

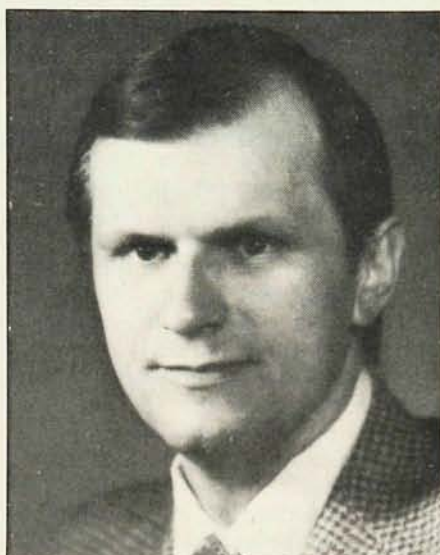
state & society

DOD signals interest in more innovative research

Basic research is receiving renewed interest and attention in the Department of Defense. One of the first positive steps taken in that direction is the creation of a research office reporting directly to the Deputy Under Secretary of Defense for Research and Advanced Technology. Nominated to head that office, as Assistant for Research to the Deputy Undersecretary, is physicist George Gamota.

We recently interviewed Gamota in his Pentagon office, where he discussed his plans for the new office, the impact on the research program of the recent Office of Science and Technology panel report on DOD basic research (PHYSICS TODAY, October 1978, page 93) as well as the Defense Science Board panel report on DOD-supported university research (PHYSICS TODAY, February 1978, page 77), and briefly reviewed the DOD in-house laboratory research program.

Gamota received his PhD in physics from the University of Michigan in 1966. From 1968 to 1975 he was a research scientist at Bell Laboratories in Murray Hill, N. J., where he did basic research in low-temperature physics, especially superfluid helium. In 1974 he organized a science advisory council for his local congressman (PHYSICS TODAY, January 1976, page 101), and during the following year he worked for the President of Bell Labs on



GAMOTA

the Governor's Commission to Evaluate the Capital Needs of New Jersey. Since January 1976 he has served as Staff Specialist for Research in the Office of the Director of Electronics and Physical Science in DOD.

Significance of appointment. DOD has not had a senior official with broad oversight over the basic research program since 1973. Gamota thus perceives the creation of his new position as being im-

portant in three respects. First of all, it reflects a definite commitment by DOD to the idea that White House Science Adviser Frank Press and the Defense Science Board have been promoting—that basic research is important not only for the NSF but also for the mission agencies, and that the mission agencies should look at support of basic research as an important and necessary part of their mission and fund it appropriately.

Secondly, DOD recognizes that basic research provides numerous future technological options that are relevant to national security. Gamota observed that most of DOD's current development programs are based on basic research done 15 to 25 years ago. He noted that many DOD administrators believe that the basic research being done now or that has been done over the past ten years will provide fewer technological options than research done 20 years ago.

Thirdly, the creation of the new post should signal to the research community that DOD recognizes a decrease in innovative ideas and is now more willing to support revolutionary new high-risk ideas—"the kind that provided the highest payoff in the past," according to Gamota.

Gamota explained that in his new po-

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International group to reallocate radio spectrum

On 24 September representatives from over 150 nations will meet in Geneva for a ten-week World Administrative Radio Conference. There the delegates will attempt to reach an international accord on frequency allocations for various "services." Run by the International Telecommunications Union, the last WARC of general scope was held 20 years ago. Applications of radio technology as disparate as radio astronomy and taxi-dispatch radios are at stake.

The current table of allocations, drawn up in 1959 and modified at seven specialized radio-frequency conferences since then, comprises about 40 different services, or categories of use, including such services as aeronautical radio navigation,

broadcasting, port operations, radio location and time-signal service.

In preparation for the conference, the Federal Communications Commission and the National Telecommunications and Information Administration have submitted recommendations to the US Department of State. The FCC has, for the past several years, been gathering information on government uses of the radio spectrum, and the Interdepartment Radio Advisory Committee, a branch of NTIA, has been doing the same for government uses. From the reports of these two groups the US delegation to WARC has put together a set of proposals for reallocating wavelengths. Glen Robinson, a University of Virginia law professor,

will head the US delegation, which will include representatives of most of the interest groups involved. A final list of about 60 delegates will be released some time this spring.

