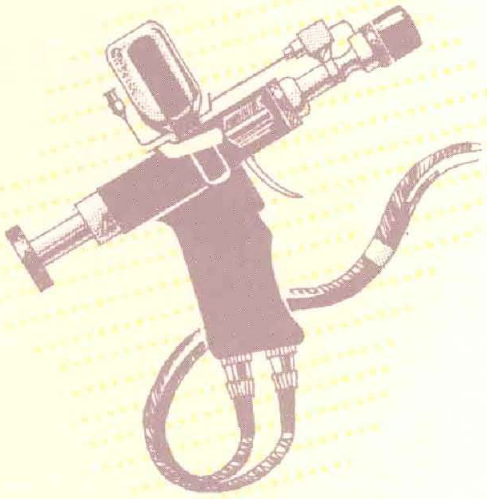
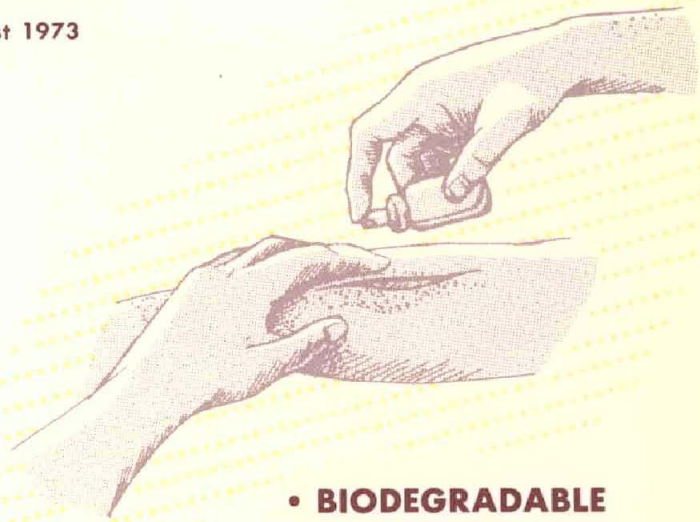
ARMY RESEARCH AND DEVELOPMENT

July-August 1973

• JET IMMUNIZER





• BIODEGRADABLE POLYMERS

AN EXEMPLARY TRANSITION

Fort Detrick Progressing To One of Nation's Major Medical Research Centers

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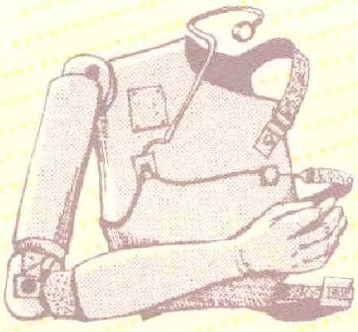


• SPEECH-ACTIVATED PROSTHESIS

RESEARCH FOR THE SOLDIER

SPEAKING ON . . .

Reflections on Army R&D

LTG W. C. Gribble Jr.
(New Chief of Engineers)

For the past 10 years I have enjoyed a close association with the Army R&D community in a variety of positions. For the past 2½ years I have been privileged to serve as the Chief of Research and Development on the Army staff. Over that period of time I've shared with many readers of this fine magazine such "memorable" experiences as:

- Seeing the AMC complex grow out of the technical services establishment;
- Living through the period of the Bell and Skifter reports on science and laboratory policy;
- Watching the pendulum of project management swing to a total of 68 project managers and back again to 31;
- Surviving the several studies of Army Testing and Evaluation;
- Participating in RAMS, MALLARD, ENSURE, MRRCs, MPPRCs,* congressional hearings, and R&D review boards at all levels.

There have been many "ups" and a few "downs" in 10 years; there have been many successes and a few failures. I remember them all with a feeling of great fondness for the individuals on the R&D team.

Mostly because they are freshest in my mind, I would like to recite a few statistics on our activities of the past 2½ years in the hope that you will share with me pride in support that R&D has provided the Army in that period.

Much attention is given to new programs when they are initiated, and even greater visibility attends our occasional failure. But it has long been a concern of mine that the publicity given to those events contributes to the impression that we start a lot of things in R&D, but we don't finish very much. Let me correct that impression.

In the past 2½ years approximately 170 items have completed the development cycle, been formally type classified, and are in the process of contributing to the modernization of the Army's inventory. The list of R&D completions is long and diverse. It includes Lance and extended range projectiles; it includes radios and radars; it includes a grenade launcher and a mine detector; bridges and maintenance vans; items of clothing and aircraft armament. The list is impressive.

The new emphasis on nonhardware programs has been equally productive in improvements to training methodology and literature, as well as to our understanding of the human and social factors so relevant to military operations and to medical care and treatment of our soldiers.

Balancing the continuous output of R&D projects has been the initiation of about a dozen major new engineering development projects. Most notable are the Army's "Big 5": The AAH, XM-1, UTTAS, MICV, and SAM-D.**

Intensive management, our new procedures, and thorough preparatory work should insure the success of these new efforts. The major increase in funding of our 6.3 advanced development program—in terminal homing, in night vision, in BMD, electronic warfare, and in RAM—reflects the productivity of the technological base and represents an investment in the future of the U.S. Army.

As I prepare to move to my new assignment, I will take with me great satisfaction and pride in having been a member of such a productive organization. Its lifetime track record is an outstanding one that far overshadows the few bad days. And I see the future for Army R&D equally productive; the seeds of this productivity are now planted in our 6.1 and 6.2 programs.** A strong technological base effort cannot help but insure future productivity.

All in all, the experience of working in Army R&D has been an exciting one, and I would like to take this form and opportunity to thank all of you, in offices, in laboratories, on testing grounds, and in industry, who have contributed much in making it so.

**RAMS (Reliability and Maintainability Studies). MALLARD (Project Mallard, a multimillion-dollar program to develop a comprehensive communications system for the field armies of Canada, Australia and the United States). ENSURE (Project ENSURE, Expedited Non-Standard Urgent Requirement for Vietnam), MRRCs (Materiel Requirements Review Committee studies). MPPRCs (Materiel Priorities Procurement Review Committee studies).*

***AAH (Advanced Attack Helicopter). XM-1 (new Main Battle Tank program). UTTAS (Utility Tactical Transport Aircraft System). MICV (Mechanized Infantry Combat Vehicle). SAM-D (Surface-to-Air Missile Development). 6.1 (basic research); 6.2 (exploratory development).*

U.S. Army Flood Control Programs

LTG F. J. Clarke

U.S. Army Chief of Engineers LTG F. J. Clarke, whose retirement July 31 finished four years in that capacity, gave many of his "farewell" speeches on the Corps' flood control program results in minimizing heavy damages during the 1973 ravaging in the Mississippi Valley. This is one excerpt:

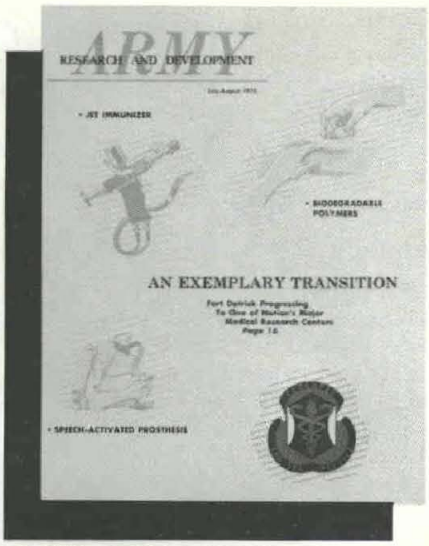
* * *

"You must have been prophetic when you chose 'Hell and High Water' for a conference theme, because that's what we have been going through . . .

"Your newspapers have undoubtedly told you of the almost eight million acres under water and the $162 million in flood damages in the lower valley. Unfortunately, however, they probably haven't told you the story of what might have happened had not the mainline levee system stayed intact. They probably have not described the devastation and loss of property—estimated at $2.5 billion—that would have occurred had not the elaborate Mississippi flood control system been operational.

"The 'environmental impact statement' on these past few weeks would be a sad litany, indeed, describing the effects of more than 17 million additional acres that could have been innundated. In 1927 the raging waters of that great river drowned 165,000 head of livestock, more than 1,000,000 of poultry, and uncounted wildlife. More than 41,000 buildings were destroyed, 162 homes

(Continued on page 32)



ARMY RESEARCH AND DEVELOPMENT

Vol. 14, No. 4 July–August 1973

ABOUT THE COVER:

Fort Detrick, MD, has a prestigious history of notable contributions to military biological warfare defense and numerous other scientific research achievements, many of which have contributed immensely to the benefit of the civilian population in the United States and in foreign lands. President Nixon visited Fort Detrick, Oct. 18, 1971, to announce that the Biological Defense Research Center, with about $130 million worth of buildings and equipment, would be converted principally to the Frederick Cancer Research Center as a major element of the U.S. National Cancer Institute. Today, Fort Detrick is evolving into one of the nation's leading civilian and military medical research centers. The article begins on page 16.

Editor . . . . . Clarence T. Smith
Associate Editor . George J. Makuta
Editorial Assistant . .Harvey Bleicher

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Purpose: 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 Army R&D activities; 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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FEATURES

DEPARTMENTS

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Selective Scanner . . .

Army Awards $115 Million for AAH Development

Two contracts totaling $115 million for initial development of the U.S. Army Advanced Attack Helicopter—involving a time-phased competitive flyoff development and testing program over about 5½ years—were announced June 22 by the Army.

Bell Helicopter Co. was awarded $44.7 million and Hughes Helicopter Co. with Hughes Aircraft $70.3 million in the initial contracts. Other competing firms were the Boeing Co., Vertol Division; Lockheed of California Co.; and United Aircraft Corp., Sikorsky Aircraft Division.

Terms require a competitive flyoff involving two flying prototypes provided by each contractor. This phase is expected to be completed in about three years, after which the winner will install and test the required systems for night vision, fire control, navigation and communications.

A production decision will be reached following further testing of the prototype with the added systems. Stabilized high-powered optical systems and night vision equipment will enable the AAH to place accurate fire on enemy forces 24 hours a day in all but the most severe weather conditions.

Armament will include the aerial tube-launched, optically tracked, wire-guided (TOW) antitank missile system, and a rapid-firing 30mm cannon. In lieu of TOW missiles, the AAH will be capable of carrying 76 aerial rockets—or it may be equipped with a combination of TOW missiles and aerial rockets.

Survivability and effectiveness of the AAH will be insured by power and agility to apply hovering tactics and evasive maneuvers, as determined necessary through combat and testing experience and computer analyses.

When introduced into active Army units, the AAH and the Cobra, the existing attack helicopter, will form a complementary team to increase the effectiveness of Army forces in 24-hour-a-day and nearly all-weather operations.

Antipollution Kit Checks Lance Propellant Leaks

Decontamination resulting from spillage of liquid propellant from a damaged Lance missile may be avoided with an experimental antipollution kit currently under evaluation by the U.S. Army Missile Command.

Developed by LTV Aerospace Corp., the kit is designed to remove liquid propellant units from the damaged Lance or its shipping containers. The Lance tankage is then filled with a neutralizer prior to moving the missile.

Consisting of two self-contained, portable palletized units, the kit is complete with a pump and pressurization system for draining propellants and supplying neutralizing agents. Although the likelihood of a propellant leak from a damaged Lance is remote, if not contained, it could contaminate soil, water, or add to air pollution. Following successful completion of tests, the kits will be supplied to specific Army Lance battalions.

Army Reports on Noise-Induced Hearing Loss

Noise-induced hearing loss may be the number one health hazard in the U.S. Army, according to findings in a recent report titled "The Extent of Hearing Loss in the Army."

Initiated because of increasing incidence of hearing loss, the survey and study involved some 2,726 personnel representing numerous branches of the Army. Each subject was examined by special test teams, with particular emphasis on high-intensity noises during training exercises.

Prior to basic training, 98 percent of 246 Fort Dix, NJ, inductees exhibited H-1 (normal hearing) profiles. Upon completion of basic training, this figure was reduced to 93.7 percent. Similar results were reported following infantry, artillery and armor advanced individual training.

The report suggests that as active duty time increases so does the chance of sustaining a hearing loss. An infantry group with less than four years active duty reported 93.1 percent with H-1 profiles, those with 4-10 years service, 65.8 percent and those with over 10 years service, 42.7 percent.

Additionally, 23 percent exhibited hearing which would require mandatory duty limitations and four percent failed to meet minimum standard requirements for retention on active duty.

Over-all, it was estimated that from 30 to 50 percent of all active duty personnel develop some degree of noise-induced hearing loss during military careers.

$155 Million Awarded for XM1 Tank Prototype

Two contracts totaling $155.1 million for procurement of competitive prototypes of the U.S. Army's XM1 tank, including a mobility test vehicle and ballistic test components, were announced June 28 by Army Secretary Howard H. Callaway.

Chrysler Corp. will receive $68.1 million and General Motors Corp. $87.0 million under the initial development contracts. Approximately three years will be required for development, fabrication and competitive testing.

The winner of the prototype competition, upon completion of the validation phase, then may be awarded a 4-year full-scale engineering development contract. After further testing, a production decision would be made.

Intended to be integrated into a combined arms team of tanks, infantry, artillery and helicopters, the XM1 will form the core of the armored formations. It will be complemented by tanks of the M60 series and the New Mechanized Infantry Combat Vehicle (MICV).

XM1 specifications call for a 1,500hp engine and an advanced gun stabilization system for precision firing on the move—with substantial improvements over present tanks in speed, mobility, crew protection and weapons accuracy. The main armament will be a conventional tank gun.

Slightly larger than the M60 series tank, with a lower silhouette, the XM1 is expected to be capable of speeds of 40 to 50 miles on roads and possess cross-country speeds substantially higher than existing tanks.

HumRRO to Examine Employment Problems

Major problems confronting Vietnam-era veterans in seeking and holding jobs will be examined by the Human Resources Research Organization (HumRRO), a major U.S. Army research contractor, under a recent grant by the Manpower Administration, U.S. Department of Labor.

Code-named ENABLE, the project consists of an exploratory work phase and a survey phase utilizing questionnaires and personal interviews with a special focus on long-term unemployment.

Results will be finalized in a handbook containing practical recommendations for obtaining employment. An informative report on the nature of the veteran's problems will serve as a guide for federal, state, and local manpower administrators.

AVSCOM Acquiring Fuel Cell Modification Kits

Crashworthy fuel cell modification kits for the UH-1 (Iroquois) helicopter, models B, C, D and H, will be procured under a $3,168,510 contract award announced June 20 by the Army Aviation Systems Command, St. Louis, MO.

The fuel cells are designed to provide an added safety feature for helicopter crew members by "virtually eliminating" the chances for postcrash thermal injuries or deaths.

