

ARMY RESEARCH AND DEVELOPMENT



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Authors Selected for 96 Army Science Conference Papers

Brochure, Film Outline Value Analysis Techniques

Application of Value Analysis techniques to effect substantial cost cutting in research and development of military armaments and materiel is stressed in a forthcoming brochure and a 30-minute film.

Presented as a resumé of results of the recent Value Analysis Seminar sponsored jointly at the Pentagon in Washington, D.C., by the Chief of Research and Development and the Deputy Chief of Staff for Logistics, the brochure and film will enhance the current drive to broaden the base of VA throughout the Army R&D establishment, in cooperation with industry.

Another important tool in the all-out effort to spread the doctrine of Value Analysis is the newly published Army Regulation 700-47, which prescribes the general responsibilities and procedures for implementation of the VA program.

Indications are that the brochure and film will have wide appeal to industrial organizations engaged in Army R&D on a contract basis, or interested in supporting the Army drive to offset rising production costs by using new

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Army Sponsors Joint Meet On Adhesives Development

Department of Defense personnel, representatives of the Army, Navy, Air Force and National Aeronautics and Space Administration and design engineers representing prime contractors recently attended a 2-day adhesives symposium, the first ever sponsored by the Army, at Picatinny Arsenal, N.J.

Objective of the meeting was to inform design engineers about the latest advances in modern adhesives technology. W. J. Powers, Deputy Chief for Research in Picatinny's Plastics and Packaging Laboratory, characterized the symposium as an excellent example of industry and Government working together toward a common goal.

Those who presented technical papers included Dr. Norman A. de Bruyne of England, who made the trip from Britain solely to attend the symposium. Dr. de Bruyne played a major role in developing adhesives for use in the Comet jet airplane.

Army-wide Parley Slated On Operations Research

Significant results of the Army's operations research program will be discussed at the first Army-wide Operations Research Symposium, to be held at the Army Research Office-Durham (ARO D), Durham, N.C., late in March 1962.

Army personnel desiring to submit papers on completed research projects to the Symposium should forward abstracts of proposed presentations to the Commanding Officer, Army Research Office-Durham, Duke University, Durham, N.C., not later than Dec. 20, 1961.

Featured in This Issue

Individual creativity in the development of new ideas and in advancing technology is being encouraged throughout the Army Research and Development establishment in many ways, and will continue to be stressed at all echelons of command.

In support of the interest of the Chief of Research and Development and the National Inventors Council effort to stimulate inventiveness, an authority on patents and the U.S. Patent System has written a long article. For the first of three monthly installments, turn to page 14.

Authors of 96 scientific presentations to be made at the 1962 Army Science Conference, scheduled for the third consecutive time at the United States Military Academy, West Point, N.Y., June 19-22, were announced in late November.

More than 400 narrative summaries of proposals for presentations were considered, indicating the widespread response of researchers to the opportunity of reporting on their work before a distinguished group of 500 Government key scientists, engineers and administrators.

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DOD Directive Prescribes Basic Research Policies

Clarification of the administration and support of basic research is the basis of a new Department of Defense directive issued in November by the Secretary of Defense.

Directive No. 3210.1 defines basic research as "that type of research which is directed toward increase of knowledge in science. It is considered research where the primary aim of the investigator is a fuller understanding of the subject under study."

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Examining plastic ordnance items at Picatinny Arsenal, N.J., during Army's first structural adhesives symposium are, left to right, Paul S. Forsyth, ODDRE; Dr. J. L. Martin, Director, Ordnance Materials Research Office; Col Daniel Shepherd, Director of Picatinny's Special Weapons Group; Michael J. Bodnar, Picatinny chemist, who organized the meeting, and W. J. Powers, chairman for the symposium.

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To improve informal communication among all segments of the Army scientific community and other Government R&D agencies; to further understanding of Army R&D progress, problem areas and program planning; to stimulate more closely integrated and coordinated effort among the widely dispersed and diffused Army R&D activities; to maintain a closer link from top management through all levels to scientists, engineers and technicians at the bench level; to express views of leaders, as pertinent to their responsibilities, and to keep personnel informed on matters germane to their welfare and pride of service.

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By-lined Articles: Accuracy and relevancy of contents of this publication to accomplishment of the Army R&D mission are of constant concern to the editors. Primary responsibility for opinions of by-lined authors rests with them; their views do not necessarily reflect the official policy or position of the Department of the Army.

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Theme of the Month

By Dr. Maurice J. Murray

Chief Scientist, Office of the Chief Chemical Officer

The massive qualitative struggle between the Soviet Union and the United States for scientific supremacy necessitates our making the best possible use of every man, every manhour, and every national defense dollar in our research and development program.

How can research and development best be conducted so that we are certain of receiving the ultimate for the money expended and from our limited scientific manpower? How do we insure that a vital research project will not drag along for months or years and perhaps even then fall short of the solution sought?

The many Army research laboratories throughout the United States are staffed with well trained scientists and competent supporting technicians. The problem is how to get the greatest scientific advances from these various research groups.

The most important single factor in achieving this goal is for every director and supervisor to feel, first of all, that there is a real urgency about the project being investigated and then to instill this sense of urgency into every person in the laboratory.

Each member of the research group must believe that what he or she is doing has a degree of critical priority about it—that the whole project is important and vital. Scientists often produce their best work when under a calculated degree of pressure. Excessive pressure in any field is disconcerting, but moderate urgency in realization of a research goal speeds up its attainment.

The efficiency with which research progresses may be compared to the operation of a passenger car. The modern automobile is designed to run most efficiently and give best mileage at approximately the speed limit on the open highways. However, when the car is run slowly over extended periods of time, the engine becomes fouled and the performance drops sharply.

The productivity and the quality of research are improved if there is a reasonable steady pressure on the personnel accelerator. This pressure decreases lost time and waste motion; it increases the enthusiasm of the worker for his job when he knows his services are timed into maximum team effort to meet essential production requirements. *There is an optimum speed, and the directors have the responsibility of finding out what this optimum speed is and of seeing that the researchers work in this range.*

Corollary to the idea of instilling the proper sense of urgency is this fundamental principle: Each individual on the research team must be made to feel that without his specific effort the task might fail. The worker must be imbued with the thought that the success which he has with his portion of the task is crucial, and that others depend on him because they respect his capability and devotion to that task.

These human factors are very important considerations because scientists, like anyone else, enjoy being a part of a smoothly working team and having their work appreciated by the supervisor in charge. Those directing the research must show continued interest in the project as a whole and in the various parts which make it up. If any section of the effort seems to be falling down, new interest must be instilled in this part of the total.

In scientific research, as in other fields, progress thrives on competition. We are in so much competition these days with a potential enemy imbued with the complete opposite in ideologies that the need for utmost accomplishment under our economic and social philosophy should be obvious.

Since our national defense effort depends so critically upon our R&D advances, all involved—the man at the bench as well as the man in uniform—must seek the most expeditious means to reach the goals which will insure our scientific supremacy. The scientist must look ahead constantly to the swift conversion of laboratory findings to the development phases, with a realistic approach to exploiting all sources to speed end products, so that the Armed Forces are assured of the total national scientific support for the defense effort.

Above all, planners and directors of Army research must so function that the most faultless defense and the most awesome offense will be able at all times to counter the worst blusterings of those threatening to destroy us unless we yield to unreasonable demands. Indeed, over the years of the cold war and the cold peace, Mr. Khrushchev may well turn out to be outstanding "director" of American research. By his prolonged cold war tactics he has created a real sense of urgency—growing and responsive recognition among the research and development personnel that how well they do their job has a decisive bearing on whether our Nation and the Free World progress, working as a team, or are engulfed by superior dynamic forces.

DOD Directive Prescribes Basic Research Policies

(Continued from page 1)

Among the clarifying elements in the Directive is a statement that free and effective communication among scientists is important to basic research.

Favorable consideration should be given to basic research, the Directive states, in the administration of the provisions of The Armed Services Procurement Regulation which relate to the allowability of a contractor's independent research under certain DOD contracts.

Terms of reference compatible with DOD reorganizational changes made since issuance of the original directive in 1957 also are provided.

The following principles are cited as fundamental to the administration and support of basic research:

- Basic research is essential to the development of military power.
- Continuity is essential to successful basic research. Therefore, long-term planning and funding of basic research will be employed to the maximum possible extent.
- Basic research may be conducted by competent scientists in universities and nonprofit institutions, industry, military laboratories, or elsewhere.
- Sustained support of basic research will result in increased effectiveness and economies in military programs.

Basic research in laboratories of the Department of Defense or in laboratories of other Government agencies, best qualified for such work in particular areas, should be encouraged, the Directive states.

Brochure, Film Outline Value

(Continued from page 1)

materials and advanced technology. As this publication went to press, more than 50 firms had filed requests for the brochure.

Value Analysis techniques, described in considerable detail in a featured article in the October issue of the *News magazine*, involve the searching study of every item of cost in procurement of every piece of Army materiel, with a view to obtaining a superior product at lower cost.

Implementation of the program will be furthered through a series of seminars and planning sessions. In addition to the Pentagon seminar on Oct. 20, a 3-week training program was conducted by the General Electric Co. for key Army R&D staff officers.

Lt Gen Arthur G. Trudeau, Army Chief of Research and Development, who attended the Pentagon seminar, has directed Army R&D management officials to utilize VA techniques as a

"MAULER," the Army's mobile air defense missile system now under development, contains its own power supply, target detection and electronic computer fire control equipment. Capable of firing while moving, it will be air-transportable and will carry its own supply of solid-fuel missiles.



Mauler Meets Objectives in White Sands Test Shot

Developmental test firings of the new MAULER air defense guided missile are being conducted by the Department of the Army.

The solid-fuel missile met all test objectives recently in its first firing at White Sands Missile Range, N. Mex., said Brig Gen John G. Zierdt, Commander of the Army Rocket and Guided Missile Agency. Additional test firings are taking place at White Sands.

Designed to give air defense to fast moving Army units on the battlefield,

MAULER is being developed under the technical supervision of the Army Rocket and Guided Missile Agency by the Pomona Division of General Dynamics, Pomona, Calif., prime contractor. The contract is administered by the Los Angeles, Calif., Ordnance District.

Each MAULER unit (missiles, tracking and guidance equipment) will be self-contained on a self-propelled vehicle. MAULER is designed to defend against high performance aircraft as well as short-range missiles and rockets.

Analysis Techniques for Army-wide Program

proven method of stretching funds.

Officials from The Martin Co., Radio Corp. of America, the Bendix Corp., and the General Electric Co. made presentations at the Pentagon meeting on "What Is Value Analysis," "Value Analysis in Procurement," "Value Analysis Organization," and "The Need for Value Analysis in Manufacturing."

Dr. Finn J. Larsen, Assistant Secretary of the Army (R&D), made the introductory remarks. Paul R. Ignatius, Assistant Secretary of the Army (Installations and Logistics), who made the closing remarks, said:

"Value analysis is a technique which must be applied by all Army technical services to reduce overall materiel costs. It is essential that we in the Army take advantage of any techniques that will enable us to reduce the cost of Army materiel and

thereby enable us to obtain the equipment and supplies necessary to modernize the Army."

In heralding the merits of VA in a recent address to the American Management Association in New York General Trudeau said:

"Certainly one means to cutting cost is Value Analysis—the engineering technique which is gaining in importance daily and which should be employed, I firmly believe, by all of you in the Army-Industry team. We must have a more objective appraisal of each element of design, manufacture, and procurement in the industrial equation if we are fully to achieve optimum function and reliability at a minimum cost. . . .

"Let's adopt and apply the triple I treatment—inspiration, imagination, and ingenuity—to cut costs in time, money, and effort. . . .

"I urge you, our industrial partners, to employ to the maximum degree the sound and productive principles of Value Analysis in forwarding Army research and development projects. There's hardly an item I've seen that couldn't be improved in this manner. We will share the savings with you in a change order and will be glad to simplify or modify even military requirements, whenever possible."

Extensive Study of Materiel Testing Nears Completion

Results of an extensive study by the Army Ad Hoc Committee for Materiel Testing are scheduled for submission to the Chief of Staff by Jan. 15, 1962.

The committee was established Sept. 12, 1961, to review and evaluate existing requirements, objectives, policies, organizations, facilities, funding, manpower and procedures for Army materiel testing. Its objective is to make recommendations leading to improvement of the Army materiel development and test program, with attention on reduced lead time and costs.

A committee spokesman said its study findings will be broad in scope, ranging from development of a testing philosophy to consideration of duplications in testing and the feasibility of combining or eliminating complete test series. It is functioning under supervision of the Chief of Research and Development, who is the Department of the Army coordinator for materiel testing.

As of mid-November the committee had been briefed by the divisions of the Office of the Chief of Research and Development and other General Staff agencies, the seven Army Technical Services, the U. S. Marine Corps, the U. S. Navy, the U. S. Air Force, by representatives of the United Kingdom and Canada, and by Headquarters, U. S. Continental Army Command.

Orientation trips to test facilities will take the committee to both military and civilian materiel testing installations throughout the U. S.

The committee is composed of Col Edward Duda, chairman, and Lt Col Corbie R. Truman, recorder, both from the Office of the Chief of Research and Development; Benjamin S. Goodwin, Associate Director, Development and Proof Services, Aberdeen Proving Ground, representing the Deputy Chief of Staff for Logistics; Col Fred W. Jacks, Jr., Office of the Deputy Chief of Staff for Operations; and Col John F. Polk, Deputy, Armor Board, Fort Knox, Ky., representing Headquarters, U. S. Continental Army Command.

Augenstein Appointed Assistant For Defense R&E Special Projects

Bruno W. Augenstein has been appointed Assistant Director of Defense Research and Engineering for Special Projects.

Mr. Augenstein was a member of the staff of Lockheed Missiles and Space Co. from 1958 to the time of his recent appointment, first as Consulting Scientist, then as Scientific Adviser for Satellite Programs and, most recently, as Director of Advanced Planning.

As senior staff scientist and associate head of the Science Staff, he was with the Rand Corp. from 1949 to 1958. He conducted studies in various national defense fields, especially in areas of technological influences on defense.

Mr. Augenstein is a member of the American Physical Society, American Nuclear Society, American Rocket Society, Society of Sigma Xi, American Geophysical Union, American Ordnance Association, and the American Association for the Advancement of Science.



Attendees at the second annual Materiel Test Program Conference included, left to right, Col G. W. Seward, USCONARC, Fort Monroe, Va.; Col James M. Kimbrough, Jr., USASRDLC Commander; S. E. Petrillo, Director of Engineering; Victor E. Suski, special assistant, and Col Arthur W. Reese, OCSigO.

Materiel Test Group Ponders Scheduling Problem

Establishment of a schedule of delivery of new models of electronic equipment developed by the U. S. Signal Corps to the U. S. Continental Army Command formed the core of discussion at the second annual Materiel Test Program Conference.

Held at the U. S. Army Signal Research and Development Laboratory, Fort Monmouth, N. J., the 4-day meeting was attended by 65 representatives of Signal Corps agencies and USCONARC in addition to about 200 USASRDLC military and civilian personnel. Particular attention was given to items which will be available for user tests during fiscal year 1962.

One result of the meeting is the likelihood of more consolidation of equipment tests reporting. In many instances USCONARC may expect to receive a unified report, instead of a series of reports, on test phases carried out by USASRDLC and the Army Electronic Proving Ground at Fort Huachuca, Ariz. Data on tests by contractors will be made available when desirable.

With more comprehensive technical data in hand, it was stated, USCONARC would be better prepared to start service tests for final determination of whether new equipment were suitable for Army use. Such consolidation, however, would not cut back the close step-by-step liaison between the developer and the user during the emergence of new equipment.

The list of materiel, prepared by the Research and Development Division of the Office of the Chief Signal Officer, contained 95 items for discussion. Of these, 89 are developments under USASRDLC direction.

Applications, as indicated by the USCONARC boards represented at the conference, range through Aviation, Armor, Artillery, Infantry, Air Defense, Airborne Electronics, and Arctic operations.

Col James M. Kimbrough, Jr., Commanding Officer of the Signal Laboratory, was one of the principal speakers at the meeting. Senior representative for USCONARC was Col G. W. Seaward, and for the Office of the Chief Signal Officer, Col Arthur W. Reese. Col Seaward is head of USCONARC's Communications and Electronics Division in Materiel Development. Col Reese is Chief of the Combat Development Branch of the R&D Division of OCSigO.

Other Signal Corps agencies represented included the U. S. Army Electronic Proving Ground, U. S. Army Combat Surveillance Agency, U. S. Army Signal Air Defense Engineering Agency and U. S. Army Signal Materiel Support Agency.