The principal guideline by which the US delegation will operate at the conference next fall is that the fewer changes that need to be made in the current table of allocations the better, and in this regard the US is more conservative than many other countries. However, the delegation will go to Geneva with a number of proposals for changing the International Radio Regulations, the rulebook governing the electromagnetic spectrum between 10 kHz and 27 GHz. New allocations will be suggested for the sensors

used in the LANDSAT and SEASAT satellites, for example, and some short-wave bands would be reallocated in another US proposal, which would give more bands to maritime mobile transmitters and international broadcasting, such as Voice of America and Radio Free Europe broadcasts. This proposal is expected to meet with some resistance from the third-world nations, which will have a majority at the one-nation, one-vote conference. Many developing countries still use these short-wave bands for domestic services, and so will resist any infringement, according to Samuel Probst, chairman of the Interdepartment Radio Advisory Committee. In addition, he said, the current drive among third-world nations to de-Westernize the international news media is in direct conflict with the US plans.

Radio astronomy. Because discussions over how to divide up the short-wave spectrum are likely to dominate the Geneva conference, Bernard Burke of MIT is afraid that the needs of radio astronomers will become "lost in the shuffle." Burke notes that the US went to the 1959 WARC "without any clear position on radio astronomy," and as chairman of the National Academy of Sciences Committee on Radio Frequencies, he is determined not to let that happen this year.

The International Radio Consultative Committee (CCIR) is the technical arm of the International Telecommunications Union. A special meeting of CCIR was held last November in preparation for WARC. Out of that technical conference came several recommendations for radio astronomy.

In the way of allocations, radio astronomers are requesting protection for the spectral lines of some key molecules and 2% wide bands at approximately octave intervals within the range of 2 MHz to 300 GHz to use for observing broad-band emissions. But perhaps more important to the radio astronomers is the issue of protecting the observatories' extremely sensitive receivers from more subtle forms of interference. Spurious, harmonic and band-edge emissions from other radio sources often cause problems for the radio observatories. Five years ago, for example, the National Radio Astronomy Observatory in Green Bank, West Virginia, reported interference from the ATS-6 television broadcast satellite, which was creating noise outside its normal operating band (see PHYSICS TODAY, September 1974, page 77).

Burke said that CORF is therefore trying to have put down as law—or at least formally stated as a goal—at the September meeting a set of interference limits. The US delegation is reluctant to accept those limits, partly, according to Burke, because Congress has refused to fund an FCC study of interference levels that are harmful to radio astronomy, and so lacks an impartial study of the problem. And partly, he said, because the US

does not even have domestic rules to enforce interference limits, and so can hardly defend them at the international conference. Probst defends the government's position, saying that if the CORF levels were mandated by law, they would have a "horrendous economic impact." The US delegation will propose a tightening of the tolerances for frequency instabilities and spurious emissions, though not to the rigid standards the radio astronomers desire.

A small group of radio astronomers, those involved in the search for extraterrestrial intelligence, had also asked the US delegation to propose reallocating the region from 1.40 to 1.72 GHz to the search for interstellar radio signals. That region is now used for air traffic control, navigational satellites, meteorological aids and fixed service microwave links. This request was the source of some controversy since it would have deprived NASA of some satellite bands. The FCC's solution to the disagreement is to propose a "bear-in-mind" footnote to the tables asking users in that region of the spectrum to consider SETI's use of those bands. Dissatisfied, the SETI researchers have turned to their colleagues in less industrialized countries for support. Because these countries have less use for the radio bands, they are more willing to protect them for SETI use, according to Frank Drake, director of the National Astronomy and Ionosphere Center at Cornell. Drake said that a significant number of less developed nations have informally committed themselves to the SETI cause.

New services can be added to the already-crowded spectrum in one of three ways: An existing service can be given fewer bands or eliminated from the tables entirely; the new service can share a band with an existing service, provided they operate in different geographic areas, or the usable spectrum can be expanded. In 1971, the table of allocations was extended from 40 GHz to 275 GHz, and several bands in that region were allocated to space science. The US will propose at WARC allocating many unassigned bands in that region to terrestrial services and expanding the tables up to 300 GHz.