HumRRO Focuses on DoD Personnel Operations

Research studies and analyses on military personnel policies and programs, specifically on procurement, utilization, performance, retention and separation, will be performed under a recent $493,699 contract award to the Human Resources Research Organization (HumRRO).

Sponsored by the Office of the Assistant Secretary of Defense (Manpower and Reserve Affairs), the project is code-named UNCLE. The prime objective is an examination of the operation and effect of over-all DoD personnel policies.

NIGHT-VISION GOGGLES, developed as one of the numerous devices responsive to the U.S. Army's urgent requirements for night-time operational capabilities, are finding rapidly increasing civilian applications. Resulting from R&D performed by the U.S. Army Electronics Command's Night Vision Laboratory, Fort Belvoir, VA, the 1.85-pound goggles enable the operator to detect a man at more than 50 yards under starlight or skyglow conditions. In good moonlight, the range of detection is extended considerably. ***Potential civilian applications*** include use of the goggles by police officers for hands-free and undetectable night-surveillance activities, night-time observation of wildlife by naturalists or hunters, and use by hospital and nursing home attendants to observe wards without disturbing patients. Designed to fit 90 percent of the people who might use them, the goggles have an adjustable headband, and eyepieces adjustable for the different widths between eyes and the depth of the eyes of various individuals. Each lens focuses independently of the other in order to compensate for near-sightedness and far-sightedness of each eye.

ARI Awards Weapons Training Study Contract

What is the value of live-firing to weapons proficiency? What are the critical performance requirements for various weapons? How do live-firing, dry-firing and simulated-firing compare in field training experiments?

These are some of the questions that the Human Resources Research Organization (HumRRO) will strive to answer under a 14-month, $171,177 contract awarded by the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI), Arlington, VA. This research is part of ARI's Unit Training and Educational Technology Systems technical area mission.

Established in 1951, HumRRO conducted R&D exclusively for the U.S. Army until 1967, when services extended to include various other U.S. Government agencies as well as industrial and educational institutions.

Headquartered in Alexandria, VA, with field units in Georgia, Kentucky, Alabama, Texas and California, HumRRO will conduct the "Research on the Contribution of Live-Firing to Weapons Proficiency" in three phases under the code-name Dragon.

The first phase will include an analysis of present Army weapons training, including instructional content and techniques, training devices, management, and training support resources.

Analyses then will seek to identify critical performance requirements for an indirect-fire weapon, a large-caliber, direct-fire weapon, and a missile system.

The third phase will involve field experiments with two of the three "task-analyzed" weapons to evaluate and compare live-firing, dry-firing, and simulated-firing. Published reports for all phases will describe the procedures and results.

Fort Eustis Gains Training Aid From Scrap Yard

Relegated to the scrap yard, a vehicle used during the 1960s in search and rescue missions around Aberdeen Proving Ground (APG), MD, has again become a valuable piece of equipment in the Army's inventory.

Known as the Lighter Amphibious Resupply Craft (LARC), the vehicle given a "new lease on life" was transferred from APG to the 355 Aviation Company, Fort Eustis, VA, to be used as a training device for pilots and crews that fly CH54B helicopters.

Valued at $47,000, the LARC measures 35 feet long and 10 feet high with a weight of 20,000 pounds. Although considered rather bulky, it was transported with relative ease to Fort Eustis by a CH54B helicopter commonly called a "Sky Crane."

The LARC is termed an ideal aid in training the CH54B pilots. Classified as a heavy-lift cargo helicopter, the CH54B is designed to provide airlift support for the movement of heavy supplies, vehicles and aircraft and equipment.

STRATCOM Installing 27 AMME Systems

Under a $28.9 million contract calling for deliveries extending through 1978, Automated Multi-Media Exchange (AMME) message switching systems will be installed at 27 sites worldwide by the U.S. Army Strategic Communications Command.

HQ STRATCOM, Fort Huachuca, AZ, announced the schedule for installation calls for the first AMME to be set up in March 1974 at the Oakland, CA, Army Base. It will furnish improved communications support for western area Military Traffic Management and Terminal Service and tenant agencies.

Other AMME installations scheduled in 1974 will be at HQ U.S. Army Missile Command, Huntsville, AL, and the Army STRATCOM Agency, Bayonne, NJ. The contractor is the UNIVAC Division of Sperry Rand Corp.

The AMME-level telecommunications center, which is designed to consolidate as well as automate communications centers, will receive, store, distribute and maintain records on all incoming/outgoing narrative and data messages. In its simplest form, the AMME has two computers capable of servicing up to 16 terminal subscribers and data processing installations and is expandable by a third computer to handle up to 48 subscribers.

The AMME is part of the long-range Army Telecommunications Automation Program (ATCAP) to consolidate and automate message processing through 1981.

Armed Forces Consolidate Vocational Testing

Consolidation of all U.S. Armed Services vocational aptitude testing facilities is the purpose of a new joint service agency established recently at Randolph Air Force Base, TX.

The Armed Forces Vocational Testing Group (AFVTG) is commanded by Air Force COL Ralph S. Hoggatt. It is staffed by some 50 military and civilian employes representing the Army, Navy, Air Force and Marine Corps.

The agency is expected to result in a more economical, equitable, and widespread distribution of the Armed Services Vocational Aptitude Battery (ASVAB), furnished free to high schools.

Consisting of nine short subtests, the ASVAB can be completed in about 2½ hours. Results are combined into aptitude indexes to predict student success in electronics, mechanical, clerical administration, and general technical areas.

Tests will be scored by the new unit and sent through local recruiters to high school counselors. Successful completion of the battery of tests can qualify a student for military service without further testing.

Aberdeen Develops Portable Sign-Making Kit

A portable sign-making kit designed for emergency use by military police units has been developed by the U.S. Army Land Warfare Laboratory (LWL), Aberdeen Proving Ground, MD.

Packaged in a reuseable olive drab fiberglass reinforced case, the kit measures 28 by 29 and 13 inches high. It contains sufficient materials for fabrication of about 100 signs, with most components replenishable through normal supply channels.

Components include self-adhesive vinyl letters, staple guns and staples, double faced tape, reflective tape, lettering guide, spray paint, ruler, scissors, hammer and nails, sign backing material, stencil board, sign facing material, and lettering set.

Designed for ease of use, the kit is capable of producing professional quality signs by personnel with a minimum of training. A quantity of the kits has been shipped to various military police agencies throughout the world for evaluation.

Patent Policy Highlights (1963–1973)

By LTC James E. Noble

LTC James E. Noble has served since 1971 as chief, Patents Division, Office of the Judge Advocate General, Department of the Army, Washington, DC. During 1969–70 he was staff judge advocate, XXIV Corps, Vietnam after two years as staff judge advocate general, 32d Army ADC, Germany.

Service with the U.S. Air Force and Air Force Reserve during 1948–64 included assignments as air electronics officer, communications officer, and air traffic controller.

LTC Noble holds a BS degree from Trinity University, a BA degree from the University of Texas, an MA degree in geology from the University of Missouri, a juris doctorate from Oklahoma City University and LLM degree in patent and trade regulation law from George Washington University.

Certified to practice law before the U.S. Supreme Court, Supreme Court of Oklahoma, U.S. Court of Military Appeals and the U.S. Patent Office (Department of Commerce), he is a member of the American Bar Association, the Government Patent Law Association, Geological Society of America, and the American Association of Petroleum Geologists. His military honors include the Legion of Merit, Bronze Star Medal and the Army Commendation Medal.

The United States Patent is strikingly colorful with its booklike printed cover bound by a blue ribbon, and the ends of the ribbon secured under a bright red seal. This document represents a valuable property right to exclude others from making, using or selling that patented invention in the United States which may be either assigned or licensed.

Government agencies have title to approximately 24,000 unexpired United States patents stemming from government employe and contractor invention disclosures. The Department of the Army owns 4,200, the Department of the Navy 8,400, and the Department of the Air Force 1,800. The government also has royalty-free license rights under thousands of patented inventions, and government agencies hold title to, or are licensed under, an indefinite number of foreign patents. Many of the patents are end-products of research and development.

During Fiscal Year 1972, the Department of the Army obtained title to 88 United States patents issued on contractor patent applications and a license to 225 contractor patent applications. It obtained title to 307 United States patents issued for employe invention disclosures and a license on 39 employe patents. Ninety-eight foreign patents were issued to the Army under reciprocal filing agreements with foreign governments.

The scope of the U.S. Army's patent practice is adequate reason for reviewing some of the patent policy highlights of the past decade. In 1961–62 the Chief of the Patents Division, Office of the Judge Advocate General, LTC G. F. Westerman contributed to the *Army Research and Development Newsmagazine* a notable series of three articles on the history of the U.S. patents process, rights and many humorously novel inventions as well as those particularly significant in WWII.

Highlights that will be reviewed in this article are familiar to most patent attorneys, but they may be new to research and development personnel. The reader should remember that patents are only one form of intellectual and industrial property, and that a patent is generally supplemented by proprietary data.

Presidential Patent Policy. Presidential patent policy statements have influenced all government patent activities. President Kennedy, in 1963, established guidelines to be followed by U.S. Government agencies.

The policy required agencies to take title to inventions made in government-sponsored research if: the research was directly concerned with public health or welfare; was intended for commercial use by the general public; was in a field in which there was little experience outside of the work being funded (other purposes were stated).

Agencies were permitted to leave title to inventions with contractors in cases where an objective was to build on existing technology, and the contractor had an established commercial position in the technology involved.

Special situations were permitted for contractors such as educational and nonprofit institutions not having commercial situations. President Kennedy's guidelines were placed in the Armed Services Procurement Regulations and affected R&D contracting.

A revised Presidential Memorandum and Statement of Government Patent Policy was issued by President Nixon Aug. 23, 1971. Under the new policy, agency heads have more authority to leave title to inventions to the contractor when the agency head determines this is necessary to create an incentive for development and marketing of the invention, or if the government's contribution is small when compared to the inventor's.

The new policy has several specific purposes, but it is summarized as a liberalized patent policy for the public interest to cause government inventions to be utilized in commerce. The changes should soon be reflected in the Armed Services Procurement Regulations and Federal Procurement Regulations.

Licensing of government-owned inventions received special emphasis in President Nixon's policy statement. Government agencies were authorized to grant limited exclusive licenses to government-owned patents and inventions when an agency head determined that an exclusive license was necessary to accelerate commercial utilization of the invention.

The general public has had a free nonexclusive use of government patents and inventions since 1924 when the Attorney General of the United States originally approved granting an express, revocable, nonexclusive nontransferable license to a government patent.

The new patent licensing policy was implemented by General Service Administration Patent Licensing Regulations May 7, 1973. A limited exclusive license on a designated government patent is now authorized as an incentive to develop and utilize commercially the invention covered by the patent.

The GSA regulations must be implemented by a Department of Defense Directive and Army regulations due for publication soon.

Significantly, the GSA regulations and Department of Defense implementations indicate a preference for nonexclusive licensing over exclusive licensing—drawing some congressional and consumer fire in the courts as an "unconstitutional give-away of government property."

Presently, the rules for obtaining an exclusive license to a government-owned patent are not complex. They provide that certain patents may be designated for exclusive licensing; that notification of those designated patents be published; and that the public be informed of any prospective exclusive license to government-owned patents. Non-exclusive licenses do not require the same procedural formality.

Lists and abstracts of Department of the Army and other government agency patents available for licensing are being published by National Technical Information Services. Government employes are not precluded from licenses to government-owned patents.

Congressional Activities. Most inventors know that the United States Patent Law is Title 35 United States Code (1953), but they may not know that there have been strong congressional efforts to revise that law.

President Johnson, in 1965, appointed a presidential commission to study the United States patent system. The system appeared to be in trouble because the United States Patent was thought to encourage infringement and litigation; also, because the United States Patent Office seemed to use different standards of patentability in granting patents than courts used in reviewing the validity of patents in infringement suits, in which a high percentage of patents are held invalid.

A strong antitrust movement existed in the United States at that time against patents and there was a worldwide surge of technological advancement. President Johnson's commission produced a report containing 35 recommendations to accomplish major objectives in revising the patent system, which became the basis of a Patent Reform Act.

Some of these objectives were to raise the quality of United States Patents, to accelerate public disclosure of technological advances, and to prepare the U.S. patent system to cope with exploding technology.

Congress worried with the Patent Reform Act until 1972 when the Act's latest revision (S. Bill 643) bogged down in a patent antitrust controversy that involved "Federal Patent Law Preemption" and "Antitrust aspects of patent licensing."

In response to the spirit of the times, Congress enacted a Clean Air Act (42 U.S.C. 1857, 1970) in 1970. That legislation provided for compulsory licensing of patents related to air pollution control. The Clean Air Act led to discussions about compulsory licensing of unworked patents, especially patents related to the environment. Bitter battles are expected over this issue.

Senator Philip A. Hart of Michigan introduced Senate Bill 1321 on Mar. 22, 1973, to revise our patent system and to change proceedings in the United States Patent Office. His bill provides for a procedure of deferred examination of applications in the U.S. Pat-

ent Office and also participation by a public counsel during examination proceedings to argue for the public interest.

Supreme Court Influence. Supreme Court decisions effectively changed many aspects of the law of patents during the past 10 years. Important decisions are too numerous to discuss but two recent cases may be interesting to R&D personnel.

In *Lear v. Adkins* (395 U.S. 653, 1969), the court abrogated the doctrine of patent license estoppel which had prevented a licensee from challenging the validity of the patent under which he was licensed. The decision also put a cloud on licenses involving trade secrets and know-how because the lawfulness of licensing nonpatented subject matter was questioned by the court.

The *Gottschalk v. Benson and Tabbot* (409 U.S. 63, 1972) decision pertained to computer programs and held that ideas and mathematical algorithims are not patentable, but the court did not go so far as to state that all computer programs are unpatentable. It deferred to Congress and stated, "The technological programs tendered in the many briefs before us indicate to us that considered action by Congress is needed."

International Developments. The international patent field has been widely cultivated and it promises to be productive. When the European Economic Community (EEC or Common Market) was started Jan. 1, 1958, with the Treaty of Rome, Article 36 of the Treaty expressly recognized industrial property law and national patents.

Further, Article 222 provides that the Treaty would not interfere with the property law of Member States. The European Court of Justice has generally upheld the applications of those articles. Still, it had fretted about the possibility of abusing the Community Antitrust Articles 85 and 86 by the use of parallel patents and the principle of territoriality to create or maintain country barriers to free trade.