Army Awards Contract to Extend NIKE HERCULES Capabilities

Two contracts totaling \$31,987,340 for production of propellants and explosives for artillery shells and ground equipment for the NIKE HERCULES guided missile system were announced by the Army Oct. 31.

A \$20,430,915 equipment contract to Western Electric Co., New York, N. Y., provides for extending the capabilities of the NIKE HERCULES system, operational since 1958. The contract was awarded by the New York Ordnance District.

Holston Defense Corp., Kingsport, Tenn., received a \$11,556,425 contract for propellants and explosives to be used primarily for artillery shells. The award was made by the Ordnance Ammunition Command, Joliet, Ill.

TAGO Human Factors Research Unit Transferred to OCRD

Effective early this month, the Human Factors Research Branch was transferred to the Office of the Chief of Research and Development (OCRD) from the TAG Research and Development Command, and redesignated the U.S. Army Personnel Research Office (APRO).

The change affords closer association between the Army Personnel Research Office and other research and development activities in the Army community. It is in line with emphasis on a concurrent effort between human factors scientists and the materiel developer.

APRO consists of four research laboratories and one statistical laboratory. Dr. Hubert E. Brogden continues to serve the organization as Chief Scientist, and Dr. Julius E. Uhlener as Director, Research Laboratories.

APRO employs 130 civilians, 70 of whom are research scientists, principally with training and experience in industrial, military, experimental and quantitative psychology, in statis-

tics, and in mathematics. Almost half of these employees have Ph. D. degrees.

Under the guidance and direction of Dr. Brogden and Dr. Uhlener, the Military Selection Research Laboratory seeks solutions to Army-wide enlisted selection and classification problems—appraising men and women and matching their potential contributions to a large range of Army jobs.

Another laboratory, the Behavioral Evaluation Research Laboratory, is assessing the elusive qualities needed in special assignments, including officer and NCO assignments.

Army officials said it is in the Combat Systems and Support Systems Research Laboratories that the closest ties with materiel scientists and combat development experts are emerging, and from which some of the significant scientific advances can be expected.

Human factors scientists must study total systems or subsystems as

they are developed, or materiel obsolescence may set in before results of the human factors research—selection, training, human factors engineering, utilization—can be applied.

Concepts of future warfare are constantly changing. If the utilization of the Army's human resources is to be improved, continued research study under many varieties of battle conditions is needed, it was explained. APRO tasks such as Future Combat and Electronics are examples of research designed to improve utilization in modern man-machine systems.

Concerning the transfer, Dr. Uhlener said he is "excitedly looking forward to the challenge to develop new human factors products urgently needed by the Army's weapons and support systems."

During the last two decades, the organization now known as APRO has been engaged in a variety of research projects and tasks to insure the proper use of manpower in getting the Army's job done.

APRO scientists have successfully standardized interviewing techniques for identifying potential junior officers. Based on data collected at the frontlines in Korea, they have developed devices for identifying potential fighters—testing techniques now a part of personnel operations. They have provided means of identifying men who would profit most from general and specialized Army training, and have produced many devices to meet Army requirements for selecting, classifying, assigning, and utilizing military personnel.

APRO traces its first impact on the Army back to World War I, with the development of the Army Alpha and Beta tests. Just prior to World War II, the organization was reactivated under The Adjutant General's Office as the Personnel Research Section, which developed the Army General Classification Test (AGCT) and other instruments.

In 1953, as the Personnel Research Branch, the organization became a part of the Army's coordinated research and development program, and in 1960 it was renamed the Human Factors Research Branch.

Though OCRD is assuming direct command responsibility for APRO, the organization will remain, for the time being, at its present location, Temporary A Building, Southwest, Washington, D.C.

Col George F. Bayerle, Chief of the Human Factors Research Division, U.S. Army Research Office, said APRO will continue to maintain close, direct contact with operations personnel in TAGO and with personnel in the Office, Deputy Chief of Staff for Personnel responsible for personnel policy matters.

R&D Leaders Brief Dr. Larsen on ARO-D Program

Dr. Finn J. Larsen, Assistant Secretary of the Army (R&D), made his first official visit to the Army Research Office-Durham Oct. 31, accompanied by Maj Gen Dwight E. Beach, Deputy Chief of Research and Development, and Maj Gen William J. Ely, Director of Army Research.

Dr. Harold C. Weber, Chief Scientific Advisor, Office of the Chief of Research and Development, and Dr. Richard A. Weiss, Deputy and Scientific Director of Army Research, participated in the orientation of Dr. Larsen on the ARO-D program and operational procedures.

Col George W. Taylor, ARO-D Commander, Dr. John W. Dawson,

Chief Scientist, and Dr. Sherwood Githens, Jr., Deputy Chief Scientist, joined in outlining the scope and objectives as revised since ARO-D became the successor to the Office of Ordnance Research Jan. 16, 1961, with greatly expanded responsibilities in the physical and mathematical sciences.

Members of Dr. Larsen's immediate staff who participated in the all-day orientation session were Col O. G. Goodhand, Executive and Special Assistant for Air Mobility; Col Edward L. Powell, Deputy Chief, Air Mobility Division, and Lt Col K. C. Emerson.

The current ARO-D exploratory research program, Dr. Larsen was told, comprises 390 active projects, located at 137 universities and involving 414 chief investigators.



On his first official visit to the Army Research Office-Durham, Dr. Finn J. Larsen, Assistant Secretary of the Army for Research and Development, is pictured with Maj Gen Dwight E. Beach and Dr. John W. Dawson.

3 Firms Build Test Models of Light Helicopters

Three aircraft companies share contracts totaling \$18,677,273 recently awarded by the Army for production of test quantities of a new light observation helicopter designed to improve reconnaissance and mobility.

Aircraft built by the three companies will be subjected to a 6-month user evaluation program conducted at Fort Rucker, Ala., following which a single model may be selected for introduction into the Army's inventory. During the evaluation, each aircraft is expected to undergo about 600 hours of flight in the process of determining its suitability to meet requirements.

Designs submitted by these three companies (the Bell D-250, the Hiller 1100, and the Hughes 369) were selected following a recent design competition participated in by 12 aircraft companies. All three designs were adjudged as capable of meeting the rigid Army specifications for a lightweight, single rotor, 4-place helicopter which will be reliable, readily air-transportable, inexpensive and easy to maintain.

The aircraft will be powered by a 250 hp. gas turbine engine and have

Watervliet Sets Up Center To Integrate Weapons R&E

An integrated weapons research and engineering center has been established at Watervliet Arsenal, N.Y.

Housed in a modernized 116-year-old structure, the facility was opened with a ceremony during which Col Walter H. Tisdale, Arsenal commander, remarked:

"To meet the stepped-up demands of today's weapon technology with its increased emphasis on research, Watervliet has been constantly building up its staff of highly trained scientific personnel. With the opening of this modern, functional research and design center, we close the gap that has existed between personnel and facilities. Here, the Arsenal can carry out all its present and future assignments in the Nation's weapons development program."

Since its erection in 1845, the building which houses the new facility has been used variously as a storehouse, machine shop, hospital, officers quarters, and jailhouse.

Silent Sentry Radars Sent To U.S. Troops in Germany

Shipments of the first units of a transistorized radar that provides Army tactical forces with a new capability for battlefield surveillance was made in November to U.S. Army troops in Germany.

Called the Silent Sentry, the portable, front-line ground surveillance radar reaches through darkness, fog and smoke to pick up and locate enemy soldiers and vehicles. A 2-man team normally operates the unit but it can be set and operated by one man.

The original design was developed by the U.S. Army Signal Research and Development Laboratories, Fort Monmouth, N.J., and Sperry Gyroscope Co., a division of Sperry Rand Corp. Transistorization was accomplished under the direction of the U.S. Army Signal Materiel Support Agency, Fort Monmouth, N.J., in conjunction with the Sperry Co.

an endurance of three hours. With a speed of 110 knots, the new helicopters will be faster than the L-19 (Birdog) fixed wing aircraft and the H-13 (Sioux) and H-23 (Raven) helicopters, which they are intended eventually to replace in the Army's air fleet. These three aircraft currently carry out the Army's missions of visual observation, target acquisition, reconnaissance and command control.

The companies and the value of their contracts are: Bell Helicopter Co., Fort Worth, Tex., \$5,782,019; The Hiller Aircraft Corp., Palo Alto, Calif., \$6,542,375, and the Hughes Tool Co., Aircraft Division, Culver City, Calif., \$6,352,879.

Contracts call for delivery of five aircraft by each company on a one-per-month basis starting in October, 1963.

The Bell LOH model has been given the Army designation HO-4, the Hiller will be known as the HO-5 and the Hughes as the HO-6.

Russians Lead in Arctic Bibliography Items

For the first time since inception of the *Arctic Bibliography* in 1951, a single volume contains more Russian language abstracts than English language items, as evidenced in Volume 10, just off the press.

Volume 10 contains 6,570 abstracts of which 3,075 are Russian and 2,503 are English language items. Scandinavian countries have 513 abstracts; Germany, 212; and other languages, 267.

The total number of items through Volume 10 is 62,848. Volume 11, scheduled for publication in January 1962, will contain an additional 6,500 abstracts.

"The *Arctic Bibliography* is one of the more important reference tools for Arctic research," said Dr. Carl R. Eklund, Chief of the Polar and Arctic Branch, Earth Sciences Division, U.S. Army Research Office (ARO). He pointed out that the Army, together with the Navy and Air Force, has provided a major source of funds for its publication.

Preparation of the "Arctic Bibliography" was begun in 1947 under a contract with the Arctic Institute of North America. Its primary aim is to maintain a unified systematic record of publications resulting from the exploration and scientific investigation of northern regions hitherto little known or difficult of access and development by peoples native to the temperate zone.

Three methods of arranging the *Bibliography* were considered when preparatory work began in 1947: by subjects, regions, or authors. The extent of the literature, and also the interdisciplinary and interregional character of a good deal of it, decided



New Director of Army Aviation, Brig Gen Delk M. Oden, at controls of Army turbine-powered HU-1B Iroquois helicopter during recent visit to Bell Helicopter Co., Fort Worth, Tex.

the Directing Committee to favor the author arrangement, with full citations and content notes.

The increasing role of Government agencies, scientific institutions, and other organizations in the publication as well as the initiation of research is reflected in the *Bibliography* in the increasing number of corporate authors.

The recent flood of Russian geological literature follows many lean years. However, one field of prime importance is still but lightly reported from the U.S.S.R., namely medicine.

The high regard in which the Russians hold the "Bibliography" is shown in a review by Z. S. Romanovich, who said: "This bibliography is valuable not only because it covers such a large amount of material, but also because the detailed annotations give a full account of the contents of each item. The bibliography reflects the wide scope of the work conducted in the Arctic, such as construction, transportation and communication, as well as associated technical problems, studies of the properties of ice, and methods of controlling ice and permafrost."

A 1954 book review in the *Scientific Monthly* stated:

"In time *Arctic Bibliography* will prove itself to be all but indispensable to northern research workers. Its value as a training aid for undergraduates cannot be overestimated. A happy combination of private initiative and Government support has enabled the *Bibliography* to appear at very reasonable cost."

The Army distributes 150 copies of the "bibliography" to all interested Army agencies. Volumes can be purchased through the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D. C.

Picatinny Publishes First Encyclopedia on Explosives

The only known product of its kind in the world, an 800-page unclassified volume entitled *Encyclopedia of Explosives and Related Items*, has been published by the U.S. Army Picatinny Arsenal, Dover, N.J.

In preparation for the past 10 years, the encyclopedia is a highly technical and comprehensive book listing important properties, methods of preparation, hazards and possible uses of hundreds of explosive compounds.

Volume I, covering A to Azoxy, is designed as a reference work for research scientists, Army Ordnance officers and safety engineers. Included in the book are all pertinent references enabling a scientist to seek out additional details in a technical library.

Senior editor of the work is Dr. Basil T. Federoff. Though he retired

from the Arsenal several months ago as a regular employee, he is working as a consultant on Volume 2. More than 60 percent completed, Volume 2 is expected to be published by personnel of Picatinny's Explosives and Propellants Laboratory within the next six months.

Principal coauthor of Volume I was Oliver E. Sheffield. Other contributors included Henry A. Aaronson, retired, Earl F. Reese, and George D. Clift, now employed at the Army Chemical Center, Aberdeen, Md.

In preparing the encyclopedia, Dr. Federoff has included information selected from technical journals published all over the world.

Copies of the current encyclopedia are available at \$10 each from the Office of Technical Services, U.S. Department of Commerce, Washington, D.C. Reference should be made to Picatinny Arsenal Technical Report 2700.

\$9 Million Contract Orders 8,598 Frontline Radios

Award of a \$9 million contract for production of 8,598 units of a new front line radio set to replace three separate sets now in use has been announced by the Army.

Developed by the Army to be backpack carried, the AN/PRC-25 transistorized walkie-talkie will replace the current AN/PRC-8, 9, and 10 used during the Korean War. Compact, versatile and suited to the type of ground action foreseen in any possible future combat, from "brushfire" wars on up to general conflict involving large numbers of troops, it is capable of communicating on 520 FM channels.

Designed by the U.S. Army Signal

Research and Development Laboratory, Fort Monmouth, N.J., the AN/PRC-25 is smaller than its predecessors, measuring 11 x 11 x 4 inches. It weighs 17 pounds, 11 ounces, including batteries, which is slightly less than any of the others. The contract was awarded to the Radio Corp. of America, Camden, N.J.

For extreme simplicity of operation under conditions of darkness and combat, the controls of the walkie-talkie can be set so that at least two channels are always readily available. Advanced frequency control circuits and transistors give the new portable set the stability and reliability of much larger vehicular equipment.

OCRD Plans, Management

Two of the five divisions of the Directorate of Plans and Management, Office of the Chief of Research and Development, were abolished and three others established to take over their functions, effective Oct. 16.

Established to replace the Programs and Analysis Division and the Management Division were:

- Programs and Budget Division, constituted from the Programs Branch, P&A Division, and the Financial Management Branch Management Division.
- Procurement and Facilities Division, constituted from the Procurement and Contracting Branch and the Facilities Branch, Management Division.
- Management Analysis Division, constituted from the Review and Analysis Branch, P&A Division, and the Data Systems Branch, Management Division.

Few personnel changes resulted. Col Victor W. Hobson, Jr., who was Chief of the P&A Division, is Chief of the Programs and Budget Division. Col Herbert J. O'Connor, who was Chief of the Procurement and Contracting Branch, Management Division,

C-B Division Established Within OCRD Directorate

The Chemical-Biological Division has been established by OCRD Regulation No. 10-14, dated Nov. 6, within the Directorate of Special Weapons, Office of the Chief of Research and Development.

Lt Col Robert L. Doupe has been named Chief of the new division, and Lt Col P. G. Olenchuk, Deputy Chief. The division comprises two branches, the Weapons Branch, with Lt Col Robert L. Andreoli as Chief, and the Defense Branch headed by Maj Stanley D. Fair.

Under supervision and control of the Director of Special Weapons, Brig Gen David C. Lewis, the C-B Division is responsible for general staff supervision of research, development, test and evaluation pertaining to chemical and biological weapons and defense, except for basic research, and for the medical and meteorological applied research aspects. It also is responsible for coordination of all chemical and biological programs within the Office of the Chief of Research and Development.

The Office of the Chief of the Chemical-Biological Division provides the following committee representation: Assistant, Joint Chemical-Biological Coordinating Committee; Chairman, Joint Chemical-Biological Working Group; Chairman, Army Working Group for Chemical-Biological Materiel Projects.

In addition to the C-B Division, the Directorate consists of the Air Defense Division, Atomic Division, and Missiles and Space Division.

Division Reorganized

is Chief of the Procurement and Facilities Division.

Col John A. Graf, who was Chief of the Management Division, is Chief of the Management Analysis Division.

The MA Division includes a new Special Projects Branch headed by Lt Col Wilford D. Gower.

Free World Scientists Consider High Magnetic Fields at MIT Meet

Outstanding scientists of 10 Free World nations presented papers at the 1961 International Conference on High Magnetic Fields held at the Massachusetts Institute of Technology, Nov. 1-4. More than 700 persons attended.

Countries represented included England, France, The Netherlands, Austria, Sweden, the Federal Republic of Germany, Switzerland, Japan, Canada and the United States. The U.S. Army Research Office was represented by Dr. Robert B. Watson.



Transistorized walkie-talkie, AN/PRC-25, nearly triples soldier's communication capability in frontline areas.

Tests Promise Improved Treatment of Wounds

Dramatically improved techniques in battlefield emergency treatment of severely wounded soldiers are promised by results of recent investigations of familiar drugs by U.S. Army medical officers.