Because the allocations set down in September might remain unchanged until 1999, a good deal of foresight is necessary in order to predict the needs that will develop as a result of improving technologies over the next two decades. And once a frequency is allocated to a given service, a country must register its specific intended use for that frequency with the International Frequency Registration Board in Geneva. This registration process occurs on a first-come, first-served basis; that is, the first country to register a frequency use essentially closes that frequency to any other use that would interfere with the registered one. This creates something of a "technology race"

for those frequencies that are not now widely used (such as those above 40 GHz).

Although the regulations hold all of the weight of an international treaty, every nation retains the right to allocate the spectrum for its own domestic uses any way it wishes, with the restriction that it cannot cause interference with a system abiding by the international rules and cannot stop any interference such systems may cause their signals. During the two to three years after WARC ends the FCC and IRAC will jointly decide how the spectrum will be used in the US. —MEJ

DOD interest in research

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sition he will have responsibility for the policy, guidance and review of DOD's basic-research program and for budgetary reviews. The offices of scientific research for each of the military services will continue to have responsibility over their day-to-day operations and their selection of manpower for both in-house and contract work. Gamota told us that he would like to revive the Defense Committee on Research, an internal advisory group that has been dormant since 1972. The Committee's purpose would be to strengthen the base of support of the research program, provide better coordination among the various DOD components supporting basic research and other federal agencies, and provide a visible focus for the invigorated DOD research program.

OSTP and DSB panel reports. Because of the creation of the new office, Gamota feels that it will be easier to implement many of the recommendations in the OSTP and Defense Science Board panel reports. (Gamota was the executive secretary of the DSB panel, which suggested ways of reestablishing research relationships between the universities and DOD.)

"The DSB report was a tremendous catalyst for initiating two long-overdue actions," noted Gamota. "One was to reverse the funding erosion of the past ten years; the other was to focus upon a valuable asset to DOD—the academic research community." Gamota noted that in 1978 Congress put its stamp of approval on DOD's effort to strengthen the research program and increase support of academic researchers. "The specific language to that effect appears in the final defense appropriation bill."

The report of the OSTP panel (which dealt with broad matters of policy) had already provided the ingredients for a strengthened, focused and stable research program. Gamota believes that a definitive policy statement will be made on DOD commitment and need to support basic research. Then the report's recommendations will be implemented in a series of actions that will include the

Einstein statue commemorates centennial

The National Academy of Sciences will place a monumental statue of Albert Einstein, three times life size, in the southwest quadrant of its grounds in Washington, D.C. NAS plans to unveil the statue on 22 April 1979 at its 116th annual meeting. The ceremony will honor the centennial this year of Einstein's birth.

After sculptor Robert Berks completes the statue in clay, it will receive a bronze casting. A portrait head of Einstein that Berks sculpted from life in 1953 is the basis for the new statue. The Einstein memorial will rest on a circular white granite base 30 feet in diameter on which is a slightly smaller circular map of the heavens done in black granite. To delineate the stars of the constellations, Berks will use 3000 stainless-steel studs of varying thicknesses; US Naval Observatory astronomers will plot their exact locations.

The seated figure of Einstein will rest on the middle of a three-step semicircular white granite bench as he contemplates the universe at his feet. The statue is to

be twelve feet high; it would be 21 feet were Einstein standing.

A pad of paper in the left hand will bear three of Einstein's most important scientific contributions: a tensor for the theory of relativity, the equation for the equivalence of energy and matter, and the equation for the photoelectric effect. On the back wall Berks will inscribe Einstein's credo: "The right to search for truth implies also a duty; one must not conceal any part of what one has recognized to be true."

The cost of the statue, base and ground preparation is expected to be more than \$1.5 million. In addition to seeking large donations from a small number of potential donors, the Academy has organized a fund-raising campaign among the US technical community; letters from Academy president Philip Handler have already been sent to over 130 000 scientists and engineers. Contributions should be sent to the Einstein Memorial Fund, National Academy of Sciences, 2101 Constitution Avenue, N.W., Washington, D.C. 20418.



NAS: RICHARD MEEK

participation of the membership of the OSTP group.

