

a while listeners find themselves speaking more rapidly and sometimes even feeling a bit rushed in other ways besides speech. The reverse is true for speech expansion, in which voices are greatly slowed down.

This slowing-down feeling is actually accompanied by a slowing-down of metabolism, said Dr. Gates, which could be used to produce a helpfully relaxed condition in people suffering from heart ailments.

Mental illness, too, could benefit from speech compression, Dr. Gates said. Instructions or therapeutic commentaries could be given in compressed form with all the normal inflections, yet too rapidly for the patient's "usual mental barriers" to form.

The Navy has a problem which could easily be solved by the compressor, since the device enables the speed and pitch of a voice to be varied independently of each other. Deep-sea aquanauts who breathe high-pressure atmospheres of oxygen and helium suffer a pronounced "Donald Duck effect" which can sometimes make speech comparatively useless. An instant playback compressor would lower the pitch of their voices while maintaining normal speed.

The Navy is investigating this problem with several speech compressors of its own.

**Normal speed** for humans is actually less efficient than that of many animals, said Dr. Gates. "Research with birds and recordings of dolphins substantially slowed down give evidence that man, comparatively speaking, is operating in low gear," he said.

The sounds of such creatures, who have been in prolonged contact with human beings have been slowed and broken down and found to contain traces of human words, Dr. Gates said. Although it is still "cloud nine," he said, there is the possibility that speech compression could actually lead to communication with these animals.

The key to the compressor's operation is the fact that while the speed of a voice being played back on a tape recorder depends solely on the speed of the tape, the pitch of the voice depends on the speed at which the tape passes across the playback head of the machine. By spinning the playback head in the direction of tape travel, the relative speed of the tape across the head is reduced, thereby lowering the pitch. If the head is rotated in the opposite direction from tape travel, the pitch of the voice during playback increases.

## A Crack in 'Able'

One of the many organizations that keep watch over the nation's burgeon-

ing space program is the National Academy of Science's committee on "Potential Contamination and Interference from Satellites." It was created several years ago to study Project West Ford, in which hundreds of millions of copper needles were orbited in an attempt to establish a jam-free communications network. Astronomers at the time expressed fears, since shown to be unfounded, that the needles would interfere with their observations.

**A few months ago**, the astronomers were up in arms again about another project that they thought would endanger their seeing, and again the committee stepped in to investigate. Their concern arose when the National Aeronautics and Space Administration collaborated with the Defense Department to spend almost \$500,000 on studies of a gigantic mirror (SN: 1/14), 2,000 feet across, to be assembled in a synchronous orbit 22,300 miles above the earth, where it would literally turn night into day by beaming the sun's rays down to selected spots on earth—such as Vietnam.

What concerned the astronomers was the chance that the mirror's great light would spoil their observations over a large piece of the sky, especially if its attitude control system malfunctioned, leaving it free to shine anywhere it wanted.

By all indications, however, the mirror has been shattered before it was ever built. And the scientists had little to do with it.

Another concern was that the light would disturb the rhythms of plant and animal life.

**It's simply** too impractical and too expensive, according to Dr. John W. Findlay, head of the Academy committee and director of the National Radio Astronomy Observatory in Charlottesville, Va. "It's obviously a Saturn V operation," he said, referring to the giant booster the inclusion of which would make the project both a large and costly venture. Besides, Dr. Findlay added, "there isn't any real demand."

NASA has its own scientific advisory committee for the project, headed by Dr. Charles Townes of MIT, but Dr. Townes has already stated that he expected to rely on the Academy committee's recommendations. These will be delivered this week in a report to the Academy's Space Science Board.

A NASA official, questioned about the future of the project, said, "I doubt whether it will be pursued." Neither NASA nor DOD is ready to officially kill the plan, he said, "but for the time being no further work will be done on it."

"Well," said Dr. Findlay, "I'm glad to hear them say it."

## Engineers Find Ocean Formidable

"A unique and generally harsh environment as compared to atmospheric air for the operation of machinery" sounds like a pretty good description of space, perhaps an engineer's warning from a decade ago. Yet the warning was heard last week, and is becoming the concern of more and more scientists and engineers involved not with space, but with the world's oceans.

There was fair evidence—at the New York meeting of the Institute of Electrical and Electronics Engineers—that there are as many unsolved technical problems facing aquanauts as faced astronauts a decade ago.

As in space, the most critical is the support of life. Although the amount of oxygen in the breathing medium can safely vary over 80 percent at sea level, according to Navy deep-sea engineer David Harrell, anything more than a one percent variation is "unacceptable" at a depth of 1,000 feet.