Mixtures of two World War II discoveries, penicillin and mafenide, have produced "marked benefit" when sprayed promptly into large open wounds to halt infection. In some tests the drugs have brought about recovery without surgery or other treatment.

Studies of the antibacterial action of penicillin and mafenide are being conducted at the Army Chemical Corps Research and Development Laboratories in Maryland by Col Douglas Lindsey, Director of Medical Research, and Maj Janice A. Mendelson, Chief of the Trauma Investigation Branch. Mafenide is a sulfonamide, but has a type of action quite different from that of the common "sulfa" drugs.

Honored Scientist Addresses Incentive Award Conference

Robert M. Schwartz, recent winner of a \$15,000 share of a \$25,000 maximum Department of the Army Incentive Award, was a key speaker at the Fall Conference of Incentive Award Administrators.

Representatives from all Federal agencies attended the conference, sponsored by the U.S. Civil Service Commission, in Washington, Nov. 7.

Employed as Chief Engineering Scientist for Special Weapons, Headquarters, U.S. Army Ordnance Special Weapons Command, Picatinny Arsenal, Dover, New Jersey. Mr. Schwartz worked on a 3-man team in developing nuclear warheads for the DAVY CROCKETT and other missiles.

Coworkers, each of whom received \$5,000, were Milton C. Epton, Chief of the Special Weapons Development Division at Picatinny Arsenal, and the late Irving Mayer, whose widow accepted the award.

Named ARGMA Lab Deputy

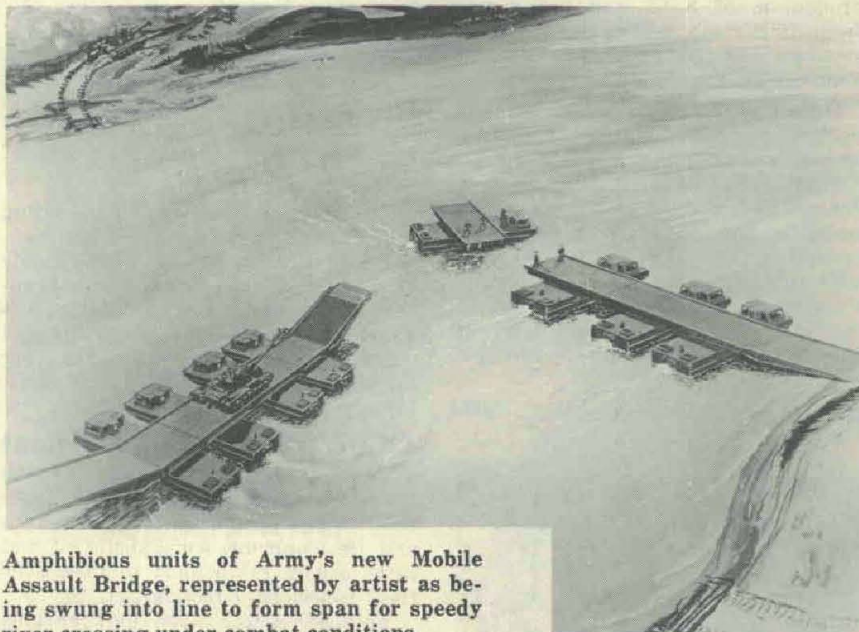
Charles L. Northrop, formerly Associate Director for test management, has been named Deputy Director of the Army Rocket and Guided Missile Agency's Test and Evaluation Laboratory.

Mr. Northrop joined the Army missile organization at Redstone in 1952 after working at the Langley Aeronautical Laboratory of the National Advisory Committee for Aeronautics, predecessor of the National Aeronautics and Space Administration.

Application of the findings to human wounds has not been tested at this point. In tests with laboratory animals it was possible to achieve recovery without any other treatment by spraying the wounds with mafenide alone or in combination with penicillin, but not by penicillin alone.

The promising dual-drug spray technique was used by the two medical research officers in a search for a more effective and simple method of treatment that would prolong survival time of a wounded soldier awaiting surgery and other hospital treatment. Their specific objective was to discover an expedient way to prevent gas gangrene infection of wounds, one of the combat soldier's historic bugaboos.

Findings were reported to the American Association for the Surgery of Trauma by Dr. Lindsey at a recent meeting in Chicago.



Amphibious units of Army's new Mobile Assault Bridge, represented by artist as being swung into line to form span for speedy river crossing under combat conditions.

\$2,296,000 Contract Awarded for Mobile Assault Bridge

Production of test units of a mobile assault vehicle designed to travel on land or water, serve individually to ferry troops, or be joined together to form a bridge in a matter of minutes, has been ordered by the Army.

The Chrysler Corp. of Detroit, Mich., was awarded a \$2,296,000 contract for the equipment, designed by the Army Engineer Research and Development Laboratories, Fort Belvoir, Va. The contract calls for fabrication of 12 units, with delivery scheduled to start Jan. 1, 1963.

Officially named the Mobile Assault Bridge, the vehicle is reported capable of speeding river crossings of

Col Skinner Takes Command Of WSMR SC Support Unit

Col William George Skinner, Jr., took over from Col Paul W. Albert early in November as Commanding Officer of the U.S. Army Missile Support Agency at White Sands Missile Range, N. Mex.

Until reassigned Col Skinner was Deputy Signal Officer for the U.S. Army Ryukyu Islands Command and prior to that was stationed for three years at the U.S. Army Electronic Proving Ground, Fort Huachuca, Ariz. He headed the Huachuca Electronic Warfare Department and served as Chairman of the Army Electronic Warfare Coordinating Committee.

Col Albert was credited with guiding the U.S. Army Signal Support Agency to many outstanding technical achievements during his tour of duty. His new assignment is in Puerto Rico.

large forces, with minimized concentration of troops to reduce risks of enemy attack.

By joining individual units, bridges of almost any length can be speedily assembled. The span section can be rotated hydraulically to a position at right angles to the boat-truck body.

Each unit has a 2-man crew and 8 men can prepare a 4-unit ferry, capable of carrying 55 tons, for loading in 15 minutes. Thirty-two men with 16 units could put a 400-foot bridge in place in one hour. Made principally of aluminum, each unit weighs 50,000 pounds is powered by 335 hp. engine.

Defense Supply Chief Gets Sweeping Procurement Authority

Lt Gen Andrew T. McNamara, former Army Quartermaster General and now Director of the new Defense Supply Agency (DSA), has been authorized to operate and control supply and service organizations, activities and facilities assigned to the Agency.

Secretary of Defense Robert S. McNamara recently signed a directive defining the responsibilities and authorities of DSA to centralize management of common supplies and services.

When it becomes fully operational, DSA will procure annually more than \$2,500,000,000 worth of supplies and material and will manage a multibillion dollar inventory for peacetime and mobilization requirements. More than 1,200,000 line items will be managed by the Agency.

General McNamara will recommend to the Secretary of Defense the establishment of new supply facilities, or the absorption or use of existing facilities of the military departments. He will also direct the consolidation, centralization or elimination of DSA facilities, operations, and functions to achieve maximum efficiency and economy.

DSA will not conduct research and development projects but will recommend to the military departments research and development to improve materials, items and methods within

ABC Group Holds 5-Day Meet At Huachuca Proving Ground

Twenty-five members of the American-British-Canadian Standing Working Group on Combat Communications Equipment met recently in a 5-day work session at the U.S. Army Electronic Proving Ground, Fort Huachuca, Ariz.

The ABC group is one of several which are considering various aspects of Signal standardization within the general framework of the Basic Standardization Agreement among the Armies of the United States, United Kingdom and Canada.

One aim of this agreement is to insure that there will be no operational, material or technical obstacles to full cooperation and collaboration among American, British and Canadian Armies. Another purpose is to obtain the greatest possible economy in the use of combined resources and effort.

Robert F. Brady, OCSigO, Washington, D.C., was chairman of the conference. Heads of the delegations included R. A. Julinyi, U.S. Army Signal Research and Development Laboratory (USASRD); W. E. Stark, Signals Research & Development Establishment, United Kingdom Army; and Lt Col W. S. Hamilton, Directorate of Signals, Canadian Army.

its commodity jurisdiction and to eliminate duplication. It will also recommend new or changed research projects to the Director of Defense Research and Engineering.

The Agency assumed the functions of the Armed Forces Supply Support Center in early October. Other functions will be assumed progressively upon approval by the Secretary of Defense.

Among its functions, DSA will perform system analysis and design for assigned supply and service systems. It will compute special program and mobilization materiel requirements when authorized to do so by the Secretary of a military department.

DSA will administer the Defense Coordinated Procurement Program, the Federal Catalog Program, the Defense Standardization Program, the Defense Materiel Utilization Program, and the Defense Surplus Personal Property Disposal Program.

The Agency will operate a whole-

sale distribution system including warehouses and depots in the continental United States, providing supplies and materiel to the Armed Services which will effect the retail distribution.

The directive authorizes DSA to furnish direct support to field and operating forces in Alaska, Hawaii, and outside the United States when mutually agreed by the Agency and a military department.

In the supply management area, DSA will compute replenishment requirements, forecast supply requirements, determine which items will be centrally or locally procured, conduct inspection and quality control, conduct mobilization and industrial readiness planning, maintain inventory control, prescribe requisitioning procedures and establish pricing procedures and prices for assigned items.

DSA headquarters are temporarily located in the Munitions Building, Washington, D.C., and will be permanently located at Cameron Station, Alexandria, Va., next year.

CmC Honors 40-Year Career Employee, 212 Others

In recognition of his 40 years of service with the Federal Government, Dr. Francis M. Wadley, statistician at the U.S. Army Chemical Corps Biological Laboratories, Fort Detrick, Md., was presented recently with a certificate and lapel pin.

Brig Gen John R. Pugh, Chief of Staff, Second U.S. Army, made the presentation at a Length of Service ceremony honoring Dr. Wadley and 212 other employees.

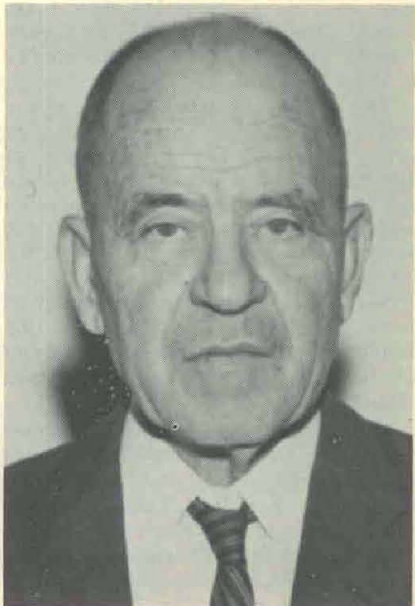
Dr. Wadley began his Federal service in 1914 with the U.S. Department of Agriculture at the age of 22, with assignments in the field and in Washington. He also worked in the Bureau of Entomology, the Naval Bureau of Aeronautics and the Census Bureau, prior to assuming his present position at Fort Detrick. He earned a master's degree from Kansas State University in 1922, and his Ph. D. in 1928 from Minnesota University, both in entomology.

A resident of Arlington, Va., Dr. Wadley plans to continue with his work until Civil Service rules order him to retire. When that day comes, he expects to continue working in the science field.

Dr. Carlton E. Brown, aerobiologist, was presented with a 30-year pin and certificate by General Pugh. Ten and 20-year awards were received by 210 other career employees at the ceremony, at which General Pugh praised the high level of competency at Fort Detrick, and expressed the

gratitude of the Army to the civilian employees for their staunch support, loyalty and high level of achievement.

Dignitaries present for the ceremony included, Representative Charles McC. Mathias, Col John J. Hayes, Deputy Commander, U.S. Army Chemical Corps Research and Development Command, Mayor Jacob R. Ramsburg of Frederick, Md., and Col Carl S. Casto, Commanding Officer of Fort Detrick.



Dr. Francis M. Wadley

OCRD Scientific Adviser Keynotes 7th HFE Parley

Dr. Harold C. Weber, Chief Scientific Adviser, Office of the Chief of Research and Development, sounded the keynote of the Seventh Annual Army Human Factors Engineering Conference, speaking on "Combat Communications and Communicators."

Held at the University of Michigan, Ann Arbor, Mich., the conference was centered on the theme of "Combat Communications and Surveillance." Papers were presented by representatives of all the Army Technical Services, industrial concerns holding Government contracts and by officials of the U.S. Continental Army Command and other Government agencies.

The Army Signal Corps and the University of Michigan were co-hosts. Approximately 200 scientists and administrators of Army research and development, industry, and educational institutions attended.

Sponsored annually by the Chief of Research and Development, the Conference has three principal purposes:

- To provide direct exchange of information on human factors engineering among personnel of the U. S. Army development agencies, and between these and representatives of user agencies and other qualified individuals.

5 U. S. Scientists Inspect Soviet Hydraulic Facilities

Joseph B. Tiffany, Technical Director of the U.S. Army Engineer Waterways Experiment Station, Vicksburg, Miss., represented the Corps of Engineers on a 5-man American team which recently completed a 2-week trip to inspect hydraulic laboratories in the Soviet Union.

The U.S. team acted as one of the cultural and scientific exchange groups intended not only to learn of Russian scientific developments but to foster good will between American and Soviet engineers and scientists. It comprised the heads of the hydraulic laboratories of the Massachusetts Institute of Technology, University of Iowa, University of Minnesota, the Department of the Interior's Bureau of Reclamation and the Waterways Experiment Station.

Mr. Tiffany and his colleagues visited the Central Scientific Research Institute of Economy for Exploitation of Water Transport and the All-Union Scientific Research Institute in Moscow, the Wave Scientific Research Station in Sochi on the Black Sea and the Institute of Water Transport in Leningrad. On his return to the United States he inspected installa-



Dr. Harold C. Weber

- To provide recommendations and suggestions to be followed up by the Army Human Factors Engineering Committee to assure exploitation of all opportunities for improving man-machine compatibility in the design of Army materiel.
- To provide a conference report that will serve as a useful, complete, and authoritative compendium of current work programs and related information concerning all Army human factors engineering research and development activities.

tions in Finland, Sweden, The Netherlands, England and France.

Graduated as class valedictorian from the University of Illinois with a B.S. degree in civil engineering in 1932, Mr. Tiffany has been closely associated with all phases of work at the Waterways Experiment Station since its establishment.



Joseph B. Tiffany

Army Awards Five Contracts For Tanks, Engines, Trucks

Production of M-60 tanks, tank engines, power pack assemblies and trucks is called for in five contracts awarded by the Army to Michigan firms.

A \$16,500,000 letter contract for production of the M-60 main battle tank went to Chrysler Corp., Centerline, Mich. The M-60 is the Army's newest and most powerful medium tank, mounting a 105 mm. gun believed capable of defeating all known enemy tanks.

Continental Motors Corp., Muskegon, Mich., received a \$3,500,000 letter contract for production of M-60 tank 750-hp. diesel engines which provide a 250-mile operating range, an increase of 30 to 40 percent above the range of the M-48 tank now in use.

A \$4,000,000 letter contract for engines and power pack assemblies to be used in the M-88 tank recovery vehicles and the M-60 tanks was also awarded to Continental Motors.

Another letter contract, for \$10,000,000, went to Ford Motor Co., Dearborn, Mich., for 5,600 quarter-ton trucks (M-151). The M-151 was developed as a successor to the Jeep. Its development program, involving more than a half-million miles of testing, was the most rugged ever given a military vehicle, the Army said.

White Motor Corp., Lansing, Mich., received an \$8,250,000 letter contract for 2,000 M-44 2½-ton trucks.

ABMA to Build New Facility For Missile R&D Activities

Bids will be opened Dec. 15 for construction of a research and development facility at Redstone Arsenal, Ala., to serve the Army Ballistic Missile Agency, an element of the U.S. Army Ordnance Missile Command.

Laboratory, administration and shop space for 550 employees engaged in missile R&D operations will be provided in 187,000 square feet of floor area. Specifications call for a 3-story concrete and steel main building and auxiliary facilities.

Portions of ABMA's Propulsion Systems Laboratory, Research Laboratory, Systems Design and Development Laboratory, the Test, Evaluation and Firing Laboratory and the Analysis and Advanced Design Laboratory will be housed in the main structure. Most of these sections are in scattered temporary quarters.

The facility marks the first new construction for ABMA since most of the Agency's research and development facilities were transferred to the Marshall Space Flight Center in 1960.

Staff Additions Indicate Growing Responsibility of Army Research Office



Dr. Selig Starr



Roy D. Greene



Dr. Samuel H. King



Dr. Edmund K. Karcher

Expanding functions of the U.S. Army Research Office, Office of the Chief of Research and Development, are indicated by the continuing growth of its professional staff to meet review and analysis requirements.