The DOD basic research budget. The \$470-million DOD-supported research program can be tabulated, Gamota noted, according to five broad technology areas; the two with the strongest physics impact—electronics and materials—receive more than 50% of the funding.

Gamota considers the basic research supported by DOD to fall into three overlapping categories. He defines the first as "technology-pull" research. This applies to work on applied problems that still require basic research or understanding; examples would include smokes and aerosols ("making ourselves unseen"), tribology (the design, friction, wear and lubrication of interacting surfaces in relative motion), ballistics, explosives and microwave tubes.

The second category, "technology-push" research, would be identified with longer-term needs. Gamota gave as examples blue-green (this wavelength range is transparent in water) and high-energy lasers, near-millimeter waves, microelectronics, composite materials, computer-software research and new calculational methods in aerodynamics and hydrodynamics.

The third category, "which we are weakest in and need to strengthen", Gamota calls "potential-breakthrough" research—work at the "frontiers" of science and technology that may either revolutionize or make obsolete some current technology. He named neutrino communication, spin-aligned hydrogen, x-ray lasers, ultra-sub-micron (20 to 500

Å) structures, and neutral or charged-particle beams as examples.

The DOD basic-research budget cycle consists of several steps. After the Secretary of Defense provides guidance on the growth or decline in the overall budget (a 7% real growth for basic research is slated for FY 1979, and an aim for 10% growth in FY 1980), the individual military services submit for review to Gamota's office proposed budgets for their own research programs. After all points of dispute are resolved, the basic-research budget is inserted in the overall DOD budget. The latter is in turn successively submitted to the Office of Management and Budget, to the President and to Congress. After Congress authorizes and appropriates funding for DOD, Gamota's office reviews the overall DOD basic-research program again at what is known as the "apportionment review."

Gamota views the apportionment review "as an opportunity to be able to scope the overall program; to look at the direction it's heading; and to see who the key players are, what their intentions are for funding and what are the new thrusts. It is extremely important that the DOD program manager have a definite investment strategy." The program manager must establish priorities and levels of funding for his or her areas of research. With a finite research budget one must be careful not to be either spread too thin or "to over-subscribe by jumping on a bandwagon." The final job of the program manager is to support the best researcher.

How to obtain support. Gamota noted

that each military service has an office of scientific research and issues periodically a pamphlet that summarizes the current research program in broad categorical terms and lists the names and phone numbers of the various division directors. From this pamphlet the individual investigator can determine the "thrust areas" as well as the overall program. Gamota was quick to point out that "all proposals are unsolicited and that 70% of the research is not actually in thrust areas. If we could predict all important areas, there would be no need for a basic-research program."

With respect to relevance, Gamota complained that "too often we find good researchers doing good work make the decision in their minds that DOD is not interested in supporting their work and don't even bother coming in and asking us." The question of potential usefulness, he pointed out, should be determined not by the researcher but by the program manager at the office of scientific research.

Each military service handles proposals in a different way. The Army has a peer-review system, the Navy does mostly internal reviewing, and the Air Force uses a combination of peer, committee and internal review. Gamota believes this is "good and healthy," as it gives the researcher three chances of getting support instead of one.

Gamota encourages researchers to contact also the Defense Advanced Research Project Agency. Although this agency largely supports the development of high-risk technology (roughly \$290

million in FY 1979), it does have a large program (about \$50 million) in basic research as well. DARPA currently has large programs in computer science and materials, and also supports work in geophysics and lasers.

Gamota's office has in the last few months been trying to reduce paperwork in obtaining support and is developing a DOD universal research agreement. Contracts written under this agreement will be simple, one-page long, and easy to understand and implement.

In-house labs. Gamota observed that overall physics employment at the in-house laboratories has remained stable over the last few years, although he pointed out that some fields, such as solid-state physics, lasers and optical science, may have gained, while others, including nuclear sciences, may have gone down.

The Naval Research Laboratory per-

forms the greatest amount of in-house basic research. Other important centers of military basic research include the Harry Diamond Laboratories in Adelphi, Md. (high voltage-high current pulsed-power work), the Night Vision Laboratory in Fort Belvoir (night-vision electronics and materials) and the Ballistic Research Laboratory at Aberdeen Proving Ground (mathematical physics), all under the Army, and the Naval Weapons Center in China Lake, Calif. (lasers and optics), the Naval Ocean Systems Center in San Diego, Calif. (electronics and underwater work) and the Naval Surface Weapons Center in White Oak, Md. (explosive and energetic materials).