After an attempt during the mid-1960s to establish a European system for the grant of a European Patent—a dream since the 1800s—a European Patent Convention may finally be accepted by European countries. Articles 8 and 15 of the European Patent Convention left room for another unitary EEC Patent Convention which was drafted to solve partially the Common Market's parallel patent problem. Details of those patent conventions are beyond the scope of this paper, but the United States may have access to both systems.

As if to keep step with the Common Market and Europe, a Patent Cooperation Treaty, often said to have been initiated by the United States, was signed by 39 countries during 1970. The treaty provides for centralized filing procedures for patent applications. It may simplify the filing of applications on the same inventions in different countries.

President Nixon sent the Patent Cooperation Treaty to the Senate for its consent to ratification on Sept. 12, 1972, but the treaty has not yet been ratified by the United States. Four major active patent countries must ratify the treaty before it becomes operative.

All of these activities can affect research and development efforts in cooperative programs or the acquisition of basic or background patent rights to make, to use or to sell a patented invention.

The Wrap-Up. Occasionally management asks critical questions about patents:

- Why obtain patents on government inventions if the government never sues infringers?
- How many issued government patents are in commercial use?
- What money benefits have accrued on government-owned patents?

Readers may remember that these questions were asked and very capably answered by Stanley Dubroff in the May 1966 issue of the *Army R&D Newsmagazine.* Some postscripts follow:

The government still does not sue on its patents, partly because the Court of Claims in *Tektronix Inc. v. U.S., et al.*, 351 F.2d 630 (1965) refused to permit the government to counterclaim for infringment of its patents in an infringement suit against the government.

Another reason is that the government holds its patents in trust for the public. This position could be slightly modified by the granting of exclusive licenses to government patents because the GSA Patent Licensing Regulations permit a licensee to sue, at his own expense, any party who infringes the rights set forth in his licensed patent. The government has a right to intervene in suits but it is not likely to do more than hold its licensee's coat.

When this article was written, the Department of the Army had 110 patent licenses outstanding for commercial use of the 4,200 patents available for licensing. More licenses may be issued on Army patents because lists of government and Army patents available for licensing are being widely circulated.

The philosophy of government patent activity is different from that of industry. Industry uses patents to protect a head start in marketing inventions, to raise capital and to exploit inventions through patent licensing and supplemental technical data and know-how agreements. Government patents tend to be an end product and an official disclosure of research accomplishments.

Some recoupment of research and development costs may be possible through licensing of government-owned foreign and domestic patents to foreign entrepreneurs and governments. Such licensing activities, to be successful, would require active foreign filing and publication programs. Existing international patent interchange agreements already authorize reciprocal royalty-free use of government-owned patents.

Accumulating patents as industrial property is a national and international way of life essential to governments and industry. In this way of life the U.S. Patent Grant still has a constitutional purpose: "To promote the progress of science and useful arts."

Chemical Demilitarization Office Shifted to Edgewood

Demilitarization of chemical materiel has burgeoned from a one-year program planned at about $3 million, as proposed in 1969, to a potential billion-dollar effort extending to 1985. Much of the increase in cost is attributed to safety and environmental factors.

The long-range estimate of cost was included in an announcement that the Office of the Program Manager for Demilitarization of Chemical Materiel was relocated from Picatinny Arsenal, Dover, NJ, to Edgewood Arsenal, a part of Aberdeen Proving Ground, MD, effective July 2. COL Sampson H. Bass, Jr., program manager for the Office of DCM since it was established in October 1972, continues in that capacity.

"Operation Chase," initiated in 1969, involved disposal of sizeable quantities of unserviceable munitions by disposal at sea. When public reaction and Congressional concern resulted in cancellation of this operation, the National Academy of Sciences was requested to review Army plans for DCM and disposal.

Objective of the NAS study was a DCM program that would entail no hazard to the general population or pollution of the environment. The study recommendation was that large disposal facilities should be regarded as a required counterpart to existing toxic chemicals and planned manufacturing.

GEN Henry A. Miley Jr., commander of the Army Materiel Command, then established the Office of the Program Manager for DCM as a focal point for the long-range planning as well as the short-range activities.

Authorized 47 military and civilian personnel, with 28 of the 39 technical positions filled when this article was prepared, OPMDCM is now located mainly at Edgewood Arsenal. Field offices are at Rocky Mountain Arsenal, Denver, CO, the Tooele (UT) Army Depot, and HQ U.S. Armaments Command, Rock Island, IL.

The Chemical Agent Munitions Disposal System (CAMDS), a modular toxic chemical disposal plant, is in engineering development. When operational it is projected for large, diverse disposal operations, as recommended by the NAS study.

COL Sampson H. Bass Jr. became the first Army program manager for Demilitarization of Chemical Materiel in 1972 after serving as commander, Pine Bluff Arsenal, AR.

During 1969–71 he was director, Weapons Development and Engineering Laboratories, Edgewood Arsenal, MD. Other key assignments have included deputy, Chemical Operations Division, HQ Military Assistance Command, Vietnam (1967–68); and chief, CB Weapons Branch, Office of the Chief of Research and Development (1963–64).

COL Bass has a BS degree in chemistry from Virginia Military Institute (1951) and a master's degree in business administration (1957 with distinction) from Harvard University. He is also is a graduate of the Army Command and General Staff College and the Army War College.

Entering military service in 1951, COL Bass joined the Chemical Corps in 1954, serving various logistical assignments at the Army Chemical Center and as deputy commander, Edgewood Arsenal, MD.

R&D News . . .

Army Begins Implementing 'Realistic' Artillery Training System

In response to an urgent need, expedited R&D support and acceptance by users in tests prior to production have set the stage for all field artillery battalions in the Active Army, National Guard and Reserve Forces to begin receiving a "realistic" training system.

The new system was developed in response to findings of the Gorman and Dynamic Training Boards. Their reports stressed a need for a system capable of providing realistic artillery training for the Modern Volunteer Army.

Based on these findings, the Office of the Chief of Research and Development (OCRD) was tasked in May 1972 to develop in minimal time an inexpensive, rugged device that could provide training at almost any Army post, National Guard or Reserve training area.

In record time of about six months, roughly half the time projected, the R&D community developed a pre-production prototype. The intensive effort included agreement on a concept, building and user testing of the prototype system, and standard classification.

The trainer proved highly acceptable to troop units used to test the system at Fort Sill, OK, and Fort Hood, TX.

During the search for a feasible concept of a system that would provide realistic training for all personnel in an artillery battery, various proposals and systems were considered. Most of the proposed systems were evaluated as too sophisticated, too expensive, or "would take too long to develop and issue to the field."

In many brain-storming sessions it was determined that a fully acceptable trainer would have to fire a projectile that would leave a signature on impact easily visible to a forward observer, would provide realism for all artillery elements, and that would be simple, rugged, relatively cheap, and adaptable for rapid development.

In the final analysis, the M31 (14.5mm) artillery trainer, already in the inventory in small numbers, was identified as a system capable of providing the nucleus for development of a unit trainer that could meet requirements.

The tripod-mounted M31 had been used primarily as a forward observer trainer for years. Criticism of its limitations included: It provided little firing battery training, it lacked realism, safety restrictions were too great, fire direction procedures were different than for other howitzers, and the Field Army Digital Artillery Computer (FADAC) could not be used.

Following a decision June 26, 1972, to upgrade M31 capabilities, the Army Training Device Agency of the Army Materiel Command was tasked to develop adaptors to permit mounting of the 14.5mm barrel inside the tube of 105mm, 155mm and 8-inch howitzers. ATDA project manager Ted May and the project engineer, Hubert Cadle, were able to design, build and test prototype adaptors within three months.

Concurrently, a computer program was developed at the AMC Frankford Arsenal and Fort Sill, OK, to permit use of the FADAC to solve the 14.5mm gunnery problem. In addition, graphical firing tables and site tables (slide rule) were developed along with clear and simple instructions on how to prepare a reduced-scale map (1:5000) for any local training area. Estimated costs of $100,000 were cut to $14,000 by this joint effort, using knowledge acquired by Fort Sill's Gunnery Department in earlier work.

These improvements permit the use of a grid coordinate system by the forward observer and the Fire Direction Center and provide a capability to train FDC crews in both computer and manual solutions to gunnery problems.

Over-all, the new system is rugged and inexpensive. For example, 14.5mm ammunition costs approximately $1.00 a round, compared to $30.00 a round for 105mm and $37.00 a round for 155mm ammunition.

The point-detonating ammunition is non-fragmenting and leaves a smoke cloud (about one meter in diameter) upon impact, making it easy for an observer to request fire direction adjustments. Since the system can be fired in local training areas as small as 800 meters by 300 meters, or on known-distance rifle ranges, substantial savings in travel time, POL and vehicle maintenance cost can be achieved.

The Artillery School at Fort Sill has substituted 14.5mm ammunition for standard service ammunition on approximately 80 administrative service practices. Annual savings of $550,000 are anticipated in ammunition costs. In effect, in three years the total PEMA cost to equip all the artillery battalions in the Active Army and Reserve Forces will be recouped by savings at Fort Sill.

Further, the M31 PEMA costs for M114 (towed) 155mm howitzer and M101 (towed) 105mm howitzer systems are expected to be less, because of recent design improvements.

The basis of issue for U.S. units is one system for each artillery battalion. Each system consists of six 14.5mm barrels, six adaptors that permit mounting inside the tube of the howitzer, two tripods to permit firing without howitzers, and the associated softwear.

This basis of issue will permit any artillery battalion to perform reduced-scale battalion firing exercises. It provides for utilization of all the battery and battalion Fire Direction Center's communications and observers, using two guns per battery.

Another alternative provided by this basis of issue is to give the entire system to a single-firing battery on a daily basis for complete battery training.

M31 (14.5mm) barrel, fitted with an adaptor, can be mounted inside the tube of a 105mm, 155mm or 8-inch howitzer for realistic training for the Modern Volunteer Army.

DoD/NBS Creating Facilities For COBOL Compiler Testing

The National Bureau of Standards and the Department of Defense are cooperating to create a Federal COBOL Compiler Testing Service (FCCTS).

The FCCTS will take over the expanded mission of the DoD Central COBOL Compiler Testing Facility operated by the Department of the Navy.

Establishment of the FCCTS is viewed by the NBS and the DoD as a significant step in reducing redundant testing of COBOL compilers improving compatibility and interchangeability of COBOL programs, and improving the quality of COBOL compilers used by federal ADP installations.

Requests for cost-reimbursable COBOL compiler validations may be submitted to the FCCTS by vendors wishing to have a compiler validated for their own purposes; vendors wishing to have a compiler validated in response to a government request for proposal; government agencies involved in a procurement; government agencies wishing to validate a compiler already in use.

Further information is available from the Office of Technical Information and Publications, National Bureau of Standards, or the Director, Federal COBOL Compiler Testing Service, Automatic Data Processing Equipment Selection Office, Department of Navy.

NBS Announces Experimental Technology Funding

Funding is available for the Experimental Technology Incentives Program (ETIP) being implemented through the National Science Foundation and the National Bureau of Standards in response to President Nixon's FY 1973 budget special message to Congress on "Science and Technology."

Coincident with this May 16 announcement by Dr. Richard W. Roberts, director of the National Bureau of Standards, the NBS issued three vest pocket-size ETIP guidance publications. They are titled "Federal Regulatory Policy," "Assistance to Inventors and Small R&D Firms," and "Federal Procurement Policy." The initial ETIP allocation to the NBS is $7 million.

In a feature article titled "Nixon Proposes United R&D Effort . . . Message to Congress on Science and Technology Requests Action to Strengthen Economy, Improve the Quality," the May-June 1972 edition of the *Army Research and Development Newsmagazine* presented the major portion of the presidential message.

The statement of purpose of the ETIP is duplicated in each of the three guidance documents issued by the NBS late in May, as follows:

"The specific objective of ETIP is to obtain knowledge and experience concerning technological invention and innovation in the U.S.A. and to determine what cost-effective actions the Federal Government can take to increase the rate at which new technologies are successfully introduced to the marketplace.

Availability of such knowledge and experience will enable the Federal Government to shape its policies, programs and procedures so as to accelerate technological progress."

The document on "Federal Procurement Policy" explains in part, under the heading of "Premises Being Tested":

"The general premise for the experiments to be conducted is that federal and federally assisted procurement policies and practices can be found which will stimulate the rate of technological invention and innovation, and are cost effective. . . . It is also assumed that the private sector will respond positively to such stimulation and that the innovations will be cost-competitive when all factors are taken into consideration."

Cost-effective comparisons will be made in judging the total benefits of the ETIP activities. "The type of experiment contemplated," the Federal Regulatory Policy guidance booklet states, "would seek to introduce a sensitivity to technological change into the regulatory process.

"Also the ability to forecast the probable impact of a contemplated regulatory action on technological invention and innovation would be tested by requiring the development of a technological impact statement before the promulgation of a new regulation."

Since the 1972 presidential message on Science and Technology, the R&D leaders in each of the Military Departments have promulgated policies and programs designed to insure that the technological advances resulting from military R&D activities are made available promptly when they are foreseeably applicable to the goals set in President Nixon's message.

Further information on the ETIP plan and guidance for submission of suggestions can be obtained by contacting:

Director, Experimental Technology Incentives Program
National Bureau of Standards
Administration Building, Room A-724
Washington, D.C. 20234

NBS Publishes Technical Note On Thermal Conductivity Data

Thermal Conductivity is the subject of a recently published National Bureau of Standards Technical Note 634, giving the basic theory and empirical data for determining more rapidly and less expensively the conductivity of metal through the relationship between electrical resistivity and thermal properties.

The Wiedemann-Franz-Lorenz law quantifies this relationship so that approximate values of thermal conductivity can be predicted from less expensive resistivity measurements. The empirical law states that thermal conductivity is proportional to the ration of absolute temperature and electrical resistivity. The value of the constant of proportionality (L) is determined experimentally and is called the Lorenz ratio.

The Technical Note is available (prepaid $1.25) from the U.S. Government Printing Office, Superintendent of Documents, Washington, DC 20402 or local U.S. Department of Commerce Field Offices as SD Catalog No. C 13.46:634.

Laser Tracking System Permits Precise Missile Monitoring

Tracking an object traveling faster than 1,000 miles an hour while determining its position 200 times a second is possible with a new laser system undergoing final testing at White Sands (NM) Missile Range.

Designated as the Laser Ranging and Tracking System (LRTS), it was built to specifications outlined by scientists in the WSMR Instrumentation Directorate, and has undergone extensive tests for more than two years.

John A. Roth, LRTS project manager, says the system can provide critical early launch and "real time" (exact) information, including missile distance accuracy within four inches, 200 times a second. A high-speed digital computer controls the system.

