organized under the main headings of personality and culture, experimental psychology, applied psychology (educational and industrial), and psychology and mental health. It is being held under the joint auspices of the Instituto Tecnológico y de Estudios Superiores de Monterrey, the Institute of Latin American Studies of the University of Texas, and the Centro de Investigaciones Sociales, with headquarters in Monterrey. Abstracts of papers must be submitted in duplicate *prior to 1 August*. (Centro de Investigaciones Sociales, Box 7553, University of Texas, Austin 12)

Courses

A 2-week course on the application of **nuclear methods to oceanography** and related fields will be conducted by the Oak Ridge Institute of Nuclear Studies 6–17 November. The course, conducted by the institute for the U.S. Atomic Energy Commission, will be limited to 20 participants. Deadline for return of applications is *1 August*. (Ralph T. Overman, ORINS, P.O. Box 117, Oak Ridge, Tenn.)

An extensive research training program in **obstetrics and gynecology**, established with a grant from the Public Health Service, will begin on 1 July at the University of Oregon Medical School. The program, designed for training of undergraduate, graduate, and postgraduate students, will emphasize basic and applied cancer research. Student trainees will be provided with a 3-year stipend, and will receive a master's degree as well as a doctor of medicine degree on completion of the program. Postgraduate trainees during a 4-year residency program will receive salaries in excess of the regular resident stipends. Postresidency trainees will receive stipends comparable with those of beginning private practice. (University of Oregon Medical School, Portland 1)

The American Oil Chemists' Society is offering a short course on **newer lipid analyses** for organic and physical chemists and biochemists, to be held at the University of Rochester 24–26 July. The closing date for registration is *13 July*. (American Oil Chemists' Society, 35 E. Wacker Dr., Chicago 1)