Newest of more than a dozen specially qualified scientific administrators and analysts who have joined the ARO staff this fall are Dr. Selig Starr, Dr. Edmund K. Karcher, Dr. Samuel H. King and Roy D. Greene.

Assigned to the Mathematics Branch, Physical Sciences Division of ARO, Dr. Starr served from 1958 until recently in the Operational Mathematics Office, Quartermaster Activities, Cameron Station, Va. From 1956 to 1958 he was employed at the Naval Propellant Plant in Washing-

ton, D.C. He received his A.B. degree from Brookline College (1940) and his M.S. degree (1951) and Ph.D. degree (1961) from George Washington University.

Dr. Karcher is a social psychologist in the Psychological and Social Sciences Branch, Human Factors Division. Previously, he was Chief of the Behaviorial Evolution Research Laboratory, The Adjutant General's Office, Research and Development Command, for 14 years. He earned his A.B. degree at St. Lawrence University in New York and his M.A. and Ph.D. degrees at the University of North Carolina.

Dr. King is assigned to the Human Factors Research Division as a program coordinator. Employed for the past 13 years as a research psycholo-

gist in the Personnel Research Branch (TAGO), he advanced to Chief of the Performance and Evaluation Rating Research Unit and later became Chief of the Combat Systems Research Laboratory. He was graduated from Lincoln Memorial University with a degree in mathematics and psychology (1946) and gained his Masters degree from the University of New Mexico (1947) and Ph.D. degree from Western Reserve University (1954).

Mr. Greene is a budget analyst in the Research Programs Division of ARO. Until his recent transfer he was employed for two years as a program analyst in the Office of the Chief of Ordnance. He holds a B.S. degree from Western Kentucky State College.

Former CE Scientist Joins ARO Tropical-Desert Branch

Dr. Leo Alpert, formerly Chief of the Operations Analysis Branch, Department of Engineer Intelligence, Army Map Service, Corps of Engineers, has joined the Tropical and Desert Branch, Earth Sciences Division, of the U.S. Army Research Office, OCRD.

At the close of his 10-year tenure with the Engineers, Dr. Alpert was connected with an investigation of the application of automatic data processing to Engineer Intelligence. From 1946 to 1950 he was with the Topographical Intelligence Division of the Military District of Washington, D.C. He served as a meteorologist with the Air Force Weather Service from 1940 to 1946, rising from aviation cadet to lieutenant colonel, a rank he holds in the Air Weather Service Reserves.

Graduated from State College, Bridgewater, Mass., with a B.S. Ed. degree in 1937, he was awarded his M.S. degree by the Graduate School of Geography, Clark University, Worcester, Mass., in 1939, and his Ph. D. from Clark in 1946. He did graduate work in meteorology at the Massachusetts Institute of Technology from 1939 to 1940.

ARGMA Official Turns R&D Travel to Christmas Art.

The delicate minaret of a mosque in Trinidad, B.W.I., and the dome of a synagogue in Curacao, Netherlands Antilles, are pictured as his personal handiwork on Christmas cards being sent out this year by Edward Rosenfeld, a key member of the Army Rocket and Guided Missile Agency's NIKE ZEUS development team.

As Chief of the Facilities Section for the NIKE ZEUS anti-missile-missile program at Redstone Arsenal, Ala., Mr. Rosenfeld has island-hopped both the Atlantic and Pacific missile ranges, selecting test sites and planning the physical layout of development facilities. In his travels he keeps his eyes open for picturesque houses of worship to draw.

"Most people expend a little extra effort in building a church," the missile engineer remarks. "That's why they are interesting subjects for me to draw."

Mr. Rosenfeld began drawing churches in 1956, when he made a sketch of Notre Dame de Paris. In 1957, the National Cathedral in

Washington, D.C., was his subject.

The following year, while in El Paso, Tex., he made a 200-mile side trip on a weekend to draw a Spanish mission church at Chihuahua, Mexico.

The far ends of the earth provided subjects for his Christmas card in 1959. He drew an English chapel on Ascension Island, a ZEUS radar test site in the Atlantic for the outside cover and a church in the Marshall Islands in the Pacific, soon to be a major antimissile test installation, to illustrate the inside of the card.

His cards, done on a 5" x 7" plain card with a fine screen offset press, are fine reproductions of the original drawing. Each looks as if it had been drawn directly on the card.

Mr. Rosenfeld sends out about 500 cards each year. "My list of friends keeps growing," he explains, "and once on the list they are never dropped. If it hadn't been for NIKE ZEUS and its widely scattered installations, I wouldn't have had a chance to draw these churches as a way of saying 'Merry Christmas' to my friends."



Winners of the first annual Technical Achievement and Leadership Awards presented by the U.S. Army Signal Research and Development Laboratory are Dr. Helmut E. Weickmann (left center) and Francis A. Kineavy, flanked by USASRDLC Commander Col James M. Kimbrough, Jr., and Dr. Hans K. Ziegler (left), USASRDLC Chief Scientist, who took part in awards presentation.

USASRDLC Cites Physicist, Management Chief

Winners of the first annual Technical Achievement and Leadership Awards offered by the U.S. Army Signal Research and Development Laboratory at Fort Monmouth, N.J., are a weather physicist and a management expert.

The Technical Achievement Award went to Dr. Helmut K. Weickmann, physicist with the Meteorological Division, Surveillance Department. Francis A. Kineavy, Director of Management, won the Leadership prize.

Col James M. Kimbrough, Jr., Laboratory Commander, made the presentation. The citations were read and a short talk on their importance was made by Dr. Hans K. Ziegler, Chief Scientist.

Both recipients received engraved plaques citing their achievements, and their names will be engraved on an honor roll at the Signal Laboratory.

Other nominees, who received citations, were, for technical achievement: Dr. Stanley Kronenberg, Exploratory Research; Gordon A. McLeod, Communications Department; Joseph Mandelkorn, Electronic Components Department; Edward R. Nolan, Engineering Sciences Department.

For leadership: Gordon W. Bartle, Communications Department; Seymour Greenspan, Surveillance Department; Dr. Friedrich Reder, Electronic Components Department; Julius Soled, Engineering Sciences Department.

Dr. Weickmann's citation said:

"Dr. Weickmann demonstrated remarkable scientific ability in his investigation of aerosols over the Greenland icecap, the study of extreme wind gusts at the edge of the icecap, the development of a method

to determine average wind conditions over a large Arctic area, and in contributing to establishment of an Arctic Research Laboratory.

"Dr. Weickmann's achievements also include participation in seeding of supercooled clouds to catalyze their dispersal, contribution to understanding of cloud formation and growth, and investigation of the effect of solar radiation on the life cycle of clouds. Finally, he analyzed the modifying influences of clouds and particles in the atmosphere in scattering and attenuating thermal radiation from a nuclear explosion."

Mr. Kineavy's citation read:

"Mr. Kineavy has demonstrated remarkable leadership in introducing and developing a system of project scheduling and control which has provided this Laboratory with an excellent management tool and has been recognized as most effective by the Department of the Army. Requiring Laboratory-wide efforts and cooperation of unusual scope, this accomplishment could not have been made without Mr. Kineavy's personal dedication, guidance and perseverance."

Maj Gen Snyder Heads Brooke AMC

Maj Gen James L. Snyder has been named Commanding General, Brooke Army Medical Center, Fort Sam Houston, Tex.

General Snyder, who was Commandant of the Medical Field Service School, Brooke Army Medical Center, will assume his new duties this month. He succeeds Maj Gen John F. Bohlender, who retired Nov. 30 after more than 33 years of active military service.

CDEC Commander Given New Post

Brig Gen Charles S. D'Orsa, Commander of the Combat Development Experimental Center, U.S. Continental Army Command, at Fort Ord, Calif., has been reassigned to the U.S. Army Training Center (Infantry), Fort Jackson, S.C.

3 Services Support Study On Environment Sensing

A triservice-funded contract has been awarded to the University of Michigan for a 10-month study of the needs and potential for research on remote sensing of environment.

The program will be carried out by the University's Institute of Science and Technology to increase the awareness of the possibilities for remote sensing among scientists in a number of fields, particularly in the earth sciences. Its aim is to incite their interest and support, and to lay the groundwork for a comprehensive program of research which will be of maximum benefit.

All modern methods of remote sensing will be reviewed and their capabilities made known to key figures in the earth sciences.

Among outstanding devices and techniques of remote sensing are high resolution mapping radar, the infrared scanner and radiometer, the passive microwave radiometer, photographic emulsions for camouflage detection and photography in the near infrared, and high altitude, high resolution photography.

Besides scanning existing remote sensing equipment and techniques, the program will examine the extent to which these are being used, and will offer suggestions for better utilization.

Swedish Scientist Begins 1-Year Task at GIMRADA

Recent additions to the professional staff of the U.S. Army Engineer Geodesy, Intelligence and Mapping Research and Development Agency (GIMRADA), Fort Belvoir, Va., are Prof Bertil Hallert, Nathan Fishel and Maury C. Church.

Prof. Hallert is with the Royal Institute of Technology, Stockholm, Sweden, and is engaged at GIMRADA in a 1-year photogrammetric research program. A member of the Royal Academies of Engineering and Military Sciences since 1950, he has visited and studied in all Western European countries and in the U.S. He is the author of some 200 publications on photogrammetry and geodesy.

Nathan Fishel and Maury C. Church formerly were with the U.S. Navy Hydrographic Office, Fishel as a geodesist and Church as a mathematician. Fishel is assigned to the Research and Analysis Division of GIMRADA. He has a B.S. degree from City College of New York (1949) and a master's degree from Ohio State University (1960). Church graduated from George Washington University with an A.A. degree (1956) and a B.A. degree (1957).



Brig Gen L. E. Fellenz, G. V. Achorn, Jr., Col J. M. Palmer

CmIC Biology Chief Lauded For Exceptional Service

Glenwood B. Achorn, Jr., Director of Biological Operations at the U.S. Army Chemical Corps Arsenal, Pine Bluff, Ark., recently received the Decoration for Exceptional Civilian Service.

Brig Gen Lloyd E. Fellenz, Commanding General, Chemical Corps Materiel Command, made the presentation while on a visit to the Arsenal from his headquarters at Army Chemical Center, Md. Secretary of the Army Elvis J. Stahr, jr., approved the award, initiated by Col John M. Palmer, Arsenal Commander.

The citation accompanying the award noted Achorn's accomplishments in the administration of a major Army program. He has directed biological operations at the Arsenal since July 28, 1957. A native of Biloxi, Miss., he received a B.S. degree in chemical engineering at Mississippi State College in 1941, and became a civilian employee at the Chemical Corps Biological Laboratories, Fort Detrick, Md., in 1946.

Secretary of Army Inspects Pacific NIKE ZEUS Facility

Secretary of the Army Elvis J. Stahr, jr., returned to Washington Nov. 22 after an inspection tour of Army installations and commands in Hawaii, Kwajalein and the Far East, Middle East and Southern Europe.

Secretary Stahr inspected the NIKE ZEUS anti-missile-missile installation at Kwajalein, where intercept tests of ICBM's are scheduled next year.

The Secretary was accompanied by Mrs. Stahr, Lt Gen Leonard D. Heaton, The Surgeon General of the Army, and Mrs. Heaton, Col H. W. O. Kinnard, Executive Officer to the Secretary, and staff personnel.

NOVEMBER, 1961

2 Scientists Among 5 Army Civilians Attending ICAF

Two Army scientists are among five Army civilians attending a 10-month resident course at the Industrial College of the Armed Forces in Washington, D.C., designed to prepare them for important duties in Government career service.

Dr. Edward S. Josephson, special assistant to the Scientific Director, Quartermaster Research and Engineering Command, Natick, Mass., and Dr. Donald M. Swingle, consultant to the Director of the Meteorological Division, U.S. Army Signal Research and Development Laboratory, Fort Monmouth, N.J., are the scientists attending the ICAF.

Each year about 30 civilians from all branches of Government and quasi-governmental agencies are chosen, through a carefully selective screening process, to attend the Industrial College of the Armed Forces.

Other Army civilians currently attending are: Howard S. Corwin, Organization and Management Systems, Deputy Chief of Staff for Logistics; Edgar R. McDaniel, Chief of Supply and Supply Adviser, Office of the Chief Chemical Officer; and Montague X. Shanahan, Assistant to the General Counsel, Office, Secretary of the Army.

The mission of the Industrial College is stated as: "To conduct courses of study in the economic and industrial aspects of national security under all conditions, giving due consideration to the interrelated military, logistical, administrative, scientific, technological, political, and social factors affecting national security, and in the context of both national and world affairs, in order to enhance the preparation of selected military officers and key civilian personnel for important command, staff and policy-making positions in the national and international security structure."



Dr. Edward S. Josephson



Dr. Donald M. Swingle

Until he began the Industrial College course this fall, Dr. Josephson was special assistant for food and food irradiation to the Scientific Director, QM R&E Command. A graduate of Boston Public Latin School and Harvard University, he earned a Ph. D. "with distinction" from the Massachusetts Institute of Technology. He resides with his wife and three children in Newton, Mass.

Dr. Swingle, 39, won a \$500 cash incentive award in June 1957 for a paper he presented to the Army Science Conference at the U.S. Military Academy, reporting on his research into detection of nuclear clouds by radar. He is a member of the Institute of Radio Engineers, the American Institute of Electrical Engineers, the American Meteorological Society and the American Association for the Advancement of Science. He holds A.M., M. Eng. Sc. and Ph. D. degrees from Harvard University, an M.S. degree in meteorology from New York University and a D.S. degree in mathematics from Wilson Teachers College in Washington, D.C.

QM Conference Weighs Problem Of Materiel Deterioration

The problem of microbiological deterioration of petroleum fuels and of fuel handling and storage equipment was one of the subjects discussed at the Tenth Conference on Prevention of Deterioration of Military Materiel, held recently at the Quartermaster Research and Engineering Center, Natick, Mass.

Other topics dealt with "Materials Problems," including those involving plastics, rubber, electronic components, textiles, and marine engineering materials; "Testing and Analytical Procedures," and "Long-Range Fundamental Research Studies."

Patents Knowledge Viewed as Useful Tool for R&D Personnel

Part 1 of 3 Parts

By Lt Col G. F. Westerman

An understanding of patents can be a powerful tool for research workers, scientists and engineers. The United States Patent Office has on file the largest store of applied technology in the world. Its collection consists of more than 3,000,000 United States patents, with approximately 1,000 new patents being added weekly, and almost 6,000,000 patents from 24 foreign countries. In this huge body of information can be found solutions to daily technological problems and suggestions for further developments along widely different lines.

Then, too, there is a good possibility that any one of you, as engineers and research and development personnel, may make an invention yourself and obtain a patent of your own. A patent is always favorable publicity for an inventor, adding to his personal prestige and, in some cases may result in an increase in his income.

Finally, the fact that the patent system has played an impressive role in our national defense is obvious from such patents as those granted on Colt's Six-Shooter, the Gatling Machine Gun, Bell's Telephone, Marconi's Wireless Telegraph, the Wright Brothers' Airplane, and countless other implements essential to the conduct of war.

These are a few of the reasons which make it important that all Army personnel, particularly those engaged in research and development, acquire an understanding of a few basic principles of patent law.

HISTORICAL BACKGROUND. During the classic period in ancient Greece and Rome, the useful arts were regarded more or less with contempt. Although a few rugged individualists like Archimedes made inventions, they were looked on as mere frivolities, scarcely befitting a philosopher. Nevertheless, five or six centuries B.C., the Greek city of Sybaris held cooking contests in which the inventor of a new dish was given an exclusive right to prepare it during one year.

This was probably the earliest patent system, anticipating our own by about 26 centuries. It worked so well that the people of Sybaris achieved immortality as connoisseurs in the art of eating and to this day, the word "sybarite" is a synonym for epicure.

Long before 1400, the Government of Venice was interested in inventions and officials were appointed to examine inventors' projects. After 1450, the grant of patents became quite systematic in that country. The main craft of Venice was glass-making, the secrets of which were so jealously guarded that the death penal-

ty awaited Venetian glass-blowers who tried to practice their art abroad.

Glass was then so precious, however, that in spite of this danger many Venetian artists took the risk of establishing works abroad. Being familiar with the Venetian patent system, the first thing they sought in foreign countries was a monopoly for the new methods they brought with them. In this way, patent systems were introduced into various countries during the 16th century. Consequently, many of the early patents were granted for glass manufacture and numerous Italians were among the first patentees in a number of countries.