WSMR officials stress that the LRTS is somewhat of a scientific first in that it is a "skin-track" system not requiring special retroreflectors or other optical and tracking augmentation as do beacon type systems. White paint is used on target vehicles.

Prototype cost of the LRTS is $1 million but production models are expected to cost less. Adoption of the system at WSMR will be dependent upon results of present tests.

Deputy Chief of Army Research and Development MG George Sammet Jr. recently visited the U.S. Army Training Device Agency and the Naval Training Equipment Center, Orlando, FL. Al Marshall, an NTEC scientist, demonstrates the latest galium arsenide rifle laser designed for USATDA to MG Sammet and COL Myles H. Mierswa Sr., USATDA commander, as Dr. G. R. Rosendahl, another NTEC scientist, looks on. MG Sammet also witnessed a demonstration of a laser rangefinder developed for the U.S. Marine Corps. a direct artillery fire simulator (M31) designed and fabricated at NTEC for the Artillery School, Fort Sill, OK, a television visual simulator, and an inexpensive pollution control device having potential for use by U.S. military services.

APG Applying High Performance Liquid Chromatography For Rapid Analyses of Army Propellants and Explosives

High Performance Liquid Chromatography (HPLC) has been adapted by Aberdeen Proving Ground, MD, as a possible new technique for the rapid, accurate and inexpensive analyses of Army propellants and explosives.

Variations in the compositions of propellants and explosives affect their stability, sensitivity, ignitability and performance efficiency; therefore, an accurate analyses is necessary to provide important information for quality control and surveillance as well as for research.

For example, the presence of impurities can decrease the stability of energetic materials; RDX explosive contaminated by HMX explosive (and vice versa) is less stable than the pure compound. In addition, the shelf-life of ammunition and rockets is highly dependent upon the depletion rate of the stabilizer in the propellant.

In modeling the interior ballistics performance of ball powder, researchers A. A. Juhasz and J. Omar Doali, using average retardant concentrations, consistently found differences between performance data based on firing records and predicted performance curves.

Subsequent analyses of propellant samples showed that retardant concentration varied with sample grain-size. New calculations, which incorporated these variations, yielded better agreement between theory and experiment.

Because most propellant test methods involve wet chemical techniques that are time consuming and require considerable operator experience, the gathering of accurate and precise analytical data on these energetic materials can be difficult. Although recent developments in thin layer chromatography and gas chromatography have provided faster, and in some cases more precise analyses, there are many problems that still remain.

Thin layer results are difficult to quantify, while gas chromatography is limited by the thermal instability of some compounds and the low vapor pressure of others. A simplified, accurate and generally applicable analytical approach would provide an improvement in providing useful analytical data for surveillance and research applications.

High performance liquid chromatography offers favorable speed, promise of good quantitation, easy handling of thermally labile compounds, analyses in the microgram range, and nondestructive detection that allows samples to be used in subsequent spectroscopic examinations.

The difference between HPLC and the familiar traditional column chromatography is that column diameters are small (typically 2-3 millimeters), packings are uniformly sized (about 20 microns), and solvent flow is caused by pressures that can range from several hundred to several thousand pounds per square inch.

The results are shortened analysis times (minutes as opposed to hours), and superior column efficiencies (2,000 theoretical plates per meter). Sample requirements are modest; quantitation and spectral identification of a component are readily done with 30 micrograms of sample.

In practice, a mixture to be analyzed is carried by a solvent (mobile phase) through an adsorbent bed (stationary phase) packed within a column. Separation occurs through the competition between the sample components and the mobile phase for the active sites on the surface of the adsorbent.

The eluting compounds are then measured by an appropriate detector. With a suitable detector and recorder, chromatograms that give both qualitative and quantitative analysis are obtained. Time to peak emergence or retention time is characteristic of the composition of the compound while peak area is a function of the amount of constituents in the sample.

Two types of detectors are used to indicate changes in the eluant due to eluting compounds—a differential refractive index monitor and an ultraviolet monitor. Since such detectors are nondestructive, fraction trapping and identification by auxiliary techniques are possible.

A typical chromatogram of the components of a double-base propellant extract appears as Figure 1. The separation was achieved in a little over ten minutes. The components, diphenylamine, dibutylphthalate and nitroglycerin were identified by comparison with the retention times of known standards. Quantitative determination of each ingredient is possible once the appropriate calibration curves are established.

An example of the separation of the components and their identification by infrared spectroscopy appears in Figure 2. A solution of the explosive tetrytol was separated into its components, TNT and tetryl. Analysis time was under ten minutes. Component identification was made by direct comparison of the infrared spectra of trapped fractions with published data.

In addition to using the HPLC method in research, the scientists are evaluating the technique for application to routine propellant analyses.

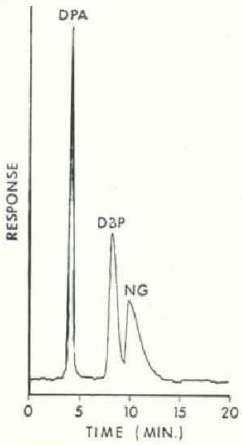


Fig. 1. Separation of chemical components of a double-base propellant extract. Because the transit time through a chromatographic column, under a particular set of experimental conditions, is constant for individual components, the retention time in the column identifies these components as diphenylamine, dibutylphthalate, and nitroglycerin.

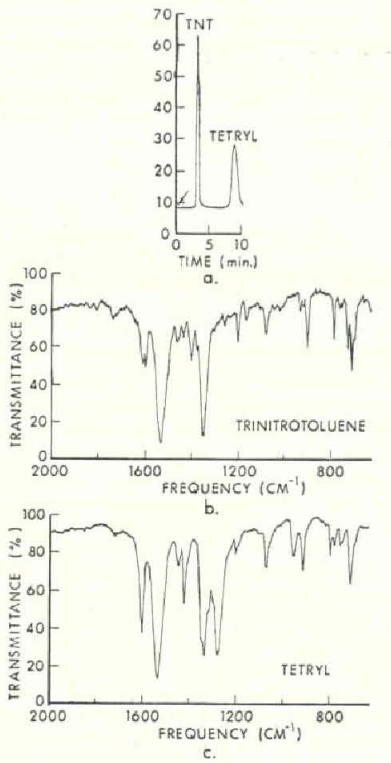


Fig. 2. Separation and identification of ingredients in the explosive Tetrytol. In 2a, high-performance liquid chromatography provides separation and tentative identification, based on retention times, for Tetryl and Trinitrololuene (TNT). Figures 2b and 2c, which are infrared spectra of the trapped, separated fractions of the sample, provide direct, positive identification of the TNT and Tetryl.

R & D NEWS

Interns Earning MS Degrees On Army Research Projects

In fulfilling requirements for a master's degree, six students at the U.S. Army Materiel Command Intern Training Center, Red River Army Depot, Texarkana, TX, are engaged in Army-related research projects.

Participants and their projects are: Joseph D. Wu, "Locating Component Failure in Mechanisms Using Vibration Analysis"; Myron J. Tingey, "Detect Analysis of Body Armor Using the Acoustic Signature"; Gregory S. Keiran, "Nondestructive Fatigue Crack Monitoring by Acoustic Emission Techniques"; and

Don E. Ferrell, "Extension of Age Life of T-10 Troop Type Parachutes through the Construction of a Reliability Predication Model"; Carl S. Royer, "A Computerized Prediction Model for Airborne Cargo Loading Stress Based on Ground Test Facilities"; and Michael Kulinski, "Cost Effectiveness of Body Armor."

The interns, all graduate engineer students, selected projects on the basis of a briefing by a U.S. Army Natick (MA) Laboratory (NLABS) engineer. Faculty members of the Intern Training Center and Texas A&M graduate school also toured NLABS facilities.

Army Corps of Engineers, 11 Federal Agencies Cooperate in $15 Million Facility for Research

Construction of a $15 million Chesapeake Bay Hydraulic Model, a U.S. Army Corps of Engineers project termed the largest of its type in the world, was initiated June 11 at Kent Island, MD, with Secretary of the Interior Rogers C. B. Morton keynoting the ceremonies.

Scheduled for completion in June 1975, the model is expected to be operational for testing about a year later, after a "tuning" process.

Realistic in-miniature studies of the bay proper, all its tributaries up to the head of tidal effects, and adjacent land areas to 20 feet above mean sea level, will be directed toward water-land resources management attuned to sound economic, ecological and recreational requirements considerations.

Importance of the research facility, being established under authority of Section 312 of the Rivers and Harbors Act of 1965, is indicated by the participation of 11 major federal agencies, other than the Corps of Engineers, four states and the District of Columbia.

Each of the participating agencies is exercising leadership and providing technical assistance in the areas for which it has special competence, thus providing a multidisciplinary approach.

The federal agencies include the Atomic Energy Commission, Departments of Commerce, Housing and Urban Development, Interior, and Transportation, the Environmental Protection Agency, Federal Power Commission, National Science Foundation, Smithsonian Institution and the U.S. Navy. The states are Maryland, Delaware, Commonwealth of Pennsylvania and Commonwealth of Virginia.

In citing the need for the hydraulic model, Dr. Eugene Cronin, director of the University of Maryland's Chesapeake Biological Laboratory, said the bay area is "probably the most valuable and vulnerable large estuary in the world."

Alfred Robinson of the Baltimore District of the Corps of Engineers calls the bay model "unique" in more than its size, explaining: "The difference is that other models (built by the Corps) were all designed for a specified purpose, to solve a problem, such as the silting in Savannah Harbor.

"The bay model will be comprehensive, permitting all kinds of tests involving such things as tidal currents, waste dispersion and effects of salinity—such as the devastation which occurred when fresh water from tropical storm Agnes washed out the soft shell clam industry."

Determinations in the bay model research will be used to evolve an over-all management plan for the Chesapeake area that will be submitted to Congress with recommendations for cooperative federal and state implementation.

In pointing to the need for farsighted planning to insure that the value of the water-land resources of the bay area are not diminished by an unwise imbalance in management, proponents of the study have cited estimates that the population of the area will double in 50 years—putting the tremendous press of a multiplicity of competing demands on use of its shores and water.

Included in considerations of the hydraulic model study will be such aspects as: What effect of such things as proposed nuclear power plants and industrial facilities have on the shores? What will be the possible consequences of dredging for deep-draft ship channels?

Use of the model is expected to provide the knowledge that will insure prediction of such results with a high degree of accuracy.

In seeking answers to such questions during the intensive effort since 1965 to proceed with the Chesapeake Bay Hydraulic Model under the 1965 Rivers and Harbors Act, many high officials in cooperating federal and state agencies have played prominent roles.

Dignitaries present for the June 11 ground-breaking ceremonies included a number of the many ardent advocates of the project, notably former Governor Millard Tawes of Maryland, who represented Governor Marvin Mandel, and Maryland Senators J. Glenn Beall and Charles McC. Mathias Jr. More than 200 federal, state and Queen Annes County officials and guests attended. Keynote speaker Morton paid particular tribute to his First District successor, the late Congressman William O. Mills, for tireless dedication to the project.

The Chesapeake Bay Hydraulic Model site is on Kent Island, two miles south of the eastern end of the Bay Bridge, at Matapeake, on 62.5 acres of land donated to the state by the U.S. Government. The model will cover 6 acres of a 9-acre paved area and will be sheltered from the elements to permit all-weather testing operations by a 40-foot-high steel truss structure covering 14 acres.

The University of Maryland, Johns Hopkins University, and the Virginia Institute of Marine Science performed hydrographic studies used in the design of the model, and the Chesapeake Research Consortium made a biota study of the Bay for the project.

GROUNDBREAKING (from left) are Secretary of the Interior Rogers C. B. Morton; Mrs. Mills, wife of the late Congressman William O. Mills; State Treasurer and former Governor Tawes of Maryland; and COL Louis W. Prentiss Jr., Baltimore District Engineer. In the background are William Mills Jr. and Senator J. Glenn Beall. Congressman Mills was cited by Secretary Morton as one of the key people who worked for years to get appropriations for the Chesapeake Bay research facility.

The scale of the model is the smallest practicable and is "distorted" in that it will be one foot to 1,000 feet horizontally, and one foot to 100 feet vertically. The length of the Bay, 195 miles, will be reduced in the scale model to 857 feet; the widest portion of the Bay, 30 miles, will be 158 feet across in the model; and the deepest point, 174 feet near Bloody Point, will be represented by a model depth of 21 inches.

To give more of an idea of the dimensions that are to be represented by the model: the surface area of the Bay and its tributaries totals 4,300 square miles; the average depth is 28 feet; the shoreline is 7,325 miles in length and the drainage basin of the waters flowing into the bay covers 64,170 square miles—larger than the combined area of Virgina and Maryland.

Protection of the model against the elements is considered essential as wind and rain would adversely affect water surface elevation and salinity measurements. Equally important is the need for keeping the model clean of dust, leaves, and other airborne debris.

In selecting the type of building required, the large size and configuration of the model, the need for column-free space, and the necessary clear height for model photography, were governing factors. The shelter, 1,080 feet long and 680 feet wide, is to be built by Charles E. Brohawn and Bros., Inc. of Cambridge, MD, at a cost of $6 million.

Thirty employes at the model complex will be highly trained hydraulic model engineers and technicians. Ten will be administrative and support personnel.

In consonance with its purpose, the construction and operation of the hydraulic model complex will have no adverse environmental effects on the Bay or the land area surrounding it.

Secretary Morton termed the bay model "an invaluable working tool that will enable us to plan and develop for the future, without destroying the delicate character of one of America's most spectacular natural resources—the Chesapeake Bay . . .

"While environmental action is most often focused on the need to set aside wildlife habitat and wilderness, on saving endangered species, or constructing parklands, these are not the most pressing challenges of our environment. The genuine challenge, instead, is whether we can create systems and build to meet the needs of an immense technological society, without destroying the quality of our environment."

Army Skin Disease Research Provides Hope for Prevention Techniques

Skin infections are recognized by U.S. Army medics as an important cause of morbidity and temporary disability among military forces, particularly those in tropical areas of the world.

Chief among these infections are bacterial pyoderma, commonly referred to as jungle sore, and dermatophytosis, also known as ringworm. The potential impact of skin infections on combat effectiveness is best appreciated by examination of recent history.

In Vietnam, for example, skin infections occurred in epidemic proportions among American infantrymen operating in wet, lowland terrain during the rainy season, and often accounted for more loss of time from combat duty than all other diseases combined.

Moreover, skin infections and other dermatoses constituted the leading cause of outpatient visits among all U.S. Army personnel during the entire conflict, and were consistently the third or fourth leading cause of hospital admissions for disease. The experience of U.S. forces in the Southeast Pacific during World War II was comparably similar.