The easiest solution is to use pre-mixed gas in an "open circuit" system such as a conventional diving lung, in which the exhaled gas passes out into the water. But this is so wasteful of gas that it is impractical at great depths. The need, Harrell said, is for an efficient recirculating system, "better than those that exist today." In addition, lightweight power supplies and some kind of navigation system are needed for man to explore the ocean bottom unfettered by an umbilical cord.

**The research submarines** that try to fill the gap are often poorly designed, operating "only at the expense of constant overhaul and replacement, or are jury-rigged to get by," two other Navy engineers reported.

Of the three ways of building research submarines, all so far have their drawbacks, said Joseph F. McCartney and Thomas D. Morrison of the Navy Marine Engineering Laboratory. The first way is to enclose everything inside pressure hull. However, the size and weight of the hull both have to increase as the intended depth becomes greater, and the hull is necessarily weakened by every propeller shaft or piece of pipe that must go through it.

Another approach is to mount as much instrumentation as possible outside of the main hull, housed in some liquid that will maintain sea pressure but free of the corrosive effects of ocean water. Unfortunately, the engineers said, perfect motor seals simply don't exist; fluid losses make motor and gearbox efficiencies "atrociously low"; and high pressure sea water leaking into cables often causes short circuits. Because of

the need for protection from the sea, each of the small, external, five-horse-power motors on the research submarine Trieste weighs about 600 pounds—"unreasonable," said the engineers.

The third technique is to mount equipment directly in sea water, but here the technology is least advanced of all.

## Social Critics Assess Youth

If some U.S. students have alienated themselves from the political system, far greater numbers in both college and high school remain unaffected and uncommitted to any political struggle whatsoever.

And despite increasing militancy among young people, America's problem is still the uncommitted, according to a panel of well-known social commentators who met last week to discuss "Committed and Alienated Youth," at the annual Washington, D.C., meeting of American Orthopsychiatrists.

Public education "turns off" two groups of high school students—the Negro ghetto student and the upper-middle class student, says Dr. Alan F. Westin, author, lawyer and professor of political science at Columbia University.

Neither is committed to American political ideals—one because he does not see himself as ever being accepted; the other because he feels "no relevance between the political system and his own life." Isolated in suburbia the advantaged child goes through school feeling no impact from the social and political issues of the day, Dr. Westin points out.

Actually, the student only reflects social reality in the United States, says the political scientist. Whenever society does not realize its ideals, the schools are blamed. But studies indicate that only a "minority of the public at large is committed to the Bill of Rights," when the chips are down, he says.

The student "looks at his elders and does not see any great political sophistication," he says. "Many kids with the mind and leisure choose not to devote their talents to problems of social justice."

But there now exists an opening for those who would like to reform the teaching of social studies, so that they deal realistically with contemporary problems of liberty and equality—from wiretapping to race.

Some people, in fact, are saying the civil rights movement may be to social studies what Sputnik was to mathematics and the hard sciences. A group of professional social scientists is currently at work recasting social studies cur-

ricula, just as science was recast after Sputnik. But how good the new course will be and whether the schools will accept it are so far unknown.

At the college level as well, apathy is the rule for the vast majority, says Dr. Kenneth Keniston, professor of psychology at Yale Medical School and author of "The Uncommitted."

Turning to youthful campus activists, he continued, "Youthful alienation is not to be universally deplored." Some activists, he says, are able to turn their alienation to profit and become worthwhile adult critics on religion, politics and society.

Dr. Christian Bay, political scientist from the University of Alberta in Canada, sees the political activists in their most complimentary light. He says the activist groups include a higher proportion of "truly autonomous" individuals than the "pseudo student government groups." No intricate psychological theory is needed to account for their fervor, says Dr. Bay. Their sense of politics comes naturally to people with a healthy self-esteem.

Dr. Bay predicts that political action will grow to embrace all of collegiate education since it is firmly rooted in affluence. Earlier college movements, rooted in deprivation, petered out when depression passed. To Dr. Bay the students offer a "basis for some optimism about the academic future and perhaps a ray of hope for society on the North American continent."

Less enthused is Dr. William Kornhauser of the University of California at Berkeley. While not disparaging the value of political action on campus, Dr. Kornhauser, a sociologist, says he is unhappy that the activists are not more interested in ideas. They are politically sophisticated, he says, but "not very open intellectually." In his opinion, they are more interested in action than ideas.

## Patent Policy Study

A study of what happens to patents generated by Federal research funds is underway, and currently is putting a damper on the once hot Senate debate on the ownership of such rights (SN: 12/31/66).

Harbridge House, a management consulting firm, is undertaking the study for the White House. It will look at all Federally-funded projects, and their outcome in terms of patentable ideas and their exploitation. An earlier study of the National Aeronautics and Space Administration's patent output found there is little spin off into private use, and of the few patents waived to industry few, if any, are making anybody rich.

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