During the Middle Ages it was common practice in England and in various countries of Western Europe for the sovereign to grant, to individuals, monopolies of the right to make or sell specified commodities throughout the kingdom. Sometimes, as in the

Patents Chief Thanks Trudeau For Congratulatory Message

In a letter dated Nov. 3, 1961, Commissioner of Patents David L. Ladd addressed the following message to the Chief of Research and Development:

Dear General Trudeau:

It was with sincere appreciation that I received your letter concerning the role of the American Patent System in stimulating technological advancement and read your very kind remarks regarding the administration of the System.

As you know, the 125th Anniversary Celebration was the occasion to note the contribution of our System to the growth of our Nation and to assess the possibilities of service to the country in the future. I was happy to observe that members of your staff were present at the Anniversary functions and were active in achieving this basic purpose of the Celebration.

We are greatly indebted to you for the high interest held by you and the Office of Research and Development in our patent problems. I hope you will inform us if we may assist you in any way in the future.

Author Recognized Widely as Unusual Patents Collector

Few men have demonstrated a more enthusiastic and searching interest in patents and the patent system than Lt Col George F. Westerman, Chief of the Patents Division, Office of The Judge Advocate General, Department of the Army.

Recognized internationally as a collector of interesting and unusual patents, Col Westerman also has won acclaim as a lecturer with a broad knowledge of both the serious and humorous aspects of patents.

More than 15 years ago he served as an examiner in the U.S. Patent Office, and his professional interest soon became a fascinating hobby which has never flagged in its appeal.

Graduated from the University of Wisconsin with a B.S. degree in electrical engineering in 1939 and an LL.B. degree in 1947, he is a member of the Bar of the Supreme Court of Wisconsin, the United States Supreme Court,

case of the Venetian glass-blowers, these monopolies were given to artisans from abroad to induce them to migrate to England and to introduce there an art that had been developed in a foreign country.

Occasionally, monopolies were granted to inventors within the realm as a reward for their inventive efforts and as an incentive to others to make similar contributions to technological advance. Other times, and with increasing frequency, they were bestowed on court favorites or were sold to provide funds for the royal treasury. These grants were evidenced by open letters or "letters patent" from the king; by association, the term "patent" came to signify the grant itself.

The practice of granting monopolies was so abused in England that eventually many of the necessities of daily life were controlled by the holders of Letters Patent. Iron, oil, vinegar, coal, lead, yarn, leather, glass, salt, and paper were but a few of the commodities which had been appropriated to monopolists and could be bought at only exorbitant prices.

The situation became so bad that, in 1623, Parliament passed an act declaring all monopolies void. In this Statute of Monopolies, however, specific exception was made to permit the granting of monopolies for limited times, for the "sole working or making of any manner of new manufactures within this realm to the true and first inventor or inventors of such manufactures. . . ." This enactment provides the basis for the British Law of Patents.

At that time patents were also granted in Germany and France. Henry II of France introduced a novelty which still remains a basic principle of patent law, namely, that an inventor must fully disclose his invention so that the public may benefit

the United States Court of Claims, and the United States Court of Customs and Patent Appeals. He was graduated from the Armed Forces Staff College in 1957 and the Industrial College of the Armed Forces in 1961.



Lt Col George F. Westerman

Patents R&D Head Explains Problems Posed by Growth

Growth in responsibilities and problems of the U.S. Department of Commerce Patent Office are reflected in statistics used by D. D. Andrews, Director of Research and Development for the Office, in an address to the Metals Congress in Detroit on Oct. 27, 1961.

In 1830, six years prior to establishment of the present U.S. Patents System, only 6,170 patents were issued, covering a range of 16 classifications. By 1868 the number of classifications had increased to 36, by 1872 to 145, by 1878 to 158 and by 1961 to 58,882 subclasses. About 100,000 patents a year are being issued.

Patent Office examiners make about 250,000 searches each year, devoting an average of 3 to 4 hours per search. Filing and final fees for patents total about \$60, but the total Patent Office cost for each application disposed of is \$225—a total of approximately \$5 million annually for patents search.

As of November 1961 some 7,000,000 U.S. and foreign patents were listed in the classification system. The reproduction cost of classified search files is estimated at \$70 million, and the cost of maintaining and revising this system at \$750,000 annually.

Automation advantage is pointed up by expected cost of \$5 to \$10 for each accession to the machine search file, as compared to \$23 for manual file accession. Likewise, Patent Office cost for machine search for each application disposed of is quoted at \$16.

from it after the patent has expired.

The American colonists chose to follow the English system, and several of the colonies and States issued patents in their own names long before the Declaration of Independence.

It is not surprising with this historical background that when the final draft of the Constitution was adopted in September 1787, it contained the specific provision that:

"Congress shall have the power . . . to promote the progress of science and useful arts, by securing for limited time to . . . inventors the exclusive right to their . . . discoveries."

On April 10, 1790, President George Washington signed the bill which laid the foundations of the modern American patent system. Samuel Hopkins of Vermont, on July 31, 1790, received the first United States patent for a new process and apparatus for "Making Pot-ash and Pearl-ash." Since that time, a series of statutes have implemented the constitutional provision, the latest being Title 35 of the United States Code which became effective January 1, 1953.

During the Civil War, the Confederate States of America established a Patent Office which granted 266 patents, about one-third of which concerned implements of war. Yankee inventors were active in this field too as evidenced by the "Combined Plow and Gun" patented in 1862 by two New Yorkers who weren't taking any chances on being caught unprepared. The Republic of Texas also issued patents prior to joining the Union.

NATURE OF PATENT RIGHTS. A United States Patent is a grant from the Government to an inventor of "the right to exclude others from making, using or selling the invention throughout the United States" for a period of 17 years from the date the patent issues.

In return, the inventor must make

DECEMBER, 1961

3,000,000

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

Whereas Kenneth R. Eldredge, of Palo Alto, California, assignor, by mesne assignment, to General Electric Company, of New York, N. Y., a corporation of New York,

PRESENTED TO THE COMMISSIONER OF PATENTS A PETITION PRAYING FOR THE GRANT OF LETTERS PATENT FOR AN ALLEGED NEW AND USEFUL INVENTION THE TITLE AND A DESCRIPTION OF WHICH ARE CONTAINED IN THE SPECIFICATION OF WHICH A COPY IS HERETO ANNEXED AND MADE A PART HEREOF, AND COMPLIED WITH THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED, AND

Whereas UPON DUE EXAMINATION MADE THE SAID CLAIMANT IS ADJUDGED TO BE JUSTLY ENTITLED TO A PATENT UNDER THE LAW.

Now therefore these Letters Patent ARE TO GRANT UNTO THE SAID

General Electric Company, its successors

OR ASSIGNS

FOR THE TERM OF SEVENTEEN YEARS FROM THE DATE OF THIS GRANT

RIGHT TO EXCLUDE OTHERS FROM MAKING, USING OR SELLING THE SAID INVENTION THROUGHOUT THE UNITED STATES.

In testimony whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the City of Washington this twelfth day of September, in the year of our Lord one thousand nine hundred and sixty-one, and of the Independence of the United States of America the one hundred and eighty-sixth.

Attest:
Emmett S. Surder
Acting Officer.

Thoris R. Reed
Commissioner of Patents.

FORM PD 277A
(9-29-59)

a complete public disclosure of his invention, thereby enabling other individuals and the public in general to benefit from it, perhaps through stimulation of new ideas from its disclosure and in any event by use of the invention after the patent expires.

In other words, the deal between the Government and the patentee is simply this: The Government agrees to give a 17-year right to exclude others in exchange for the inventor's disclosure of his invention to the public.

The patentee must also clearly define the scope of the invention he claims, a necessary requirement to enable the Patent Office to state just what he is getting by his patent and to acquaint others with the exact boundaries of the field to which the "no trespassing" sign applies.

To give teeth to the right to ex-

clude, the law permits the patentee to enjoin use of his invention by those not authorized by him to do so and to sue for damages, as one might sue any trespasser upon one's property.

Unfortunately, the patentee often finds his right of exclusion illusory, for it is dependent upon the patent's validity, which is subject to attack in court on numerous grounds. Although a patent is, prima facie, valid when issued, a very large proportion of patents which are litigated are eventually held to be invalid.

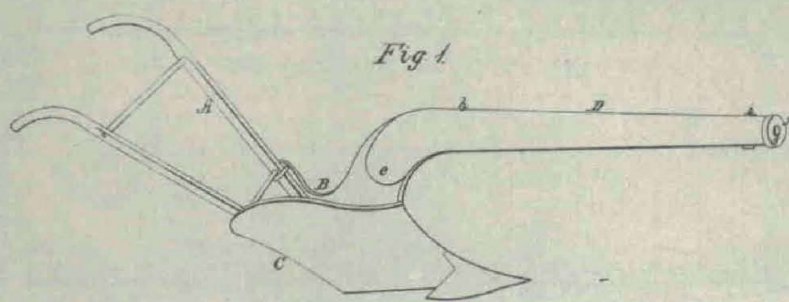
Most patents, however, never get into litigation, either because they are not infringed, because the patentee does not attempt to enforce them against infringers, or because settlements are reached with users and would-be users by the grant of licenses or other means.

(Continued, next page)

Plow

No. 36,600.

Patented June 17, 1862.



Early in the Civil War two villagers in New York State invented a plow, the hollow metal beam of which could alternate as a tongue to which to hitch a team or as a gun with which to fire ball or grape ammunition at marauders.

(Continued from page 15)

Contrary to a popular misconception, the protection afforded by a United States patent extends only throughout the United States, its territories and possessions and is not operative in a foreign country. Consequently, an inventor must file a separate patent application in each country in the world where he wants patent protection.

Another prevalent misconception is that a patent grants the inventor an exclusive right to make, use and sell his patented invention. This idea is inaccurate. The patent gives to its owner "the right to exclude others" from making, using, or selling the patented invention, but the mere issuance of a patent carries with it no assurance that the inventor, or anyone else, has a right to practice the invention.

The reason that the patent cannot guarantee the right to use the invention is simply that someone else may own a prior patent on some essential part of the invention.

To illustrate this point, let's go back to the days before there were any chairs. Jones, while sitting on a somewhat cool and damp spot of ground, is suddenly inspired to build the first chair. Even though Jones then obtains a basic patent covering his chair, it is still possible at some later date for Brown to be granted a patent covering a chair mounted on rockers. However, Brown cannot make his rocking chair until after the expiration of the patent on the first chair unless he comes to some agreement with Jones.

As a practical matter, what usually happens in this situation is that Brown sells Jones a license, or trades him a license to make rocking chairs in exchange for a license under Jones' patent. In this way, either one or two manufacturers of the improved chair are set up and the public gets the benefit of both inventions.

The patent system must operate in this manner. Otherwise, Jones' rights

would have vanished in thin air as soon as Brown made his improvement on Jones' invention. And you can imagine what would happen to Jones' incentive to invent in such a situation!

Thus, we see that all a patent really does is give the patentee the right to exclude, or to try to exclude, others from the enjoyment of the invention during the term of the grant, except under such conditions as the patentee may dictate.

A patentee's right to use his own invention is not only dependent upon the patent rights of others but also on whatever general laws might be applicable. For example, an inventor of a new automobile, simply because he has obtained a patent, would not be entitled to use it in violation of the laws of a State requiring a license. Neither may a patentee, by virtue of his patent, violate the Federal Anti-trust laws by conspiring with his competitors to fix prices or by engaging in other practices which are banned by those laws.

WHAT CAN BE PATENTED.

Title 35 of the United States Code specifies the general field of subject matter capable of being patented and the conditions under which a patent may be obtained. In order to be patentable, an invention must fall in one of six statutory classes. Thus, a patent can be issued on a "process, machine, manufacture, or composition of matter," an ornamental design and certain kinds of plants.

PROCESS. In the patent sense, a process is an operation or series of operations performed on matter to effect a desired change in form, proportions, or composition. It may be a method involving successive physical or mechanical steps, such as are employed in the slitting and stretching of sheet metal to make the familiar expanded metal or metal lath used as a support for plaster in building construction. Or the process may be purely chemical, as in Goodyear's vulcanizing of rubber by heating it in the presence of sulphur. Or it may

be a combination of physical and chemical steps, as in the invention of Bakelite.

To be patentable, a process must be associated with some tangible means for operating it. It is for this reason that methods for performing a mental operation or for doing business or for keeping accounts are not patentable as divorced from mechanical means for conducting these operations such as electrical computers and various types of business machines.

MACHINE. A machine is a combination of mechanical elements acting on matter to produce a desired result. A good example of this statutory class of inventions is Eli Whitney's cotton gin which made possible the great textile industry of later years. If there is any doubt whether or not a thing is a machine, it usually can be termed an article of manufacture, which is the next classification of invention.

MANUFACTURE. The term manufacture, as used in the patent law, has a very comprehensive sense, embracing whatever is made by the art or industry of man, not being a machine, a composition of matter, or a design. It could be a building structure, a screwdriver, a collar button, or an electric circuit.

COMPOSITION OF MATTER. Many substances or materials, regardless of the form of the articles made from them, may be the subject of patents. These constitute the fourth category or class of inventions, namely, compositions of matter. A composition of matter is a chemical substance or combination of substances, of which the list of examples is endless and specimens are all about us. Glass, the great variety of things encompassed by the popular term "plastics," alloys, paints, explosives—all are compositions of matter.

A rather unusual composition of matter is described in U.S. Patent No. 939,431, issued to Friedrich Wilhelm Emil Muller in 1909 for "a hair tonic, consisting of pure water, 2 percent; an extract of ripe black currants, 25 percent; granulated sugar, 5 percent; best corn whiskey, 40 percent; and port wine, 20 percent." Although the efficacy of this composition in growing hair remains somewhat obscure, it was served as a cocktail at the Centennial Celebration of the American Patent System on Nov. 23, 1936.

IMPROVEMENTS. The statute also specifies that patents may be issued on new and useful improvements of the foregoing classes, thereby providing for "Improvement Patents" as well as "Basic Patents."

ATOMIC ENERGY ACT EXCLUSIONS. The above classes of subject matter, taken together, include practically everything which is made by man and the processes for making them. The Atomic Energy Act of 1954, however, prohibits the patenting of inventions useful solely in the utilization of special nuclear material or atomic energy in a military weapon.

(To be continued next month)

Authors Selected for 96 Army Science Conference Papers

(Continued from page 1)

Evaluation of the importance of the research paper proposals began with review by chief scientists and chiefs of each of the Technical Services concerned. Proposals from other Army R&D agencies were reviewed by U.S. Army Research Office scientists.

Based on quotas established for each of the Technical Services and other agencies, the Senior Scientists Advisory Council met in November and selected 96 proposals from a total of 145 recommended for final evaluation.

The final choice recognized the desire of the Chief of Research and Development to have papers presented at the Army Science Conference significantly representative of the diversity and depth of Army scientific interests.

Authors selected to prepare presentations are required to submit them through channels to reach the Army Research Office by Mar. 6, 1962. Papers will be judged first by the chairmen of each of the four technical sessions scheduled at the Army Science Conference. Final evaluation will be made by a panel of eminent scientists from outside the Army.

Recommendations for appropriate honorariums and Certificates of Merit signed by the Chief of Research and Development will be submitted to the Army Incentives Award Board for approval. Approximately 20 papers are expected to receive "outstanding" recognition at the conference.

Titles of papers to be presented, authors and their place of employment follow:

"The Krait Fuze System," James Salerno and Frank Weiss, Diamond Ordnance Fuze Laboratories (DOFL). "Nuclear Timer," R. H. Comyn and M. Apstein, DOFL. "Measurement of Transient Pressures in the Range of Very High Intensity," G. E. Hauver and R. J. Tichelberger, Ordnance Ballistic Research Laboratories (BRL). "COCODE Radar," C. H. Cash and R. A. Boot, Army Rocket and Guided Missile Agency (ARGMA).

"Design and Operating Criteria for the ARGMA 8000KW Plasma Facility," J. J. Ehrlich and T. A. Barr, Jr., ARGMA. "Spectroscopic Analyses of Plasmas," T. G. Roberts and W. L. Hales, ARGMA. "Blast Effects of Simultaneously Detonated Multiple Explosive Charges," A. J. Hoffman and B. F. Armandt, BRL.

"Provisional Estimates of the Wounding Potential of Any Penetrating Missile as Based on a Simple Experimental Procedure," J. Sperazza, BRL. "Armament for the Helicopter," Mogan G. Smith, BRL. "Effects of Gamma-Ray Irradiation on Five Plastic Bonded High Explosive Compositions," J. E. Mapes, F. R. Schwartz, J. V. R. Kaufman and Paul W. Levy, Picatinny Arsenal.