LTC Alfred M. Allen, MC, of the Division of Preventive Medicine, Walter Reed Army Institute of Research, Washington, DC, conducted a 6-month study in 1968–69 in an effort to determine the specific causes of these diseases, to measure the impact of contributing factors, such as wet clothing and footgear, and to formulate improved methods of prevention and treatment.

R & D NEWS

This work was done in cooperation with civilian contractors sponsored by the U.S. Army Medical Research and Development Command, particularly David Taplin, associate professor of dermatology and of epidemiology and public health, University of Miami, FL. The field study was part of a long-term Medical R&D program directed towards cutaneous diseases of military concern.

RESEARCHERS pinpointed the cause of painful skin ulcers, "jungle sores," shown on leg of U.S. Army infantryman, as the betahemolytic streptococcus.

Deployed with the U.S. Ninth Infantry Division in Vietnam's Mekong Delta, the research team operated where the hot, humid climate and swampy river basin terrain contributed to high rates of disability due to skin diseases.

More than 1,000 Americans and Vietnamese were examined during surveys, and cultures were performed on all those with clinical evidence of bacterial or fungal infections.

Interviews with battalion surgeons and unit commanders, analysis of sick call and hospital records, and review of tactical operations and exposures, provided additional data for clinical and epidemiologic evaluation.

Most of the research was performed at fire support bases and divisional rear areas, but the team also carried R&D efforts directly in to the field. Each team member accompanied infantry units on combat operations to gain a first-hand appreciation of the conditions contributing to the high rates of infection.

The need for this type of investigation soon became readily apparent since disabling skin infections were occurring in profusion despite application of the best available measures of prevention and treatment.

In part, these high rates of disability were due to a serious lag in studies of the epidemiology of these infections—a lag due primarily to the fact that U.S. ground combat troops had not been subjected to similar terrain and weather conditions since World War II.

Researchers found that jungle sores on U.S. infantrymen were not related to malnutrition or debility, as previously had been believed. Infections usually developed on the feet, ankles and lower legs at the site of insect and leech bites or minor cuts and scratches that became infected and aggravated during long patrols in flooded rice paddies.

Although two or more kinds of bacteria could be recovered from jungle sores, the evidence indicated that the Group A beta hemolytic streptococcus was the chief infective agent. Ninety percent of soldiers with clinically significant lesions yielded Group A streptococci.

Severe lesions occurred in the form of painful open skin ulcers. The researchers found a striking resemblance between bacterial skin infections in American soldiers and Vietnamese children.

In contrast to the streptococcal skin lesions, ringworm infections caused itchy red rashes, usually involving the groins and buttocks as well as the feet. Ringworm infections in infantrymen in many cases became so severe that the top layer of the skin sloughed off, leaving a raw, weeping surface.

ORGANISMS that caused infections in Vietnamese children were the same as those recovered from "jungle sores" that affected U.S. troops in Vietnam.

To compound the problem, the damage to the skin caused by ringworm infections left the soldiers with an increased susceptibility to streptococcal infection.

The source of the most common and severe form of ringworm infection appeared to be in wild rats, 25 percent of which carried this type of fungus in their fur. It still has not been determined how the infection might spread from rat to man, or from man to man.

The antibiotic griseofulvin was used for treatment of ringworm infections. This antibiotic is commonly administered to civilians in the United States as well. In Vietnam, however, the tropical climate and wet combat environment seemed to limit its effectiveness. Pilot studies suggested that griseofulvin might be useful as a prophylactic agent if taken prior to acquiring an infection.

Results of the research conducted in Vietnam, and of later studies in South America, have made significant contributions to the prevention and treatment of streptococcal pyoderma (jungle sore).

For example, one injection of a specific, long-acting form of penicillin looks promising as a convenient, effective means of significantly reducing healing time. Prior to this innovation, a series of oral medications and extensive follow-up procedures with physicians were required.

In one project conducted in South America in September 1971, studies revealed that climate and hygiene are principal determinants of the frequency of streptococcal sores. Investigation showed that knowledge of these two factors, may make possible a predictive

capability showing the intensity at which the disease occurs.

For example, it has been shown and confirmed that, in a jungle environment and under conditions of poor hygiene, up to one-third of a population may have streptoccoccal lesions at any time.

Field medicine, with which the preceding studies have been concerned, presents a different kind of challenge than that of hospital-based medicine. For obvious reasons, physicians and other medical personnel who are trained in the United States tend to be unfamiliar with some of the conditions which are common in field medicine.

Causative factors are not usually as well represented in statistical reports as are those which lead to hospitalization; thus they may not gain wide attention until infections reach epidemic rates.

LTC Allen says these factors must be taken into account in assigning research priorities since, as in the cases of bacterial and fungal skin infections in Vietnam, it is the infantryman who is at highest risk to disabling infections; it is he who is the key element in effective ground combat operations.

As a result of the research findings in SE Asia and in other tropical areas of the world, he stressed that a great deal can be done to reduce the impact of skin diseases on military operations.

In Vietnam, for example, recommendations were made to field commanders in regard to prevention of skin diseases. Introduction of dermatological teaching programs for battalion medical personnel increased awareness of the problems involved. This resulted in a significant cut in rates of disabling skin disease.

In addition to these field studies, the U.S. Army Medical Research and Development Command also has a comprehensive program of laboratory studies directed towards combating skin diseases of military importance.

Studies cover a wide range of subject areas, but among the more prominent are those devoted to the immunology of common bacterial and fungal infections; the effects of heat, friction and moisture on the skin; and the underlying mechanisms of resistance to heat, wetness, friction and infection.

Recently, investigators at the Letterman Army Institute of Research, Presidio of San Francisco, CA, have made rapid progress by developing suitable laboratory models of skin conditions which can disable soldiers.

Development of reproducible methods of inducing fungal skin infections and friction blisters in volunteers has enabled U.S. Army researchers to study mechanisms of injury and new techniques for prevention under rigorously controlled experimental conditions.

HDL Studying Tamper-Resistant Fiber Optics Seal

In response to a U.S. Arms Control and Disarmament Agency (ACDA) requirement, engineers at the U.S. Army's Harry Diamond Laboratories are developing a tamper-resistant seal system employing fiber optics technology.

For a number of years, ACDA officials have recognized the need for a secure system for safeguarding nuclear material under the Treaty on the Nonproliferation of Nuclear Weapons. In 1971, the ACDA sought a prototype design to develop the procedures for improved operational systems.

The system now under development is an improved version of a basic fiber-optic system proposed by the ACDA. Within a year, the HDL delivered 200 sets of this initial version, including a portable kit capable of assembling the seals, photographing each assembled seal's fingerprint, and identifying the seals for later inspection.

Using the latest advances in fiber-optics technology, the improved version currently being field tested provides a "unique fingerprint" for each seal deployed. The system permits the field assembly of each seal, the photography of the seal's fingerprint, and nondestructive verification of the seal's integrity during inspection.

Easily adaptable to a variety of situations, the seal is described also as simple to install, capable of being uniquely identified without removal of the seal, and relatively inexpensive. In mass production, the cost eventually is expected to be about $2.00.

The seal provides an effective technique for securing safeguards equipment and containers of uranium or plutonium while unattended by inspectors.

Following the clamping of a metal connector at the ends of the looped fiber bundle, exposed ends are secured and polished. When light is directed onto either fiber end, the fiber end in the opposite half of the connector reveals a "unique fingerprint."

Simple photography methods are used to capture this fingerprint, consisting of light dots which are the lighted ends of the fibers, forming a random and unique array. Because of the arrangements of the fiber bundle and the method of assembly, no two seals have an identical pattern of light dots.

An assembled seal cannot be opened without destroying this pattern, the complexity and uniqueness of which preclude reassembly or duplication of the seal. A comparison of a positive print of the fiber optic seal and a previously taken negative print is a simple and nondestructive method of inspecting the dot pattern to verify the integrity of the seal.

HDL Fluidic Research Supports Naval Programs

Fluidic power supply concepts developed at the Army's Harry Diamond Laboratories (HDL) in Washington, DC, have been applied recently in support of four Navy-sponsored programs, including a recent joint effort with the Naval Weapons Center, China Lake, CA.

HDL researchers provided a fluidic power supply for the Navy's SUU/53, an aerial weapon dispenser that was prohibited from advanced testing because of a need for additional environmental safety refinements.

In response to the Navy's request, the HDL supplied a fluidic safety velocity sensor system that transforms ram-air energy into electrical energy. Investigators report that the system performed properly at altitudes up to 35,000 feet, providing low-velocity electrical energy required for firing safety.

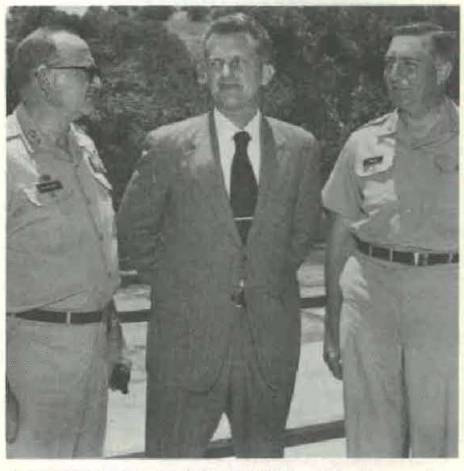
Previously, in cooperation with the Naval Ammunition Depot, McAlester, OK, the HDL provided the Navy's Remote Arming Stores System with a fluidic power supply meeting environmental safety and electrical power requirements. The generator provided a capability to test the rapid (milliseconds) rise-time of electrical power without a failure.

In another response to the Naval Ordnance Laboratory (NOL), White Oak, MD, the HDL supplied fluidic power for the Fluidic Environmental Sensor (FES) Deneye Weapon System.

To satisfy the dispensing rate control and fuzing function, the FES was required to produce a linear voltage of air speed over a velocity range from 70 to 500 knots. During flight tests, the HDL fluidic power source denied electrical power to the weapon system until a minimum airspeed was obtained; it then generated electrical energy as a function of airspeed for either fixed-wing aircraft or helicopter applications.

The first fluidic power supply program was supported by NOL to eliminate the accidental firings of rockets while the aircraft is on the ground or on a carrier deck. The resultant system senses the airborne environment and provides sufficient electrical energy to fire the aircraft rockets only when the aircraft has reached a predetermined velocity.

HDL researchers said all four systems furnished to the Navy have been flight tested and "only begin to reveal the versatility of fluidic generators."



ASSISTANT SECRETARY of Defense for Telecommunications Dr. Eberhardt Rechtin is shown with MG Jack A. Albright (left), commander, U.S. Army Strategic Communications Command (STRATCOM), and BG George M. Snead Jr., deputy commander. Dr. Rechtin spoke on "National Policy and Defense Communications" at an Institute of Electrical and Electronic Engineers conference.

Survival Vest Examined for Combat Helicopter Use

Results of engineer-design tests are being evaluated for an Individual Survival Vest for Aircrew members (ISVESTA), which integrates three standard items—aircrew armor vest, survival vest, and under-arm life preserver—into one garment.

Increased use of helicopters in Vietnam created a need for new types of personnel body armor; also, new lightweight strategic armor to protect vital areas of helicopters against small-arms fire and shell fragments.

New design features were required in developing aircrew body armor with a flexibility to compensate for the wide range of vest sizes required by aircrewmen, without restricting movement in performance of duties.

Under combat conditions, the pilot and copilot, seated in armor protective seats, wore only the front armor plate with a spall-suppressor system. Gunners, crew chiefs and other crew members wore both back and front armor plates with spall suppressors.

To meet the demand for lightweight, flexible armor, the U.S. Army Natick (MA) Laboratories (NLABS) designed three prototypes. Made of Nomex fabric, they were filled with adjustable side panels to allow more latitude in filling than previous vests. A change also was made to the closure fasteners.

Each type can be worn over the aircrewman's outer clothing. A standard under-arm life preserver is attached by threading the chest straps through loops inside the vest.

Pockets are provided in the front and sides for storing survival components such as a knife, mirror, radio and light marker. Armor plates are inserted in spall suppressors attached to the front and back of the vest.

Nine pilots and aircrewmen from Phillips Army Airfield, Aberdeen (MD) Proving Ground (APG), wore the vests during tests held in the indoor swimming pool at the Bainbridge (MD) Naval Training Center.

Tests served to evaluate the capability of the vest to support an aircrewman wearing standard flight clothing, flight helmet and body armor, while in salt or fresh water, to the extent that the head, neck and upper shoulders are buoyed above water.

Tests also were conducted on the aircrewman's ability to inflate the life preserver while in the water and to remove, with and without gloves, the armor plates and survival units.

A vest fitting study and actual flight tests were conducted for the APG by the U.S. Army Aviation Test Board, Fort Rucker, AL.

Crash tests utilizing an anthropomorphic dummy and the test facilities operated by the Naval Air Development Center at Philadelphia (PA) also were conducted.

The test program was under the General Equipment Division of the Materiel Testing Directorate, APG, and directed by Hunter H. Paschall and Julian B. McAuley. Technical assistance was provided by Thomas H. Judge, NLABS project officer.

Caseless Cartridge Nears Final Development Tests

Final development testing of a new caseless cartridge composition for small arms, proved successful in extensive firings in experimental rifles, is planned this summer by HQ U.S. Army Munitions Command, Picatinny Arsenal, Dover, NJ.

Consumable (formerly termed combustible) cartridge cases have been under joint developmental effort by several agencies for the better part of a decade—with the objective of eliminating the traditional brass casing to reduce an infantryman's weight and bulk load.

The new "multilayered" cartridge is comprised of an outer sleeve made up of small granules of propellant compressed to the geometry of a weapon chamber in a metal mold. The sleeve of heat-resistant propellant surrounds and protects a core of more energetic, less heat-resistant standard propellant.

Upon ignition, the core and sleeve materials begin to burn and, as the pressure rises, break up and revert to the initial small geometry of the original granular material, to promote rapid combustion of the entire cartridge.

Leonard R. Ambrosini, technical director of the U.S. Army Small Arms Systems Agency, Aberdeen (MD.) Proving Ground, and Dr. Jean Picard, chief of the Propellants Division, Feltman Research Laboratories, Picatinny Arsenal, have filed a patent application for the High-Ignition-Temperature Propellants, Self-Extinguishing at Atmospheric Pressure (HITP-SEAP) cartridge.

Credited with sharing in the developmental effort are scientists and engineers at Picatinny Arsenal, Frankford Arsenal in Philadelphia, PA, the U.S. Army Ballistic Research Laboratories at Aberdeen P.G., the Naval Ordnance Laboratory at White Oak, MD, Princeton University, and several industrial organizations under contract.