The bulk of Air Force basic research is done at several laboratories at the Wright-Patterson AFB complex (materials, electronics, aeronautics propulsion and guidance). The Air Force also supports work at the Air Force Geophysics

Laboratory at Hanscom AFB in Bedford, Mass. and the Rome Air Development Center at Griffiss AFB, N.Y. and Hanscom AFB (electronics) —CBW

in brief

Duane C. Sewell has been sworn in as Assistant Secretary for Defense Programs in the DOE. He is responsible for DOE's programs that support the national defense, which amount to \$1.6 billion of the 1978 DOE budget.

Robert J. Budnitz has been appointed deputy director of the Nuclear Regulatory Commission's office of nuclear regulatory research. He was formerly associate director of the Lawrence Berkeley Laboratory and head of LBL's energy and environment division.

the physics community

Optical Society elects DeMaria vice president

Anthony J. DeMaria, manager of the Electromagnetics and Physics Laboratories at the United Technologies Research Center in East Hartford, Conn., has been elected vice president of the Optical Society of America for 1979. He



DE MARIA

will succeed Warren J. Smith (Infrared Industries, Santa Barbara, Calif.), who will become president-elect. Dudley Williams (Kansas State University), the current president-elect, will ascend to the presidency, succeeding Emil Wolf (University of Rochester), who becomes junior past president. All four officers will serve on the OSA board of directors.

DeMaria received his PhD in electrical

engineering from the University of Connecticut in 1965. He joined the staff of the United Technologies Research Center as a research scientist in 1958, and has done research there in acousto-optics, picosecond pulses, nonlinear optics, laser physics and high-power gas lasers. He also serves as an adjunct professor of physics at the Hartford Graduate Center of Rensselaer Polytechnic Institute. He is editor of the *IEEE Journal of Quantum Electronics* and is a member of the National Academy of Engineering.

Elected to three-year terms as directors-at-large are Nicolaas Bloembergen (Gordon McKay Professor of Applied Physics and Rumford Professor of Physics, Harvard University), Valerie Olson (project manager of optical fabrication, Rocketdyne Division, Rockwell International, Canoga Park, Calif.) and James C. Wyant (associate professor, Optical Sciences Center, University of Arizona).

Goodman becomes editor of JOSA

Joseph W. Goodman has been elected the new editor of the *Journal of the Optical Society of America*, succeeding Douglas C. Sinclair. His three-year term is to begin with the January 1979 issue. Goodman received his PhD in 1963 from Stanford University, where he is now professor of electrical engineering. His research interests include Fourier optics, holography and optical information processing. He has been an associate editor of *JOSA*, and has served as chairman of the OSA editorial board for the past two years. He is a past co-editor of the journal *Applied Physics*, and is currently co-

editor of the book series *Laser Applications* and Associate Editor of the journals *Optical Engineering* and *Computer Graphics and Image Processing*.

in brief

The Acoustical Society of America invites members to apply for a Congressional Fellowship, which enables the recipient to spend a year, beginning 1 September 1979, as a Congressional staff member. For further information, contact Betty Goodfriend, Acoustical Society of America, 335 East 45th St., New York, N.Y. 10017. Deadline for application is 31 January; an announcement of the award will be made before 15 April. The award is \$20 000, plus \$2000 for travel and/or relocation expenses.

The Optical Society of America, in cooperation with the American Association for the Advancement of Science, is now accepting applications for 1979-80 Congressional Fellowships. Further information is available from Jarus W. Quinn, Executive Director, Optical Society of America, 2000 L Street, N.W., Washington, D.C. 20036. The deadline for receipt of completed applications is 1 February.

AIP's Manpower Placement Division has a new placement supervisor, Beverly Citrynell. Her responsibilities include overseeing the listing of employment opportunities compiled and distributed by the division and organizing the placement centers the division operates at AIP member-society meetings. She replaces Dorothy Gleason, who died last April. □