"Scientific Ways and Means for Selecting Optimum Weapons Systems," A. Go'ub and D. O'Neill, BRL. "Some New Calculational Techniques in Neutron Shielding," F. J. Allen, BRL. "Application of the Principles of Fracture Mechanics to Recoilless Rifle Problems," C. M. Carman, Frankford Arsenal. "Static Fatigue Fracturing of High Pressure Gas Vessels, Causes and Prevention," F. R. Larson, Watertown Arsenal.

"The Contribution of Solid State Physics to an Understanding of the Properties of Materials," K. J. Tauer and R. J. Weiss, Ordnance Materials-Research Office. "The Role of Electron Configuration on Properties in Dilute Transition Element Alloys," E. P. Abrahamson, III, Watertown Arsenal. "Studies of Nondestructive Testing Techniques to Control Properties of Case Hardened Steel Components," R. Korytowski, Springfield Armory,

"A Pulsing Blood Pump without Electronics or Moving Control Parts," K. E. Woodward, Dr. Timothy Barila, Dr. Daniel Nunn, George Mon and H. Straub, DOFL. "Dynamic Simulator," F. Pradko, Army Ordnance Tank-Automotive Command. "Studies of Rifle Effectiveness," L. F. Moore, Development and Proof Services, Aberdeen Proving Ground.

"The Cover System," Solomon Levine and H. C. Webb, Sr., DOFL. "Evaluation of Hypersonic Probe Materials in a Water Stabilized Electric Arc at Temperatures to 3200°C (5795°F) for 60 Seconds," D. J. Molella, Picatinny Arsenal. "An Apparatus to Measure the Bulk Modulus of Solid Propellants," N. C. Wogslund, BRL.

"Determination of the Critical Torque Inducing Buckling in a Twisted Spherical Shell Subject to Internal or External Pressure," Dr. M. A. Sadowsky and Dr. C. C. Mow, Watervliet Arsenal. "Launcher Dynamics Summary," Robert Coberly, Rock Island Arsenal. "Exothermic Reactions Behind Reflected Shocks," Arthur Cohen and R. A. Strehlow, BRL. "The Doploc Dar Satellite Tracking System," A. L. G. de Bey and V. W. Richard, BRL.

"High Altitude Lethal Mechanisms," F. J. Allen, BRL. "Synthesis of Carboxy Terminated Polybutadiene for Propellant Binder Use," H. C. Allen and C. W. Huskins, ARGMA. "High Energy Additives in Plastisol Nitrocellulose Propellants," O. E. Ayers, C. D. Howard and C. W. Huskins, ARGMA. "A Study of HAW (Long Range Time Period)," D. C. Hardison, BRL.

"Nuclear Altimeter," George Taylor, Army Ordnance Special Weapons Ammunition Command. "Microwave Diagnostics in Shock Generated Plasma," F. L. Tevelow and H. D. Curchock, DOFL. "Atmospheric Turbulence and Optical Communication," H. W. Straub and R. R. Ulrich, DOFL. "Antimissile Fuzing," C. Ravitsky, DOFL.

"Laboratory Studies of Upper Atmosphere Chemical Reaction," Fredrick Kaufman and J. R. Kelso, BRL. "The Radiation Chemistry of Liquid Nitrogen Dioxide," T. C. Castorina, A. O. Allen and E. R. Johnson, Picatinny Arsenal. "Thermal Decomposition of Lead Azide in Various Environments," Bruno Reitzner, J. E. Abel and J. V. R. Daufman, Picatinny Arsenal.

"Non-Newtonian Behavior of Hydraulic Fluids under Conditions of High Pressure, Rapid Acceleration and High Local Velocity," B. A. Howard, Jr., Ordnance Weapons Command. "Determination of the Geometry of Hidden Defects by Ultrasonic Pulse Analysis," O. R. Gericke, J. J. Maguire, Watertown Arsenal.

"Sulfamylon (R) (Mafenide) and Penicillin as Expedient Treatment of Experimental Massive Open Wounds with C. Perfringens Infection," J. A. Mendelson, Chemical R&D Laboratories, Army Chemical Center. "Purification and Concentration Methods in the Development of Viral and Rickettsial Agents," R. F. Wachter, Chemical Biological Laboratories (CBL).

"DNA Isolation by an Improved Procedure for Transformation of Bacillus Sp.," I. C. Felkner, CBL. "X-ray Studies," R. A. Fast, Nuclear Defense Laboratories, Army Chemical Center. "Development and Evaluation of Tularemia Vaccines," H. T. Engelsbach, W. D. Tigertt and S. Saslow, CBL. "Clinical Features of the Model Psychosis Produced by Belladonna Alkaloids and Related Synthetic Compounds," J. S. Ketcham and E. P. Goodman, CRDL.

"A Continuous In Vivo Method of Assaying the Effect on Whole Blood Cholinesterase of Lethal Anticholinesterase Agents," V. M. Sim, William Graff and L. A. Stennberger, CRDL. "Ecological and Epidemiological Aspects of Biological Field-Testing at Dugway Proving Ground," J. S. Palmer, Chemical Corps Dugway Proving Ground (CmC DPG).

"Leak Localizer for Use in Chemical Plants Manufacturing Toxic Agents," R. G. Eaton, CmC Engineering Command. "Production Problems of Biological Materials," T. Shook, G. Savage and J. Berky, Pine Bluff Arsenal. "Some Evidence of Toxicant Death in the Rhesus Monkey by" B. Anthracis, Frederick Klein, Dean Hodges, B. G. Mah'and, W. I. Jones and R. E. Lincoln, CBL. "Chemical Amplifiers in the Development of an Expendable Detector for V-, G-, and H-Agents," E.

J. Poxiomek, F. Balck, D. N. Kramer and B. W. Fromm, CRDL.

"Materials for Biochemical Applications," Dr. Fred Leonard, C. N. Nielson and Joshua Nelson, U.S. Army Prosthetics Research Laboratory. "Radioactive Tracer Studies of Vitamin C Utilization: Metabolism of D-Gluconolactone-6-C¹⁴, D-Gluconic Acid-6-C¹⁴ and L-Ascorbic Acid-1-C¹⁴ in Man," Maj. E. M. Baker, H. E. Sauberlich and S. J. Wolfskill, U.S. Army Medical Research and Nutrition Laboratory, Fitzsimons General Hospital.

"Cold Acclimatization in Man and its Military Application," Dr. T. R. A. Davis and Capt. R. J. T. Joy, U.S. Army Research Institute of Environmental Medicine. "Wound Healing, Collagen, and Humoral Growth-Promoting Agents," Hyman Rosen, Capt. C. W. Berard and Dr. S. M. Levenson, Walter Reed Army Institute of Research (WRAIR). "Peritoneal Dialysis in the Treatment of Post-Traumatic Renal Failure," Capt. Thomas E. Davis, WRAIR.

"A Novel Carbohydrate Reaction," Louis Long, Jr., D. H. Ball and A. K. Mitra, QM R&E Command. "Regeneration of Food Flavors through Enzymatic Action," Torsten Hasselstrom, S. D. Bailey and E. T. Reese, QM R&E Command. "Maximizing Performance through Dietary Management," D. R. Young, QM Food and Container Institute (QMFCI).

"Replacing THPC in the APO-THPC Resistant Finish for Textiles," T. Miles, F. Hoffman and A. Merola, QM R&E Command. "Organometallic Research Using Group IV Elements," M. E. Henry, J. G. Noltes, Wensel Davidson and Adolf Krebs, QM R&E Command. "Solution of Non-Steady Soil Moisture Transfer," W. D. Ohmstedt, U.S. Army Electronic Proving Ground.

"Generation and Control of an Outdoor Electromagnetic Environment through Automatic Means," Capt. G. D. Brosious, U.S. Army Electronic Proving Ground. "Mesospheric Density Variability Based on Recent Meteorological Rocket Measurements," O. W. Thiele, U.S. Army Signal Missile Support Agency. "A Mathematical Model for a Ballistic Rocket," E. L. Walter, U.S. Army Signal Missile Support Agency.

"Ultra High Pressure-High Temperature Research: A Frontier in the Quest for New Electronic Materials," A. A. Giardini and J. A. Kohn, U.S. Army Signal Research and Development Laboratory (USASRD). "Investigations on a Beam Waveguide for Optical Frequencies," G. Goubau and J. R. Christian, USASRD. "Magnetic and Telluric Detection of High-Altitude Nuclear Explosions: Part II Theoretical Interpretations," W. Ramm and S. Goldblatt, USASRD.

"Secondary-Electron Emission by Single High-Frequency Heavy Particles," S. Kronenberg, K. Nilson and M. Basso, USASRD. "Effects of Ionizing Radiation on Pyridine," C. Pearce, USASRD. "Growth of Hexagonal Ferrite Single Crystals for Application at Microwave and Millimeter-Wave Frequencies," A. Tauber and R. O. Savage, USASRD.

"A Laser Ranging System," R. C. Benson, R. O. Godwin and M. R. Mirarchi, USASRD. "Fast Wave Radiators," L. Hatkin, USASRD. "A Simple Solid State PME Detector for Laser Signals," A. Boatright and H. Mette, USASRD. "Microwave and Infrared Modulation using Free Carriers in Bulk Semiconductors," H. Jacobs, F. A. Brand and J. D. Meindl, USASRD.

"Applications of Statistical Communication Theory," B. Goldberg, USASRD. "Polarization Sensitivity as a Means of Identifying Cultural Targets in the Presence of Natural Clutter," R. L. Dunn, USASRD. "The Attenuation of Radiowaves Propagated through the Region of a High Altitude Nuclear Explosion," W. S. McAfee, USASRD.

"Combat Surveillance Correlation Radar," W. Fishbein and O. E. Rittenbach, USASRD. "Air Blasts in an Arctic Environment," L. F. Ingram, Waterways Experiment Station (WES). "Surfacing Submarines through Ice," Dr. Andrew Assur, Cold Regions and Engineering Laboratory (CRREL). "Shock Wave Attenuation Properties of a Bubble Screen," J. N. Strange, WES.

"Recognition of Subsoil Targets by Means of Microwaves," Karl Steinbach and F. B. Varnum, U. S. Army Engineer Research and Development Laboratories (ERDL). "Aerial

(Continued on page 19)

USALMC Adding Course in R&D Project Administration

The U.S. Army Logistics Management Center (USALMC) at Fort Lee, Va., is developing a resident course in Research and Development Project Administration, in response to a request from Lt Gen Arthur G. Trudeau, Chief of Research and Development.

Tentatively scheduled to start soon after the beginning of the next fiscal year in July, the 3-week course will cover areas of Army R&D related to the logistics function, contracts and grants, administrative policies and management controls.

The Army R&D Project Administrator's Course curriculum is designed for military and civilian personnel engaged as staff officers and assistants or as contracting officers.

Addition of the new course marks another step in the continuing expansion of an integrated training program planned to keep pace with the mounting problems of logistics management since the start of World War II.

The Army Supply Management Course was initiated at Fort Lee in October 1954. Attendance then was restricted to military personnel in the grade of lieutenant colonel and above and civilian employees in the grade of GS-11 or higher.

Need for training mid-management personnel in specific functional areas became increasingly apparent, leading to establishment of the USALMC May 1, 1956, under operational control of the Deputy Chief of Staff, Logistics.

Within the next two years the USALMC developed a series of functional courses ranging from two to eight weeks in length while continuing the 12-week Army Supply Management Course. Eleven resident courses were offered at the beginning

PER Schedules January Visits To Environmental Facilities

Human aspects of medical application in various environments will be the main topic of discussion at the meeting of the Panel on Environmental Research (PER) at the Medical Corps Research Center, Fort Totten, N.J., Jan. 16-18, 1962.

During the 3-day meeting, PER members will visit Republic Aviation's Space Environment and Life Sciences Laboratory, Farmingdale, N.Y., and Picatinny Arsenal, Dover, N.J., to study environmental test facilities.

More than 70 professional personnel heard presentations of technical documents at the last PER meeting in October at Fort Eustis, Va.



Col Frank White

of the current academic year, including seven designed primarily for Army officers and DA civilian employees. Four courses are offered or scheduled for officers and civilians from the Army, Navy and Air Force.

Courses currently offered to Army personnel include Supply Management, Requirements Management,

Distribution Management, Maintenance Management, Specification Management, and Logistics Management Development.

The USAIMC's joint training mission was assumed in July 1960 with establishment of the Armed Forces Surplus Disposal Management Course. Since then the Armed Services Procurement Management Course (six weeks) and two specialized procurement courses of two weeks each have been added. Current planning calls for two additional procurement courses to be phased in during the third quarter of FY 1962.

The USALMC's joint training missions from its resident courses during the past fiscal year. This figure is expected to increase substantially by June 30, 1962.

Planners of the new Army Research and Development Project Administrators Course expect it will make an important contribution to more effective administration of Army R&D activities, in line with the mission stated on the insignia of the USALMC: "To Manage Our Resources Wisely."

Mathematicians Consider Reports at ARO-D Meeting

Several reports occupied the attention of the Twelfth Meeting of the Army Mathematics Steering Committee at the Army Research Office-Durham, N.C., Nov. 30-Dec. 1.

Dr. John H. Giese, Aberdeen Proving Ground, Md., submitted a preliminary report on an information retrieval survey. Joseph Weinstein, Director of the Mathematics Division, U.S. Army Signal Research and Development Laboratories, reported on the Conference on Design of Experiments held in October at Fort Monmouth, N.J.

Dr. R. E. Langer, Director of the

Army Mathematics Research Center, gave a report on progress at the Center and projected work for the ensuing six months. Dr. F. J. Murray, Director of Special Research in Numerical Analysis at Duke University, gave a similar report on progress and projected work in his program.

The Steering Committee was briefed on the activity of the Army Research Office-Durham by members of the ARO-D staff.

Dr. Ivan R. Hershner, Jr., Chief, Physical Sciences Division, U.S. Army Research Office, presided.

NSF Manpower Bulletin Gives Scientist Statistics

Nearly 22 percent—better than one of every five—of all the full-time employed scientists in the United States live in New York, New Jersey or Pennsylvania. Moreover, scientists from these three States have the highest median salary, \$10,000, as compared with the national median of \$9,000.

These and other facts on the geographic distribution of U.S. scientists are contained in a preliminary report *Scientific Manpower Bulletin No. 15* published recently by the National Science Foundation.

Of the 112,432 scientists reporting to the National Register of Scientific and Technical Personnel, on which the report is based, 24,528 are from the three Middle Atlantic States. The lowest number of scientists reporting, 3 percent or 3,833, come from the East South Central States (Alabama, Mississippi, Kentucky, and Tennessee).

While the Middle Atlantic States possess a large proportion of scientists in nearly every major scientific and technical field, the report notes three significant exceptions:

About one-third of all earth scientists are from the West South Central region (Arkansas, Louisiana, Oklahoma, and Texas) and another 18 percent are from the Mountain States. Of all earth scientists, those in the West South Central States have the highest median salary. Many were associated with oil exploration and extraction in these States.

Four ERDL Employees Earn Superior Performance Awards

Four employees of the U.S. Army Engineer Research and Development Laboratories, Fort Belvoir, Va., recently received "Sustained Superior Performance" and cash awards.

They are: Donald P. Easter and Hyman Rosenwasser, \$250 each, in recognition of their work with the Basic Research Group; Joseph Modlens, \$200, for his work with the Technical Photographic Branch; and Daniel F. McCaffert, \$200, for his work as administrative assistant in the Military Department.

An award of \$100 was presented to John F. Christian for his invention of an eye-wash fountain, for which he received a patent last August. An award of \$50 went to John S. Pace, Jr., for his invention disclosure for a fluid lock. James P. Arnold, Jr., received \$25 for suggesting that a safety film dealing with mouth-to-mouth resuscitation be shown to Laboratory personnel.

DECEMBER, 1961

Twenty-two percent of employed meteorologists are from the South Atlantic region (Delaware, Florida, Georgia, Maryland, North and South Carolina, Virginia, West Virginia, and the District of Columbia), illustrating the importance of the Government as an employer of these scientists, many of whom work for the U.S. Weather Bureau.

Agricultural scientists are more heavily concentrated in the South and West, with 18 percent in the South Atlantic, 14 percent in the Mountain, and 21 percent in the Pacific States.

Types of employers of scientists vary considerably according to geographic region, the report shows. Scientists in industry, business, or who are self-employed are heavily concentrated in the Middle Atlantic and East North Central States. The largest number of scientists employed by the Federal Government is in the South Atlantic region, which includes Washington, D.C.