Frankford Arsenal personnel have molded and primed the new experimental cartridges, using propellants samples formulated by the FRL Propellants Division.

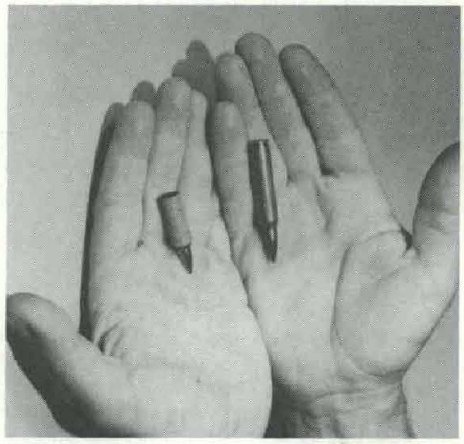
Frankford scientists demonstrated several years ago that caseless ammunition could achieve ballistic performance equivalent to metal-cased ammunition, with an attendant reduction in weight of 50 percent and volume by 35 percent. Significantly, this promised to eliminate the need for brass, a critical wartime metal, for cartridge cases for small arms ammunition.

Historically, propellants chemists had experimented with nitrocellulose, impregnated paper and numerous other materials in the search for suitable materials for caseless ammunition. Other researchers experimented with cartridge cases made of aluminum, lightweight steel, and plastic.

However, the conventional propellants that were used proved vulnerable to accidental ignition by heat, flame, and projectile impact. Thus, should one round in a soldier's rifle magazine ignite, the flame could spread to other rounds. This round-to-round propagation was of deep concern to the U.S. Army Small Arms Systems Agency (USASASA), which manages the over-all small arms development for the U.S. Army Material Command.

Another critical factor that had to be considered during the developmental work on the HITP-SEAP cartridge was that the round would have to be strong enough to withstand forces in loading an automatic weapon.

Many of the new cartridges have demonstrated the required qualities in experimental firings in a modified rifle. Researchers report that velocities and pressures at this time are very closely approaching the desired values.



CASELESS CARTRIDGE for small arms (left), designed by MUCOM scientists for the M16 rifle, is shown for comparison with standard 5.56 brass cartridge.

AMC 11th Anniversary

U.S. Army Chief of Staff GEN Creighton W. Abrams marked the 11th anniversary of the Army Materiel Command with this message:

As the United States Army Materiel Command observes its eleventh anniversary on Aug. 1, I take pleasure in extending congratulations and best wishes on behalf of the United States Army.

During its relatively short lifespan, the Army Materiel Command has procured the weapons and equipment for our ground forces that have made them the best equipped and most flexible in the history of warfare. The professionalism and dedication of AMC's military/civilian team are indeed exemplary.

The men and women of the Army join me in expressing appreciation for your efforts to improve our combat readiness and in wishing the Army Materiel Command continued success.

AMC Commander GEN Henry A. Miley Jr. addressed to AMC personnel this message:

As we celebrate our anniversary on Aug. 1, we can look back with pride on 11 years of positive accomplishment in meeting the logistical demands of our fighting forces. Our experience during the war in Southeast Asia has developed a mature, professional logistics team, characterized by mission accomplishment.

The past year was marked by significant advances in the management of our operations and by a streamlining and realignment of our organization and its functions. The year also saw many of our senior people retire, creating many gaps which will be difficult to fill.

For the first time in many years, our anniversary finds our nation at peace. We must use this peaceful interval to improve and sharpen our systems and programs in order to meet any possible contingencies in this uncertain world. It will be a period of declining resources and challenging problems. It will be a period which will require renewed dedication, increased energy, and great imagination.

I appreciate your continued loyal support and splendid performance. I am fully confident that we will be equal to whatever challenges the future may bring.

R&D NEWS...

MRC Announces Seminar On Generalized Inverses

An Advanced Seminar on Generalized Inverses and Applications, consisting of 13 invited lectures, is scheduled Oct. 8–10 at the Mathematics Research Center, the University of Wisconsin-Madison.

The first of 5 sessions (3 lectures) will provide an introduction to, and an overview of, generalized inverse concepts for matrices and linear operators. A session on numerical analysis and approximation methods (3 lectures) will deal with computational methods for generalized inverses of matrices and related topics in numerical linear algebra, linear and nonlinear least-squares problems, and approximations of generalized inverses including iterative and projection methods.

The remaining three sessions will be devoted to a wide spectrum of applications of generalized inverses, highlighting their role in partial differential equations; integral equations and boundary-value problems; regularization methods for ill-posed linear problems; quadratic optimization and control theory; and applications of generalized inverses in statistics, econometrics, and operations research.

Participants will include Arthur Albert, Boston University; Adi Ben-Israel, Northwestern University and Mathematics Research Center; Frederick J. Beutler, University of Michigan; John S. Chipman, University of Minnesota; Gene H. Golub, Stanford University; Thomas N. E. Greville, Mathematics Research Center and National Center for Health Statistics.

Also participating will be Magnus R. Hestenes, University of California, Los Angeles; Rudolf E. Kalman, University of Florida; M. Zuhair Nashed, Georgia Institute of Technology; Ben Noble and Louis B. Rall, Mathematics Research Center and Oxford University; Victor L. Pereyra, Universidad Central de Venezuela; William L. Root, University of Michigan; and G. F. Votruba, U. of Montana.

The seminar is intended to be highly expository. Many people in the audience will be mathematicians and other scientists who are not experts in generalized inverses and the related applications, but will want to learn enough to gauge the relevance of the topics discussed to their problems.

Consequently, the invited speakers have been urged that the emphasis in their presentations should be on important ideas and techniques involved. The details will be available in the published proceedings.

The theory of generalized inverses has its genetic roots essentially in the context of so-called "ill-posed" linear problems. These include problems in which one either specifies too much information, or too little. These problems cannot be solved in the sense of a solution of a nonsingular problem. However, there is a sense in which there is still a solution (and in fact a unique "solution") if one adopts the notion of "least-squares solution."

Army personnel interested in attending should write to: Secretary, Advanced Seminar, Mathematics Research Center, University of Wisconsin, Madison, WI 53706. A statement of position or scientific or engineering qualifications should be included.

Army Research Office Names Dr. Robl Chief Scientist

Promotion of Dr. Herman Robl to chief scientist of the U.S. Army Research Office in Durham, NC, following 11 years service as deputy under Dr. John W. Dawson, now retired, was announced in mid-July by ARO Commander COL Lothrop Mittenthal. The position carries the prestige of PL-313 status.

Dr. Robl is a native of Vienna, Austria, who came to the United States as a contract employe in 1955 and became a naturalized citizen in 1961. He was a member and, later, the director of the Physical Sciences Division of the Office of Ordnance Research, now the Army Research Office.

Appointed to The Army Research Council (TARC) in 1969, he is still a member and also holds alternate membership on the Technical Advisory Committee of the Joint Services Electronics Program.

Dr. Robl has received numerous professional honors, including a UNESCO Scholarship Award that resulted in a notable report on nuclear physics in the early 1950s. His records list the Theodor Korner Presidential Award (named for a former Austrian president), a U.S. Army Research and Development Achievement Award for contributions to the building of a laser research program in 1960, and the U.S. Army Decoration for Meritorious Civilian Service.

Granted a doctorate by the University of Vienna's Institute for Theoretical Physics, he held teaching positions there and returned in 1965 for five months of study and research in quantum electrodynamics under an Army Research Office scholarship program. The award included five months of similar study at the University of North Carolina.

Dr. Robl received his doctorate following World War II service as a German Army antiaircraft artillery officer. He was commissioned as a first lieutenant after completing officer's training school, and served in 1937 as an engineer noncommissioned officer in the Austrian Federal Army.

Dr. Herman Robl

NATO, U.S. Army Sponsor Technology Transfer Meet

Methods of expediting the transfer of new knowledge gained in laboratory research to potential users in the military or civilian community were considered by the North Atlantic Treaty Organization Advanced Study Institute on Technology Transfer, June 24–July 6 at Evry, France.

Sponsored by NATO and the Department of the Army, it was the first international conference of its kind ever held in the Western World. More than 110 participants representing in excess of 20 countries exchanged viewpoints and progress reports.

Members of the organizing committee included Harold Davidson, Army sponsor, on behalf of the Office of the Chief of Research and Development, with cochairmen, Dr. Marvin J. Cetron, president, Forecasting International, Ltd. and Dr. Joel D. Goldhar, Rensselaer Polytechnic Institute.

Coordinating the discussions was Prof. R. Derek Medford, International Institute for the Management of Technology, (European coordinator).

Discussions focused on development of a methodology which might best speed the technology transfer process. Current U.S. Army efforts are directed to laying down broad policy on technology transfer and expanding existing Army Regulation 70-1.

Key banquet speaker Congressman J. Edward Roush (Fourth District, D-IN), who is sponsoring legislation for creation of an office for Federal Technology Transfer, traced the development of federal interest in technology utilization. He noted the measures which the legislative and executive branches of government have taken for greater support to stimulate technology utilization.

Other featured speakers included Dr. E. Ralph Dusek, associate director, U.S. Army Research Institute for the Behavioral and Social Sciences, whose topic was "Technology Transfer in Human Resources Research," and Leonard L. Lederman, director, R&D Assessment Program, National Science Foundation, "Design of Research and Experimentation in Technology Transfer."

In reporting to the Army Research and Development Newsmagazine on results of the conference, Davidson said that a great deal of information was "exchanged and learned by the attendees, many of whom asked for another institute on this topic in two years."

Deseret TC Functions Transferred to Dugway PG

Disestablishment of Deseret Test Center, UT, as a joint military services activity and transfer of its Department of Defense chemical warfare and biological defense testing mission, with resources, to the Army's Dugway Proving Ground, UT, was effected in July.

The action followed announcement of approval by the Deputy Secretary of Defense. Dugway also assumed the function of operating as a joint contact point for chemical and biological information. The proving ground operates under the jurisdiction of the U.S. Army Test and Evaluation Command, Aberdeen Proving Ground, MD, a major component of the U.S. Army Materiel Command.

The Navy, Marine Corps and Air Force have assigned one liaison officer each to the DPG. Officers and enlisted personnel at the DTC were reassigned.

Activated in May 1962, as a jointly staffed organization and a special project under the Army Materiel Command at Fort Douglas, the Deseret Test Center was merged with the DPG in July 1968. Elements of DTC at Fort Douglas were relocated to DPG in May 1973.

Human Engineering Laboratory Seeks to Determine Weapon System Deficiencies

U.S. Army Human Engineering Laboratory Director Dr. John D. Weisz at Aberdeen (MD) Proving Ground has addressed to this publication the following response to a recent article.

* * *

In the March-April 1973 issue of the *Army Research and Development Newsmagazine*, a speech given to the American Institute of Aeronautics and Astronautics by Dr. John Foster Jr., former Director of Defense Research and Engineering, was published.

Dr. Foster emphasized the urgent need to determine weapon system deficiencies so that our future R&D effort can be oriented towards eliminating these deficiencies. Specifically, he is quoted as saying:

"All of us must change our perspective on weapon systems. The number of people in this country who are concerned about weapon systems, pro and con, is much larger than the number who are searching for critical deficiencies. This is an imbalance in motivation that we must change. We should avoid taking an advocacy position on weapon systems until we have evaluated our relevant deficiencies. When I say 'all of us,' I mean those in the Office of the Secretary of Defense, our key military men, and those in industry."

It may be presumptuous to say that the U.S. Army Human Engineering Laboratory has done exactly this type of research in the last 2½ years in its series of field tests called Human Engineering Laboratory Battalion Artillery Tests (HELBAT I, II and III), Human Engineering Laboratory Armor Systems Test (HELAST I and II), Human Engineering Laboratory Infantry System Test (HELIST I), and Human Engineering Laboratory Helicopter Armament Test (HELHAT).

These programs are all specifically oriented in their respective commodity areas (artillery, armor, infantry and aviation) to determine the exact error in-puts of the human operator and various components of the system, so that the error sources can be specifically determined and eliminated either through redesign of components, or improved training of operators, and/or isolation of the deficient components towards which future R&D programs must be oriented to improve them.

Experience of the HELBAT series has clearly shown that the error sources can be isolated (for example, 53 percent of the error of an artillery mission was found to arise at the forward observer's location). In other words, the major deficiency was isolated and then, in HELBAT II, an order of magnitude of improvement in system performance was achieved through the use of new equipment and/or operational procedures.

The Human Engineering Laboratory is predicting that similar results will be found also in the armor, artillery, and infantry weapon area. For specific details of these field tests, please request appropriate HEL technical publications from the Director, U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005.

Army Assigns STRATCOM CONUS C-E Responsibilities

Responsibilities for communications-electronics at Army installations in the continental U.S. (CONUS) were assumed recently by the U.S. Army Strategic Communications Command (STRATCOM).

Affecting more than 80 facilities, the move involved the transfer of some 4,000 personnel to STRATCOM. Additionally, three intermediate command elements were established to parallel command structures of the Army Materiel Command (AMC), Training and Doctrine Command (TRADOC), and the Forces Command (FORSCOM).

Headquartered at Fort Ritchie, MD, the new command elements have responsibilities for telephone service, telecommunications centers, military affiliate radio systems and other communications support.

Other organizations supported by STRATCOM-CONUS include the Army Air Defense Command, Military Traffic Management and Terminal Service, Health Services Command, Army Intelligence Command and the Pentagon Telecommunications Center.

Objectives of the realignment are stated as streamlined management through centralization and a reduction of overhead. The command concept is directed to standardized communications engineering, installation, operating and maintenance practices.

ASL Announces First Mobile Weather Radar Unit

Achievement of a long-desired objective for greatly improved predictability of combat conditions for tactical operational planning—successful development of a mobile weather radar—was announced late in June by the United States Army.

Designed to be the first development of its kind in the Free World, the Mobile Weather Radar AN/TPS-41 was developed by the U.S. Army Atmospheric Sciences Laboratory. The ASL is headquartered at White Sands (NM) Missile Range as an element of the Electronics Command, Fort Monmouth, NJ.

Reportedly capable of detecting and tracking nuclear clouds and rain storms including measurement and display of precipitation intensity to a distance of 240 kilometers (150 miles), the AN/TPS-41 is a solid-state, lightweight unit. Findings have applications in forecasting terminal and en route weather, trafficability and floods, as well as in hydrology and fog dissipation.

An X-band radar system is used for detection and tracking. It provides output to three types of displays: Plan position (PPI), range and height (RHI) and range (A/R). The unit, including antenna, is contained in a portable shelter for rapid relocation as desired by truck, helicopter or other aircraft.

Prototype models of the AN/TPS-41 were first constructed for the Army under contract with Fairchild Industries, Germantown, MD, and are termed the first completely mobile tactical radar. As many as three remote display units can be operated at distances up to one mile, with only a simple field wire connecting the remote units to the main radar.

The remote units are not slaves; each operates independently of the main radar and of each other. Rigid environmental and transportation tests (Engineering and Service Tests) have established that the AN/TPS-41 is rugged and has a system reliability of about 400 hours, ASL leaders report.

The system can operate from the ground or the rear of a 2½-ton truck, and can be made operational (including orientation) within 30 minutes. Components taken from the shelter can be used externally within 10 minutes, and are protected for outdoor operation under extreme climatic conditions.

The Army announcement of successful development of the AN/TPS-41 termed it "one of the world's best weather radars, and the first mobile weather radar suitable for tactical use . . . (It) can satisfy other Army requirements, such as those for the proposed Army Air Traffic Management Systems (ATMS)."

The U.S. Air Force has expressed interest in the system and is negotiating to purchase several for its use. Panel XII (Meteorology) of the NATO Army Armaments Group has requested the United States to host the 11th meeting in September, and to offer a demonstration of the unit as an item of interest.

The U.S. Army Atmospheric Sciences Laboratory has a record of expertise in developing weather radars. Prior to 1948, no ground-based radar equipment had been designed specifically for weather detection. In response to the expressed need for this capability, the U.S. Army Evans Signal Engineering Laboratory, Belmar, NJ, now the ASL, developed the first-generation weather radar (AN/CPS-9) for Air Force Weather Service.

AN/TPS-41 Mobile Weather Radar

Industrial Executive Relieves Dr. Foster as DDR&E

Director of Defense Research and Engineering Dr. John S. Foster Jr. passed that title June 25 to Dr. Malcolm R. Currie, an industrial executive in R&D assignments since 1954, after serving 7¾ years in one of the most demanding positions in the Department of Defense.

Dr. Foster became DDR&E in October 1965 and established a record for "longevity" in this capacity. He did not announce future plans although he gave notice of his resignation intention early this year.

When he accepted the presential appointment, Dr. Currie was vice president for R&D with Beckman Instruments, Inc., Fullerton, CA, and had served in this position since 1969. Until that time he had served 15 years with the Hughes Aircraft Co., starting with three years on the technical staff before he was promoted to manager of the Microwave Tube Department in 1957.

Dr. Currie's next assignment was director of the Physics Laboratory, Hughes Research Laboratories, until 1962. His responsibilities included research on laser systems and initiation of major programs on ion and plasma propulsion as well as high-power amplifiers and oscillators.

During 1962–64 he was associate director of HRL and then was promoted to corporate vice president, Hughes Aircraft Co. in addition to continuing as director of HRL. In 1965 he became corporate vice president and general manager of the R&D Division.

Responsibilities in this capacity included direction of technical and business activities of a 3,000-man staff, with R&D activities on airborne radar, communications systems, laser systems, infrared and electrooptical systems, digital display systems in airborne equipment, components and materials R&D, and analysis for electronic system reliability.

Elected by ETA Kappa Nu as the "Nation's Outstanding Young Electrical Engineer" in 1958, Dr. Currie was chosen in 1960 by the California Chamber of Commerce as one of the "Five Outstanding Young Men of California."

Since then he has received numerous honorary awards, served on NASA and Department of Defense advisory committees, and on advisory councils to the University of California, from which he received AB, MS, and PhD degrees. He also participated in the Executive Program of the UCLA Graduate School of Management.

Dr. Malcolm R. Currie

Listed in *Who's Who in America* and *American Men in Science,* Dr. Currie has authored 20 technical papers and holds nine U.S. patents. His professional affiliations include the Institute of Electrical and Electronic Engineers, the National Academy of Engineering, Institute of Aeronautics and Astronautics, American Physical Society, Electrochemical Society, and Institute for Advancement of Engineering.

Dr. Currie received U.S. Navy flight training during 1944–47.

Deane Takes Over From Gribble as Army R&D Chief

Fifteen years after he completed an assignment as chief of the Programs and Budget Division, LTG John R. Deane Jr. has returned to the Office of the Chief of Research and Development, HQ DA, to succeed LTG William C. Gribble Jr. as Chief of R&D.

LTG Gribble succeeded LTG F. J. Clarke as Chief of Engineers Aug. 1 when Clarke retired from the Army. LTG Gribble pioneered in Army nuclear engineering and is a leader in this field.

Known best as a leader of combat forces, LTG Deane was deputy director, Defense Intelligence Agency, until he assumed his new duties. From April 1971 until June 1972, when he became DACSFOR, he was director of the Defense Special Projects Group, Washington, DC. He served in 1967–68 as director of Doctrine, OACSFOR.

For three years, June 1962 to July 1965, he was assigned to the Office of the Director of Defense Research and Engineering, first as a military assistant and later as executive assistant. He also served from July 1970 to March 1971 as vice director and then as director, Communications Planning Group, HQ DA.

After leaving ODDR&E in 1965 he was assistant commander, 82d Airborne Division for about 18 months, followed by successive assignments as chief of staff, I Field Force, U.S. Army, Pacific-Vietnam; assistant commander, 1st Infantry Division, USAP-V; and commander, 173d Airborne Brigade, USAP-V.

Following graduation from the United States Military Academy with a BS degree in military science, LTG Deane started 31 years of active duty during which he has served principally with field forces. Meanwhile, he acquired an MBA degree from George Washington University, Washington, DC., and completed the United States Army Command and General Staff College, Armed Forces Staff College and the National War College.

LTG Deane's military honors include the Distinguished Service Cross with OLC, Distinguished Service Medal with OLC, Silver Star with two OLC, Legion of Merit with three OLC, Distinguished Flying Cross, Bronze Star Medal with OLC, Air Medal (27 awards), Army Commendation Medal and the Purple Heart.

LTG John R. Deane Jr.

BRL Finalizing Preparations For Atmospheric Program

Plans for a Combined Stratospheric Measuring Program (COSMEP I), scheduled the last two weeks in October, are being firmed up by the U.S. Army Ballistic Research Laboratories, Aberdeen (MD) Proving Ground.

The purpose is direct measurement of concentrations of minor constituents, both ions and neutrals, of the stratosphere for use in the development of atmospheric models.

Measurements will be made by two balloon-borne sensing instruments: a mass spectrometer for positive ions and neutrals; and an infrared spectrometer constructed for the BRL by the University of Denver.

Sensors also will be flown on the balloon payloads by the Electronic Command Atmospheric Sciences Laboratory, White Sands (NM) Missile Range. Other agencies are invited to use their instruments in the payload.

Launches will be made from Carlsbad, NM. Recovery of the payload packages will be handled by the National Scientific Balloon Facility, a part of the National Center for Atmospheric Research (NCAR) in Palestine, TX.

The sampling package will have radio frequency quadrupole mass spectrometer for studying positive ions and neutral stratospheric constituents, operating over a 2-150 amu range. Electron impact ionization will be used to ionize the neutral constituents. The spectrometer will be able to be fixed on a selected mass peak or swept over the mass range.

Ions of the less abundant neutral constituents and the ambient positive ions will be counted individually. Temperature, pressure, ultraviolet, and cosmic ray ionization detectors will be used. An onboard clock and circuits will control the collection of data, with ground command signals able to override the circuits if desired.

Data will be telemetered to earth and tape recorded. The entire instrumentation package will be designed and built to minimize contamination of the atmosphere being sampled.

Two flights will be made with the infrared spectrometer package, one for spectral regions for emission from H_2O (24 u) and HNO_3 (11.2 u), the other again covering the latter area plus O_3 (9.6 u), H_2O (6.3 u) and possibly NO_2 and NO (5.3 u).

Follow-on flights are planned, with COSMEP II scheduled in April 1974.

Inquiries concerning COSMEP should be directed to Dr. George E. Keller (Tel. 301-278-3335) or to Dr. Donald E. Snider (301-278-4681) at the U.S. Army Ballistic Research Laboratories, ATTN: AMXBR-CR, Aberdeen Proving Ground, MD 21005.

An Exemplary Transition . . .

Fort Detrick Converting to Major Medical Research Center

Conversion of Fort Detrick, MD, into one of the nation's major medical research centers, including a Frederick Cancer Research Center expected to employ 600 when fully operational in 1976, entered another significant phase July 1.

Transfer of control of Fort Detrick from the U.S. Army Medical Research and Development Command to the newly activated Army Health Services Command, headquartered at Fort Sam Houston, TX, was effective that date as part of the Armywide reorganization announced in January.

The change of control of the post was the second in about a year, the first being from the U.S. Army Materiel Command to The Surgeon General. Devoted to unclassified medical research, Fort Detrick is located on about 1,200 acres in Frederick, MD. In addition to six research-oriented tenant activities, 11 other agencies perform various missions.

FEDERAL CANCER RESEARCH

President Nixon visited Fort Detrick Oct. 18, 1971, to announce plans for conversion of the Biological Defense Research Laboratory of the U.S. Army Materiel Command to the Frederick Cancer Research Center as an element of the National Cancer Institute. In stressing the importance of Fort Detrick's new primary mission, he said more people die of cancer in the United States each year than died in battle during all of World War II.

International scientists, he said, including those from the Soviet Union and China, would be invited to participate in the FCRC research program. Currently, Dr. Albert Sabin, who developed the oral polio vaccine, and Dr. Giulio Tarro from the University of Naples, Italy, are engaged in collaborative study at the Frederick Cancer Research Center.

Operation of the FCRC was initiated in June 1972 when the National Cancer Institute awarded an estimated $7 million first-year contract to Litton Bionetics, Inc., Bethesda, MD, to renovate certain Fort Detrick facilities and to undertake the cancer research program.

Two groups are involved in the operations. A small resident staff of NCI personnel is headed by Dr. William H. Payne as scientific coordinator and project officer for the NCI/FCRC. Dr. Payne administers the FCRC program and provides liaison among the contractor, the Department of the Army, and interested cancer research groups of the NCI home laboratories.

Dr. Robert E. Stevenson, general manager of the FCRC and Vice President of Litton Bionetics, Inc., is directing research activities.

Twelve major tasks covering a broad spectrum of research have been conducted during the first year of operation. Scientific disciplines and areas of expertise include bacteriology, virology, biochemistry, immunology, environmental control, tissue culture production, and experimental animal production and holding.

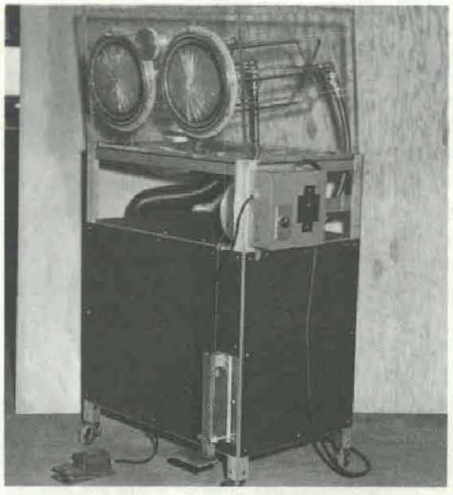
All of these diverse efforts will be directed toward three major goals: discovering what causes human cancer, how it can be diagnosed, and how it can be prevented.

An estimated 330 persons, of whom 30 to 40 have earned doctoral degrees as biomedical scientists, were employed by the FCRC as the first year's operation ended.

To meet critical staffing requirements and to implement the program as rapidly as possible, Litton Bionetics has drawn heavily on scientists, technicians and support personnel employed by the company at the end of 1972.

Expected to be operating at full capacity by 1976, with a projected annual budget of $20 to $25 million and 600 employes, the FCRC will have staff scientists, technicians, management and support personnel, and visiting cancer scientists from throughout the world.

SOVIET SCIENTISTS, in keeping with President Nixon's plans to make the Frederick Cancer Research Center (FCRC) international in scope, viewed it as guests of the Department of Health, Education, and Welfare (DHEW). Shown are (l. to r.) Dr. Mihail I. Balabolkin, medical counselor at the Soviet Embassy in Washington, DC; Dr. Merlin K. DuVal, assistant secretary for Health and Scientific Affairs, DHEW; Minister (Dr.) Boris V. Petrovsky; and Andrei Kiselev, the Russian interpreter during their visit.



PROTOTYPE arm-and-hand washer for preoperative scrubbing of operating personnel was produced by the U.S. Army Medical Bioengineering R&D Laboratory, based on principles outlined by the U.S. Army Institute of Dental Research. Using the pulsed-pressure lavage principle, the prototype reduces preoperative scrubbing time from 15 minutes to 90 seconds, with no sterilization loss.

INFECTIOUS DISEASE RESEARCH.

Among five other research-oriented tenants, the largest is the U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID), the second oldest tenant at Fort Detrick. USAMRIID began operations in 1956 and was then known as the U.S. Army Medical Unit. From a modest beginning in a few of Detrick's World War II wooden buildings, it has grown into an internationally recognized center of military medical research.

USAMRIID moved into its $17.8 million facilities upon completion of a 2-phase construction program in January 1973, although occupancy of part of the building was initiated early in 1972. The laboratory capabilities are termed among the most advanced in the nation for medical research. Incorporated are special methods of sealing controlled air flow, exhaust filtering and incineration to permit safe handling of hazardous organisms.

The Institute's far-ranging research program is designed to provide the military forces of the United States with better means of medical protection—through improved knowledge of the infectious process—against infectious diseases, including those either naturally acquired or intentionally disseminated microorganisms.

A multidisciplinary research effort is made in major areas of pathogenesis, diagnosis, prophylaxis, treatment and epidemiology of infectious disease. A study of the pathogenesis of different types of infectious diseases is being conducted.

In addition, unnatural routes of entry of infectious microorganisms or bacterial toxins are studied because they may provide

significant differences in the clinical picture, as compared to the disease or toxemia observed when exposure occurs under natural conditions.

Development of immunoprophylactic measures is a major part of the research program. Active immunization is generally considered the most effective means of protection against various infectious microorganisms, but it is not the only answer. Medical and logistical problems associated with this approach reportedly are extremely difficult.

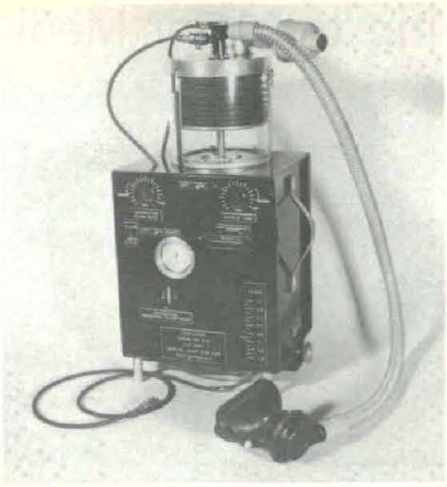
USAMRIID scientists are investigating various means for solving these problems as well as passive immunoprophylaxis and chemoprophylactic measures.