The *Bulletin* presents statistical tables and discussions of employed scientists by region, salary, field of science, type of employer, and type of work activity. Entitled "Geographic Distribution of Scientists in the National Register of Scientific and Technical Personnel, 1960," it is available on request from NSF. A comprehensive analysis on the full number of returns to the National Register—200,000—is under way and a full report will be available in early 1962.

Morton Stromberg, an employee of the U.S. Army Engineer Geodesy, Intelligence, and Mapping Research and Development Agency, Fort Belvoir, was awarded a "Sustained Superior Performance" award and \$200 in recognition of his work in the Photogrammetry Division.



Designed to skim about a foot above land or water at speeds up to 50 m.p.h., the Ectijet experimental air car, 20 x 10 feet, is being built for U.S. Army evaluation by The Martin Co., Orlando, Fla.

CE Lists 4 District Offices To Support NASA Program

Four District Engineer Offices have been designated by the Army Corps of Engineers to assist in acquiring real estate and design and construction of new facilities for the National Aeronautics and Space Administration (NASA).

Responsibilities for the four Districts follow: The Jacksonville District Engineer, for new design and construction at the Cape Canaveral Test Center; the Fort Worth District Engineer, for facilities making up the Manned Spacecraft Laboratory near Houston, Tex.; the Mobile District Engineer, for the land acquisition and easements in connection with the development of a static test facility for SATURN and NOVA class boosters in southwest Mississippi, on the Pearl River; Los Angeles District Engineer, for the design and construction of test stands for the F-1 engines at Edwards Air Force Base Test Center, Calif.

Army Science Conference

(Continued from page 17)

Detection of Snow Surface and Undersnow Targets," Dr. J. N. Rinker, CRREL. "Processes of Photon and Exo-electron Emission from Alkali Azides," H. J. Mueller, H. D. Tiller and G. D. Singer, ERDL.

"Classification of Landscape Geometry for Military Purposes," C. R. Koeb, WES. "Radar Mapping Systems," R. P. Macchia, Geodesy, Intelligence and Mapping Research and Development Agency (GIMRADA). "Feasibility of Non-Metallic Mine Detection by Earth's Magnetic Field Distortion," S. L. Carls, Jr., and P. K. Webb, ERDL.

"An Operations Research Model of Motor Truck Transport Derived from Nuclear Transport Theory," H. Charlton and J. Nebbitt, Transportation Research Engineer Command. "A Basis for the Long-Range Planning of Army Research," G. H. McClurg, U.S. Army Research Office, OCRD. "Field Experimentation as an Aid to Operations Research," Col F. J. Murdoch, Jr., Combat Developments Evaluation Center.

"A Model for Evaluating Surface-to-Surface Firepower," O. S. Spears, U.S. Army Artillery and Missile School. "Interaction of Photons and Electrons at Very High Light Intensities," H. R. Roll, U.S. Army Research Office-Durham (ARO-D). "The Error Field Associated with Instrumentation for Position Determination," T. H. W. Schmidt, ARO-D. "Optimizing Image Interpreter Performance," Robert Sadacca, The Adjutant General, Research & Development Command.



By Dr. Ralph G. H. Siu
Technical Director, R&E, OQMG

TENDENCY TO FEMINITY—Lecturer Anne Roe of Harvard University's Graduate School of Education summarized the results of a number of studies on the personality patterns of productive scientists. She listed them in six groups in her article in the August 18, 1961 issue of *Science*, as:

"1) Truly creative scientists seek experience and action and are independent and self-sufficient with regard to perception, cognition, and behavior. These findings have been expressed in various studies in such terms as the following: they are more observant than others and value this quality; they are more independent with respect to cognition and value judgments; they have high dominance; they have high autonomy; they are Bohemian or radical; they are not subject to group standards and control; they are highly egocentric.

"2) They have a preference for apparent but resolvable disorder and for an esthetic ordering of forms of experience. They have high tolerance for ambiguity, but they also like to put an end to it in their own way—and in their own time.

"3) They have strong egos (whether this derives from or is responsible for their independence and their tolerance for ambiguity is a moot question). This ego strength permits them to regress to preconscious states with certainty that they will return from these states. They have less compulsive superegos than others. They are capable of disciplined management of means leading to significant experience. They have no feeling of guilt about the independence of thought and action mentioned above. They have strong control of their impulses.

"4) Their interpersonal relations are generally of low intensity. They are reported to be ungregarious, not talkative (this does not apply to social scientists), and rather asocial. There is an apparent tendency to femininity in highly original men, and to masculinity in highly original women, but this may be a cultural interpretation of the generally increased sensitivity of the men and the intellectual capacity and interests of the women. They dislike interpersonal controversy in any form and are especially sensitive to interpersonal aggression.

"5) They show much stronger preoccupation with things and ideas than with people. They dislike introversion and affect-associated preoccupations, except in connection with . . . research.

"6) They like to take the calculated

Army Warhead Transporter Stands Out in Rail Tests

Tests to determine the relative performance of an Army warhead section transporter system and a standard Class A boxcar during rail impacts demonstrated definite superiority of the transporter in reducing the level of shock.

Results of the tests, carried out jointly by the Ordnance Corps and the Transportation Corps at the working level, were summarized as follows:

- The standard commercial class A boxcar either without idler cars or with only one idler car at each end does not provide the desired degree of protection and safety within the limits of the environmental characteristics for nuclear weapons. (An idler car is an empty car placed between two cars that support the load.)

- The standard commercial Class A boxcar with two idler cars at each end provides marginal protection and safety. The shock forces approached those of the transporter without idler cars.

- The Army warhead section transporter without idler cars provides better than marginal protection and safety. However, to provide the desired degree of protection and safety, one idler car should be employed at each end until such time as improve-

ments in the cushioning mechanisms can be made to reduce the shock magnitude commensurate with that when one idler car is used. In cases where two or more transporters make up a consist (make-up of a train), the idler car should be at the end of the consist.

The Army warhead section transporter with one idler car reduced the maximum peak shock forces to acceptable levels. Higher impacts than those made during the tests (8.1 miles per hour) could be made without approaching the environmental shock levels for nuclear weapons. Test results indicate that this method is preferred and offers greater shock and damage-free protection and thereby higher practicable safety limits within the environmental criteria.

A description and results of the test program were discussed in a paper by L. J. Pursifull, U.S. Army Transportation Research Command, Fort Eustis, Va., at the 30th Shock and Vibration Symposium in Detroit.

The special transporter used in the tests consists of an 85-foot flatcar with two vans mounted on it. Each of the vans is mounted on a turntable device having a built-in shock reduction mechanism that allows a maximum travel of 8 inches. The turntables enable the vans to be off-loaded.



Army warhead section transporter van is swiveled on shock-reducing turntable to permit offloading from flatcar for highway movement.

risk, but it must involve nature, not people, and must not depend upon simple luck."

THAT CERTAIN FEELING. "Child," Lord Arglay said, "I am an old man and I have known nothing all my life farther or greater than the work I have taken to do. I have never seen a base for any temple nor found an excuse to believe in the myths that are told there. I will not say believe or do not believe. But there is one thing only of which I have wondered at times, and yet it seemed foolish to think of it. It will happen sometimes

when one has worked hard and done all that one can for the purpose before one—it has happened then that I have stood up and been content with the world of things and with what has been done there through me. And this may be pride, or it may be the full stress of the whole being and delight in labour—there are a hundred explanations.

But I have wondered whether that profound repose was not communicated from some far source and whether the life that is in it was altogether governed by time. And I am sure that state never comes while I am concerned with myself. . . ." (Excerpt from "Many Dimensions" by Charles Williams).

French Craneman Displays Novel Bottle-Corking Idea

For the man who has everything—including a private bar—a recent demonstration of new French Army heavy engineer equipment at Angers, France, may provide a suggestion for a novel Christmas gift.

Among the equipment were 4- and 8-ton cranes. A narrator told American officers and enlisted men of the 4th Logistical Command, for whom the demonstration was staged, that the men at the crane controls were not professional operators; they had, at most, eight months of military service behind them.

Whereupon, amid applause the operator of the 4-ton crane used his machine to cork a narrow-necked bottle.

GIMRADA Employees Recognized

Clarence W. Kitchens, Sr., and Nelson K. Freeny, civilian employees of the U.S. Army Engineer Geodesy, Intelligence and Mapping Research and Development Agency, Fort Belvoir, Va., recently received "Sustained Superior Performance" awards.

In recognition of his work in the Surveying and Geodesy Division, Mr. Kitchens was presented an award of \$250 and Mr. Feeny, for his work in the Photogrammetry Division, received \$200.



Brig Gen Chester W. Clark, Assistant Chief of Ordnance for Research and Development, and Don M. Muchmore, Director of the California Museum of Science & Industry, examine mathematical model developed by Kim Gibson (left), one of six outstanding high school science students who presented papers at a recent Junior Science Symposium in Los Angeles. Cosponsored by the Museum and the International Business Machines Corp., the symposium was one of 15 scheduled in FY 1962 under sponsorship of the Chief of Research and Development, Department of the Army.

SC Device Counts, Measures Raindrops

An electronic device that counts and measures the size of raindrops has been developed by the Research Division of New York University's College of Engineering in cooperation with the U.S. Army Signal Research and Development Laboratory, Fort Monmouth, N.J.

Developed to meet the technical requirements of the U.S. Army Signal Corps, the raindrop sizer and counter is designed to be placed outdoors, in a drizzle or a downpour, to collect information on all the raindrops that fall through an area about one and one-quarter inches square. It measures drops in 13 sizes, ranging from drops less than one-hundredth of an inch wide to those more than an eighth of an inch in diameter, and it can count as many as 10,000 drops a minute of each size.

All the information is sorted out by electronic circuits and stored in a memory unit, which can be placed in a shelter some distance away. The memory unit stores the data for as long as a minute and then records it on punched tape. Later, the tape record of several hours of rainfall can be fed directly into a computer for analysis.

Knowing the size and number of raindrops in various situations is more than a matter of scientific curiosity—it is increasingly necessary. Weather researchers need the information to understand how rain forms and to perfect radar measurements of water particles in the atmosphere. Soil scientists need to fill in their picture of erosion. Safety engineers and aircraft designers must know the size and number of raindrops to determine the effects of rain on jet engines and the surfaces of supersonic aircraft and missiles.

The device includes several pieces of equipment. One is a light source that projects a beam of intense and uniform light. A viewing system, placed at an angle to the light beam, "sees" all the raindrops falling through a 1¼-inch-square section of the light beam.

WES Official Granted Secretary of Army Fellowship

Dean R. Freitag, Chief of the Mobility Section, Army Mobility Research Center, Waterways Experiment Station at Vicksburg, Miss., has been awarded a Secretary of the Army Research and Study Fellowship.

The major portion of his year of research to advance knowledge of soil mechanics will be done in cooperation with the National Machinery Tillage Laboratory of the U.S. Department of Agriculture, Auburn, Ala. He will also attend selected courses at Auburn University.

Mr. Freitag was graduated from Iowa State University in 1949 and received an M.S. degree in civil engineering from Harvard University. With the exception of a year with the California Division of Highways, his entire career has been with the Soils Division of the Waterways Experiment Station. He is a member of the American Society of Civil En-

A series of lenses in the viewing system projects the images of the falling drops onto a series of 14 horizontal "windows." Each of the windows is the edge of a tapered strip of lucite which is connected at its opposite end to a photo-multiplier detector tube.

Each window is separated from the next by a gap. The gap between the top window and the next lower is 0.2 millimeters, the gap between the second and the third is larger, and so on down through the series. The gap between the bottom two windows is 3.5 millimeters.

When a raindrop falls through the light beam its image moves across the set of windows, triggering a series of electrical impulses. When the image reaches the space that is as wide or wider than itself, the circuits "count" it, record its size, and send the information to the memory unit. The raindrop itself is not captured or interfered with either before or after it is measured.

The raindrop sizer and counter could be modified in several ways. More windows could be used to increase the number of size channels; or fewer, if desired. Spherical objects other than raindrops could be counted and sized at high speed. Smaller models could be carried aloft by balloons for high-altitude research.

The project began in the spring of 1960 with Alan Nathan, senior research scientist at NYU, directing work for the University, and Dr. Helmut K. Weickmann in charge of the project for the Meteorological Division of the Army Signal Research and Development Laboratory. Assistants included NYU research scientists Leon Bennett and Constantine Makris and USASRD researches Robert W. Fenn and Andrew Petriw.

gineers and the American Society of Agricultural Engineers and an Associate of the Highway Research Board.



Dean R. Freitag

MWDP Strengthens Free World Defense by Integrating R&D

Strengthening of Free World defenses through integrated research and development effort, directed toward significant armament and materiel advances at less cost, is demonstrating the soundness of the Mutual Weapons Development Program (MWDP).

U.S. Armed Forces have participated in the MWDP since it was established by the U.S. Congress through a provision of the Mutual Security Act of 1953. The function of the MWDP provides for increasing mutual support between the U.S. and its NATO allies in selective areas of military R&D, exclusive of nuclear weapons, on a cost-sharing basis.

Aside from helping NATO nations develop their own weapons ideas and getting better mutual defense for less money, the U.S. Army has recently encouraged another aspect of the program: private industry's interest in technical Data Exchange Agreements.

Under these Data Exchange Agreements, the MWDP mobilizes the scientific and technological skills of the Western community towards solving common R&D problems through the release of selected technical information.

Through these exchanges, U.S. industry interested in fields of R&D covered in the Agreements is provided a government-to-government channel for direct contact at the project officer level. Army policy has been to inform U.S. firms or agencies of Data Exchange Agreement material whenever a company has expressed an interest or desire to cooperate with foreign agencies.

The Army now has 113 Data Exchange Agreements established and 138 proposed, covering practically all aspects of research and development.

Dr. Herbert F. York, former Director of Defense Research and Engineering, said "The program (MWDP) is one of our Nation's best investments in the future of the Free World."

In a special message to Congress in May, President Kennedy said "We have learned to keep our defenses strong, and to cooperate with others in a partnership of self-defense."

Deputy Secretary of Defense Roswell L. Gilpatric, in his widely-publicized speech before the Business Council of Hot Springs, Va., in October 1961, said, "Our assistance to our NATO allies should also help to deter general war."

The MWDP partnership is definitely not a one-way flow, U.S. officials have stressed. The United States has profited directly from research efforts of European scientists. Major projects have been undertaken in 10 NATO countries: Belgium, Denmark, Germany, France, Italy, Greece, Norway, The Netherlands, Turkey, the United Kingdom and, outside NATO in Australia.

Total cost of the program is shared by the United States and the NATO



Capable of penetrating heavy tanks, SS-11 wire-guided missile carried here was developed by France under Mutual Weapons Development Program.



This Mountain Vehicle was designed by Italian Technical Corps for transport of weapons, ammunition, materiel.

nations, with the U.S. paying less than 50 percent. One significant advantage is that research costs in Europe are substantially below American levels, defense officials have stated.

Overall U.S. participation in the program is administered by Dr. Harold Brown, Director of Defense Research and Engineering, through the Office of International Programs. Field work is carried out by the Mutual Weapons Development Team in Paris, France, which consists of a Director who supervises members from the Army, Navy and Air Force.

The MWDP has established three technical centers. The SHAPE Air Defense Technical Center at The Hague has contributed a new SHAPE communications system to the field of air defense. The Training Center for Experimental Aerodynamics at Rhode-Saint-Genese, near Brussels, is an advanced research institute for aeronautical engineers. The SACLANT Antisubmarine Warfare Research Center at La Spezia, Italy, is the most recent cooperative enterprise to receive MWDP support.

The technical Centers are considered one of three significant developments of the MWDP. Others are the Data Exchange Agreements and

the "Twenty Projects List," the latter representing a program initiated by the former Secretary of Defense, Thomas Gates, at the NATO Defense Ministers' meeting in 1960. He proposed a list of 20 possible projects, since officially named the NATO Coordinated Research, Development and Production Program.

The NATO Armaments Committee has established a number of Ad Hoc Committees to develop, on a multi-lateral basis, specific weapons systems for NATO-wide use. The projects which have been agreed upon include NATO requirements in practically every important category of military hardware. In the R&D phases U.S. support is through the MWDP.

Some of the tangible results of the MWDP are: an antitank missile developed by the French and with arrangements for production in the U.S. under a license agreement; the NATO Light Strike Fighter, a jet aircraft for close support of ground troops, produced through agreements with Britain, France and Italy; and an Italian-developed 3-wheel Mountain Vehicle that can carry a 1,000-pound load up a 70 percent grade.

The Army's role in MWDP is continuing to help mobilize the scientific and technical competence of our allies. The inventive capabilities of Western Europe added to those of the United States are considered essential by MWDP officials in maintaining a lead in the development of new weapons.

Secretary Stahr Tells NATO Scientific Teamwork Needed

Secretary of the Army Elvis J. Stahr, jr., told the NATO Parliamentarians' Conference at Paris in November that increased support is vital in interallied research and development geared to new weapons.

Stressing that effective utilization of the scientific talent and technological capability of all NATO nations is critical, he said:

"The nations of our community can ill afford to compete blindly with each other in these fields, or to waste the talent, time, and money of any of us in duplicative effort, when the objective is to help each other against a common enemy."

While reassuring NATO representatives of growing United States military power, including important advances in developing the Army's NIKE ZEUS anti-missile-missile, he said:

"I think a common responsibility is laid upon the parliaments and executives of all the NATO nations to have the political courage to lead and inspire their citizens to make whatever sacrifices may be required to ensure the full capability to meet the Communist threat to peace and freedom."

A message from President Kennedy delivered by Secretary Stahr said, in part:

"The usefulness of the NATO Alliance in the military sphere has been proved. The wisdom of the NATO alliance as a political community has not yet reached its ultimate boundaries."

Newsmagazine Lists Highlight Articles Published During First Year of Service

The scope and variety of material published by the Army Research and Development Newsmagazine during its first year of existence are indicated by the following chronological listing of items, some chosen because of the importance of the subject, some because of their general interest.

DECEMBER 1960—Installation of Missile Master System at Philadelphia extends big electronic umbrella protection over the 10 most important critical areas of the United States. R&D division formed at Redstone Arsenal, calls for staff of 1,000.

Army announces worldwide survey to locate key R&D and AE jobs in furtherance of officer career program.

Army Scientific Advisory Panel functions outlined and members listed.

Army Human Factors Engineering conference stresses broadened participation of general scientific community in meeting Army R&D requirements in critical area of man-machine compatibility.

Significance of bionics explained at first major symposium on subject.

U.S. Army Research Office reviews research on machine translating.

Walter Reed Army Institute of Research germfree research opens new military medicine vistas.

Army nonprofit basic research grants program expanding.

Chemical Corps scientist's research seen helping to save lives of thousands of infants.

Army's new role in space communication. Brooke Medical Center pioneers in burn treatment.

Head tilting technique developed by Chemical Corps enhances resuscitation breathing.

Eight-volume U.S. Army Research and Development Problems Guide disseminated, outlining more than 1,000 problem areas to U.S. industry and private research activities.

U.S. Army Research Office Status Report No. 2 on Fuel Cells ready for distribution.

New type of Army Signal Corps solar cell hailed as important advance.

JANUARY 1961—Relocation of Army's three cold weather test centers planned.

Diamond Ordnance Fuze Laboratories noted for key roles in defense research and development.

Army R&D program utilizes scientific skills of enlisted men.

Nuclear power planned for Army's Overland Train.

Army R&D reserve units provide standby strength.

Field Army Ballistic Missile Defense System feasibility studies initiated.

Nation's experts exchange views at "Man Living in the Arctic" conference.

Fort Detrick \$25 million relay station links east coast with STARCOM, the Army's worldwide communications network.

Engineers establish Geodesy, Intelligence and Mapping Research and Development Agency at Fort Belvoir, Va.

Ordnance Corps develops combustible cartidge case, termed "significant breakthrough."

Army's Camp Century "city under the ice" in Greenland declared operational.

Army Key Scientists discuss Free World's potentialities for economic and scientific progress.

FEBRUARY—Office of Ordnance Research redesignated as Army Research Office, Durham, N.C.

White Sands, cradle of missile era, marks 16th anniversary.

NIKE HERCULES intercepts twin 19 miles above earth at White Sands Missile Range.

Director of Defense Research and Engineering approves VTOL aircraft program.

Quartermaster Corps announces field tests of dehydrated rations.

Transportation Corps tests ground mobility capability in Panama jungles.

Quartermaster Corps clothing research goal: to protect soldier in any climate.

Medical Education for National Defense Symposium hears presentations concerning chemical and biological warfare defense.

Quartermaster Corps tests automatic color measurement device.

Fluid amplification control principles developed by Diamond Ordnance Fuze Laboratories arouse widespread interest.

MARCH—Army and Marine Corps take steps to spur ground effects machines development.

Army-Navy team blazes 800-mile Antarctic "highway."

NIKE ZEUS anti-missile-missile enters advanced phase, undergoes critical tests.

Nuclear Defense Laboratory researches methods of protecting troops from battlefield radiation.

Operations Research Office summer projects acquaint gifted students with Army scientific career opportunities.

Electrical anesthesia technique developed by Army seen as having "great potentiality."

Army's experimental nitroso rubber, only known nonflammable rubber, interests other Government agencies.

Army Research Office foreign research program broadens "payoff" base.

Gas turbine-powered Army aircraft fleet foreseen within 10 years.

Signal Corps Astro-Observation Center records all satellite orbits.

APRIL—Chief of R&D directs preparation of 20-year technological forecasts.

Ordnance Corps R&D Division Project Vector exploits value of time.

Use of titanium case for rocket motor hailed as major advance.

Armed Services Technical Information Agency facilitates work of Department of Defense researchers.

Ceramics research filling critical weaponry needs.

Waterways Experiment Station presses for improved ground mobility.

Department of Defense asks over 30 firms for VTOL aircraft bids.

Army research spurred on masers, lasers, irasers.

Aberdeen Proving Ground "tortures" mobile equipment.

Geodesy, Intelligence and Mapping Research and Development Agency advance technique of high-speed mapping.

MAY—Interagency Advanced Power Group established to stimulate R&D in all areas of unconventional power sources.

Chief of Research and Development approves acceleration of tropical research.

General Trudeau stresses Government-industry research.

Army Research Tasks Summary analysis shows how Army emphasizes basic research.

Transportation Research and Engineering Command pushes aircraft crash safety research.

"Buildings in Barrels" technique studied by Corps of Engineers for use in remote areas.

JUNE—Army tests its first mobile nuclear power plant.

REDSTONE missile takes first U.S. astronaut into space.

Three Picatinny Arsenal scientists awarded \$25,000, get Presidential praise for nuclear work.

Engineer Corps' study indicates need for lunar test center.

Army school emphasizes science of management.

Office of Technical Services, U.S. Department of Commerce, disseminates worldwide R&D information.

Ordnance Corps technical intelligence agency charts direction of Army-wide R&D activities.

HumRRO Task Armornite seeks better night armor capabilities.

Army Aviation Board complete man-machine compatibility tests.

Arctic seeding experiment may lead to overcoming Arctic "whiteout."

Tack-size radiation detector developed for Signal Corps.

JULY—Army presents new materials R&D program to Materials Advisory Board, National Academy of Sciences-National Research Council.

Army Research Office 20-year technological forecast being distributed.

Ordnance Missile Command invites industry to offer new ideas, methods.

NIKE ZEUS system target track radar tracks ATLAS in Atlantic.

General Trudeau terms management of "supreme concern" in Army R&D.

Army's Rolling Liquid Transporters in testing phase.

Services united in attack on radio frequency woes.

Coherent light demonstrated as communication medium.

Prevention of Deterioration Center serves all national defense agencies.

Exhaust-driven lift fans may give jets VTOL ability.

AUGUST—Chief of Research and Development announces winners of 22 R&D Achievement awards.

Army lists 10-year aircraft program goals.

Army, Air Force hailed for JUPITER missile teamwork.

International Science Foundation lauds Army Ordnance Missile Command.

National Science Foundation forecasts Nation's needs for science program increases.

Signal Corps expands communication capability in acquiring three new long-range mobile emergency systems.

Chemical Corps mobile laboratories facilitate nuclear research.

Chemical Corps R&D Command program enlists wide industrial support.

Food-poisoning Salmonellae getting heat-purge study.

Army Packaging Board performs vital troop supply task.

Qualitative Development Requirements information program spurs outside interest in Ordnance requirements.

SEPTEMBER—Senate confirms Dr. Finn J. Larsen as Assistant Secretary of the Army (R&D).

Director of Defense Research and Engineering forms advisory group on electron devices.

Cross-country mobility studied by U.S., U.K., Canadian experts.

Expedition into Panama jungles unites all Technical Services in research.

New edition of Army R&D Problems Guide ready for distribution.

Human Factors Engineering conference focuses on man-machine problems.

Walter Reed Army Institute of Research technique speeds detection of blood and tissue parasites.

Human Resources Research Office projects 27 research tasks for fiscal 1962.

Signal Corps opens huge battery test facility.

Research Analysis Corporation takes over major part of Army operations research.

Process for casting artillery and mortar shells hailed as "scientific breakthrough."

President Kennedy requests study to determine whether Government is capable of taking over some scientific and technical work now done by contract.

OCTOBER—Chief of Research and Development, Deputy Chief of Staff for Logistics emphasize broad value analysis program.

Army installs first of 19 midget missile master national systems against missiles.

Top officials approve Army-wide Junior Science Symposia Program.

Prosthetics pioneer retiring, hailed for 16 years of Army Prosthetics Research Laboratory progress.

Role of Plastics Technical Evaluation Center at Picatinny Arsenal grows as Department of Defense finds new uses for plastics.

Ordnance Corps proves merit of value analysis techniques.

Army Mathematics Research Center is responsive to Army needs for advanced mathematics.

Quartermaster Food and Container Institute for the Armed Forces studies aerial delivery load system problems.

Inventors Council supports Department of Defense in encouraging creativeness.

Army leaders meet to integrate R&D in cold regions.

NOVEMBER—New Army Regulation 11-25 directs full-scale drive to reduce Army materiel development lead time.

Army Research Office-Durham spurs in-house creative research by grants.

Secretary of the Army Stahr calls for balanced Army R&D program.

Fluid amplifier control pulses flow of Diamond Ordnance Fuze Laboratories' experimental heart pump.

Army Research Task Summary reports status of 3,000 research tasks.

Services (Army, Navy, Air Force) unite in funding VTOL test aircraft.

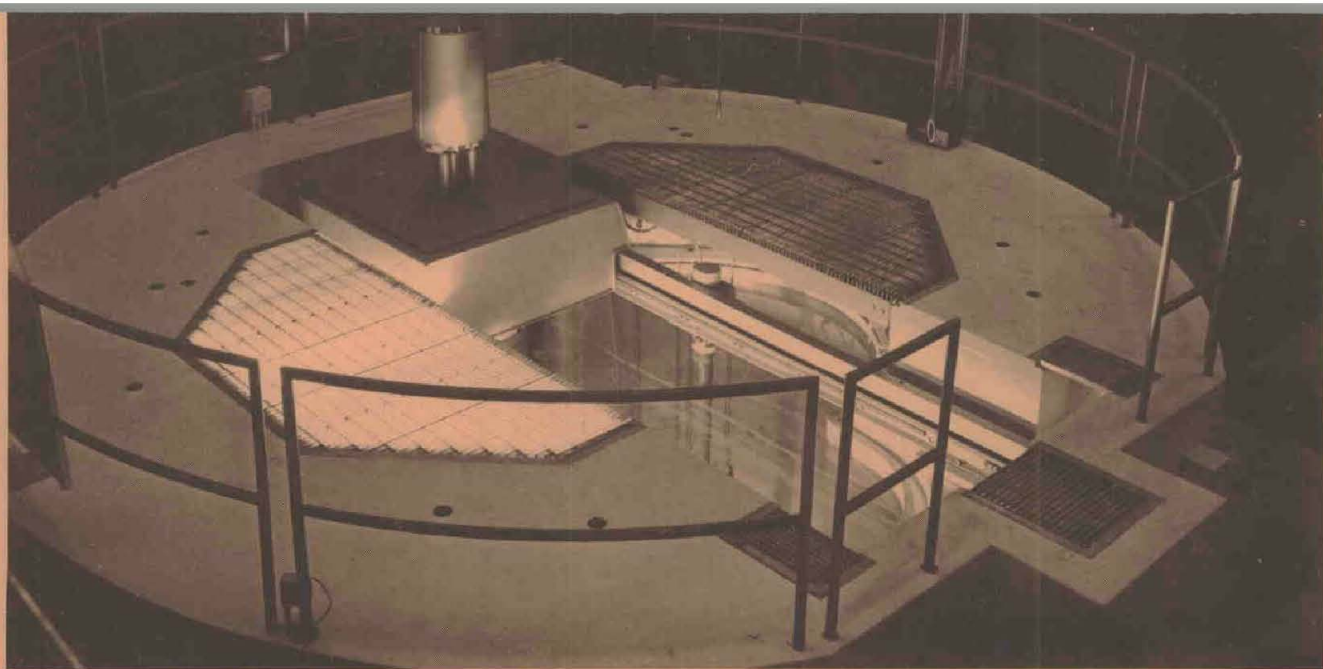
Top leaders cite Army R&D benefiting civilians.

Dr. Wilbur S. Hinman, Jr., appointed Deputy Assistant Secretary of the Army (R&D).

Army Ordnance Missile Command leader discusses missile operations.

Transparency held valuable in preservative packaging.

White Sands Missile Range vigilance avoids missile mishaps.



Light glowing at the top of the Army's new nuclear pulse reactor was emitted by radiation in water, visible through opening, during 13-millisecond pulse. Within this tiny bit of time the reactor can build up the energy level from one watt to 1,200,000 kilowatts, release intense radiation, restore itself automatically to normal operating level.

Army Studies Simulated Nuclear Bomb Radiation at DORF

Radiation effects associated with a nuclear bomb explosion are being simulated and studied, under precisely controlled laboratory conditions, at the U.S. Army's new "pulse" reactor, only a few miles from the Nation's capital.

Dedicated Oct. 17, the reactor will be turned over officially to the Department of the Army early in January. Situated in the Forest Glen, Md., section of the Walter Reed Army Medical Center, it is alphabetically designated as DORF—for Diamond Ordnance Radiation Facility—and is the first of its type fully owned and operated by the Department of the Army.

Studies currently are centered on the effect of radiation on electrical components, systems and circuits which are in use or under Army Ordnance development.

DORF is operated by personnel of the Diamond Ordnance Fuze Laboratories, an internationally renowned Government research facility in Washington, D.C. The Walter Reed Army Medical Center is providing health physicists and is permitted to use DORF on a part-time basis under terms of the agreement by which it was established.

The nuclear core of the reactor is suspended from a movable carriage and rests at the bottom of an aluminum-lined tank of demineralized water 20 feet deep and about 14 feet wide. Mobility of the core assembly permits radiations to be directed within the reactor pool or into an adjacent dry, shielded exposure room large

enough to accommodate complete systems assemblies and large-scale components.

During the dedication visitors peered into the pool at the reactor core as it suddenly emitted a flash of light, a signal that it had pulsed for 13 thousandths of a second from the energy level of an ordinary radio to a level equal to the electrical power used by the entire city of Washington during the same period.

DORF studies of the effects—both permanent and temporary—of high intensity radiation may apply not only to conventional weapons and systems, but also to systems and components designed for space travel and nuclear propulsion.

DORF will have a permanent staff of about 16 persons under Peter Haas, Chief of the Diamond Ordnance Fuze Laboratories' Nuclear Vulnerability Branch, who is in charge of the research program. The resident staff will include a supervisor, assistant supervisor, 2 operators, 2 health physicists, and 10 experimenters.

Pending completion of DORF, which took 10 months, DOFL staff members underwent training and conducted experiments for several months with a prototype, called TRIGA Mark-F, at the San Diego laboratory of General Dynamics Corp., prime contractor for the facility. Construction involved an expenditure of \$1,050,000.

In many respects, it was stated, the radiation effects of nuclear explosions can be studied better with the TRIGA pulsing reactor than in actual weapon

tests. Unlike a nuclear explosion, the TRIGA's pulses of high-level radiation are reproducible—at intervals of 15 or 20 minutes; experiments can be quickly repeated, modified or rechecked for accuracy. Instrumentation is simplified and more precise data can be obtained. A wide range of radiation doses and conditions of exposure can be produced on demand.

An advantage of prime importance to research is the fact that scientific and operating personnel are able to remain safely in the immediate vicinity of the reactor and carry on their work.

The large amount of defense research and development work which is centered in the Washington area was the prime factor in determining the site for the Diamond Ordnance Radiation Facility.

The reactor and its associated facilities, including the building, have been specially designed to eliminate the possibility of radiological hazard, either to operating personnel or to residents of the area. The facility site is in an area zoned "heavy commercial."

The TRIGA is considered an ultra-safe reactor. It regulates itself, due to the physical properties of the unique fuel-moderator elements which make up its nuclear core. This self-regulated safety—demonstrated in thousands of "pulsing" tests—together with the reactor's versatility of research applications—was a major consideration in the selection of this particular type of reactor for the Diamond Ordnance Fuze Laboratories.