Rated as the most extensive and important part of the institute research program is the development of rapid and accurate methods for establishing a specific etiologic diagnosis. Investigators say the time required for identifying a microorganism in general medical practice must be shortened considerably to be of practical value in an epidemic situation among military forces.

In addition to immunological methods employing specific diagnostic reagents, researchers working toward this goal are exploring biochemical and biophysical approaches. The host response to infection is receiving intensive study as a means of developing possible new diagnostic measures.

The entire USAMRIID research program is unclassified and all information accruing from studies is reported worldwide, as appropriate, in the medical literature. From 1956 through 1972, the USAMRIID staff published nearly 300 articles in scientific and technical media.

A number of vaccines developed by or presently under control of USAMRIID have been made available to other laboratories for the protection of at-risk personnel. Vaccines have been distributed to other U.S. Government agencies, research institutions, state and local health departments, medical schools, and universities. Certain of these products also have been made available to foreign governments.



PROTOTYPE volume-cycled ventilator, a device used to control or assist a patient's breathing, is being developed by the USAMBRDL. The goal is a rugged, compact, portable device for use in operating rooms, recovery rooms, wards and emergency rooms, including administration of gaseous anesthetics.

One of USAMRIID's most noteworthy recent projects was the provision of vaccine for Venezuelan Equine Encephalitis (VEE), in response to the 1971 request of the U.S. Department of Agriculture. The epizootic of VEE had severely threatened the horse population of the United States, particularly Texas.

The vaccine developed by USAMRIID resulted in the effective control of the disease in the United States, earning for USAMRIID the Superior Service Award presented by the U.S. Department of Agriculture.

MEDICAL BIOENGINEERING RESEARCH. The U.S. Army Medical Bioengineering Research and Development Laboratory (USAMBRDL) was formed by the merger of two of the Army Medical Department (AMEDD) units transferred to Fort Detrick in the spring of 1972, after the post was assigned to The Surgeon General.

One of its two R&D functions is the engineering development of field medical equipment on a continuing basis for the Department of the Army, and on an as-required basis for the Departments of Navy and Air Force.

Some of the equipment developed by this laboratory may be used in fixed medical facilities. Primary research emphasis, however, is on the development of equipment for use in field treatment units.

Representative items developed by elements of the USAMBRDL include hospital beds, operating tables, sterilizers, anesthesia machines, operating lights, suction-pressure pumps, X-ray machines and film processors used in the new field medical unit, and a Medical Unit Self-contained Transportable (MUST) hospital complex. Currently, field dental equipment is being intensively reviewed and updated.

One device developed at the laboratory that has had worldwide applications is the hypodermic jet injection apparatus. Specifically designed for safe, effective and economical immunization of large numbers of people, it has been used internationally by the U.S. Army and by the World Health Organization (WHO).

While this device is employed routinely at U.S. Army Induction Centers, it also has been used extensively by U.S. Army Disaster Assistance Relief Missions. During July-August 1972 in the Republic of the Phillipines, more than 350,000 immunizations were given during a 3-week period.

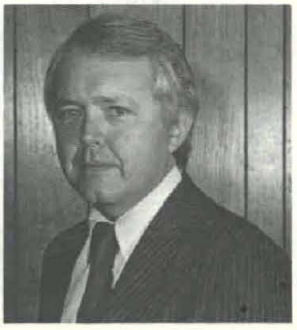
In a 3-year program sponsored by the WHO and the U.S. Agency for International Development, the jet injector was used to vaccinate the majority of the 120 million inhabitants of Western and Central Africa against smallpox. More than 15 million children were vaccinated against measles.

The second major USAMBRDL function is the development of devices and materials that can be used either for cosmetic restoration or replacement or supplementation of certain physical functions that will provide a

(Continued on page 18)

COL Orlyn C. Oestereich
Commander, U.S. Army Medical Bioengineering R&D Laboratory

Dr. William W. Payne
Scientific Coordinator, Project Officer NCI/FCRC



Dr. Robert E. Stevenson
VP, Litton Bionetics, Inc., General Manager, FCRC

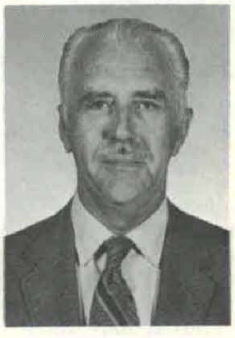
COL Kenneth R. Dirks
Commander, U.S. Army Medical Research Institute of Infectious Diseases

COL Joseph A. Pastore
Commander, U.S. Army Health Services Data Systems Agency

CPT Robert W. Swanson
Commander U.S. Naval Unit

COL William L. Bost
Commander, U.S. Army Garrison and Fort Detrick

Dr. Robert A. Darrow
Chief, Vegetation Control Division



Dr. Charles H. Kingsolver
Acting Location Leader, Epiphytology Research Laboratory

Fort Detrick Converting to Major Medical Research Center

(Continued from page 17)

disabled serviceman with some degree of self-reliance.

For example, the laboratory developed an electromechanical hand that has many of the functions of a natural hand and increases the independence capability of the amputee.

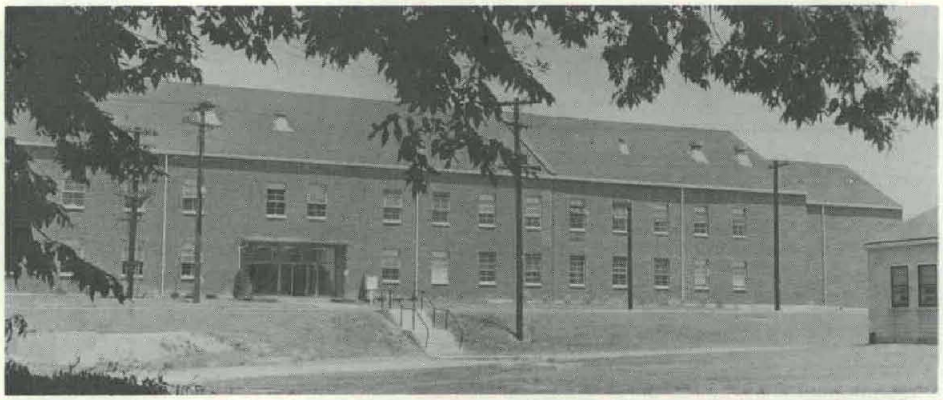
Another development is a polymeric material with skin-like properties that is used to make cosmetic gloves for artificial hands, naturally colored coverings for artificial limbs and other prostheses, and artificial ears and noses for restoration of facial features.

Work on other polymeric materials has resulted in the development of biomaterials that are used as nonclotting grafts. The biomaterials are used for the repair of arteries and veins, adhesives for gluing tissues together and preventing bleeding, and sutures that are absorbed by the body more slowly than the commonly used "cat-gut" sutures.

Results of the USAMBRDL work on biomaterials, medical equipment, prosthetic and orthotic devices are published in national and international journals. Technical papers also are presented at scientific meetings, universities, and other research institutions. Personnel of the laboratory are invited to collaborate with their counterparts in other research institutions in identifying areas of needed research.

Staff members are asked to serve on national committees, such as the Committee on Prosthetic Research and Development of the National Academy of Sciences, and the F-4 Biomaterials Committee of the American Society for Testing Materials. These activities and contributions have gained the laboratory recognition as a leader in engineering and biomedical science research.

MYOSONIC CONTROLLED (muscle + voice) prosthesis shown here is an experimental two-degrees-of-freedom (hand + elbow) system. Any active muscle available to the amputee, in this case the chest muscle, can be used to actuate a 3-position switch; two positions control the directions of movement, and the third shuts off the device. Although pictured here on a man with one limb missing, the system is being developed primarily for the more severely handicapped, such as the quadruple amputees.



BUILDING 560, completed in 1956 at a cost of $4,404,000, was designed as a medical bacteriology laboratory. Today, after renovation, it is the major facility of the Frederick Cancer Research Center, including offices for the National Cancer Institute and Litton Bionetics administrative staffs. The former Army facilities set aside for the FCRC contain over 500;000 square feet and with equipment are worth $130 million.

OTHER RESEARCH ACTIVITIES

The U.S. Naval Unit, the oldest continuous tenant at Fort Detrick, was activated at Fort Detrick on Feb. 8, 1944 to promote medical research jointly with the Department of the Army. It developed the Naval Unit Disseminator (NUD) and associated techniques for decontaminating enclosed spaces. The unit maintains liaison and insures rapid exchange of information with Navy research laboratories, hospitals and operational units involved in the control, diagnosis and cure of infectious diseases.

Plant Pathology. The Fort Detrick Epiphytology Research Laboratory, an element of the Agriculture Research Service, U.S. Department of Agriculture, is charged with identifying and evaluating both domestic and foreign plant diseases that may pose serious threats to crops of major importance to the U.S. economy, such as corn, soybeans and wheat.

Plant Physiology. The Vegetation Control Division, an element of the Chemical Laboratory, Edgewood Arsenal, MD, performs basic and applied research on defoliants, growth retardants, herbicides and other growth regulating chemicals. The primary goal of their program is to produce effective vegetation control agents for troop combat support with a minimal environmental impact.

In addition to the six research-oriented tenants whose functions have been explained, 11 other tenant units with a variety of missions are located at Fort Detrick, including two newly arrived Army Medical Department (AMEDD) units, and an element of the Army Materiel Command.

The Historical Unit prepares official histories under direction of The Surgeon General.

The U.S. Army Health Services Data Systems Agency plans, develops and maintains standard computer-based medical information systems in support of AMEDD. It also provides The Surgeon General Policy guidance and coordination required for effective operation of AMEDD data processing installations.

The Field Liaison Office of the Program Manager for Demilitarization of Chemical Materiel, U.S. Army Materiel Command, Washington, DC, provides management, planning, and technical guidance in the design, construction, and operation of facilities involved in the demilitarization of biological agents. This includes preparation of plans and operating procedures to insure compliance with all applicable federal and state requirements for occupational health, safety and environmental protection.

Completion of the disposal phase of demilitarization of biological anti-crop agents at both Fort Detrick, MD, and Rocky Mountain Arsenal, CO, is expected during 1973. When documentation, in both technical report and film form, of the biodemilitarization program is complete on or about Jun. 30, 1973, the Fort Detrick Field Liaison Office will close.

The remaining eight tenants include Army and Department of Defense units, elements from the Department of Housing and Urban Development, and the Department of the Interior, which supervise a variety of activities including defense communication, Army Reserve support, and land acquisition.

Fort Detrick has an illustrious history highlighted by noteworthy contributions in line with its research functions directed primarily toward military objectives. Many of the results have had profound byproduct benefits for the civilian community, in the United States and in many foreign countries, such as the VEE vaccine and the jet injector immunization method. Many of its research capabilities are recognized among the most sophisticated in the nation.

President Nixon, in speaking at the ceremonies in October 1971 that made public the decision to convert the former U.S. Biological Defense Research Center to the Frederick Cancer Research Center and various Army medical research activities, stated in part:

"It is my hope that this specific conversion will help illustrate the general potential for using defense-related facilities to meet pressing domestic challenges. Cutbacks in certain defense needs have provided a considerable supply of expertise and equipment which can now be used for non-defense purposes—if only we take advantage of them. . . ."

Response to Research Challenge . . .

Leads Dr. Woodward to Army Science Career Rewards

Rewards of accepting the challenge of a career in U.S. Army creative research – and tackling an exceedingly difficult initial task with comparatively little background experience for it–are illustrated admirably by Dr. Kenneth E. Woodward.

That title is brand new, awarded recently by American University, Washington, DC, as the climax of nearly 13 years of continuing studies. Most of this self-improvement effort was in night school classes and much of it was made possible by the Harry Diamond Laboratories graduate study training program to upgrade employes' technical skills.

During the interim, Dr. Woodward has been recognized for his achievements by the highest honorary award the U.S. Army can bestow upon a civilian employe, plus many civilian scientific community awards.

When opportunity knocked in September 1960–in the form of a suggestion from Dr. Romald E. Bowles, now the head of Bowles Fluidics Corp., Silver Spring, MD–Dr. Woodward was a 33-year-old mechanical engineer, employed at the U.S. Army Diamond Ordnance Fuze Laboratory (DOFL) in packaging development.

Dr. Bowles, then chief of the Nonradio Systems Branch of the DOFL, redesignated in 1962 as the U.S. Army Harry Diamond Laboratories (HDL), suggested that Dr. Woodward study the possibility of applying principles of fluidic amplification controls in an artificial heart pump. The aim was to lessen damage to blood in heart pumps used in open-heart surgery.

Winner of the Washington Academy of Sciences Outstanding Achievement Award for 1960, Dr. Bowles teamed with Billy M. Horton, the basic inventor, and Raymond W. Warren, also DOFL employes, in developing fluidic amplification.

Announcement of their work at a March 1960 press conference occasioned worldwide interest. In August 1961 they were honored with a U.S. Army R&D Achievement Award–the first of many high honors in later years.

Wilbur S. Hinman, DOFL technical director, followed the press conference announcement by suggesting to DOFL laboratory chiefs, that same month, that they begin considering possible applications of fluidic amplification controls. In November 1961, Hinman became Deputy Assistant Secretary of the Army (R&D), setting the stage for Horton to succeed him.

Announcement and demonstration of the U.S. Army experimental heart pump was featured in the November 1961 edition of the *Army Research and Development Newsmagazine*, page 6, with Dr. Woodward recognized as the inventor. He was pictured holding in his hand a set of fluidic controls, little larger than a pack of cigarettes, for the pump.

In less than 15 months from the time of Dr. Bowles' suggestion, Woodward had developed the principles and put together his experimental heart pump. An indication of the ultimate hope back of his effort was DOFL Technical Manual 640-1-61, "A Study and Proposal for an Artificial Heart Using Interacting Fluid Techniques," Feb. 23, 1961.

Still, when he started his research task, Dr. Woodward had little more in his academic and professional experience than eagerness to accept the challenge. He had been employed at DOFL since 1955, had a 1949 BME degree from George Washington University, an MS degree in 1953 from the University of Maryland, and had worked briefly with the Naval Research Laboratory in Washington, DC, and in industry as a junior mechanical engineer.

Dr. Woodward plunged into his task, however, with the determination of "pull all the stops–full speed ahead." Without any knowledge of the intricate functioning of the human heart, he set out to learn quickly. For three months he visited hospitals and individuals concerned with heart-lung machines and artificial heart development in various parts of the United States.

Then he returned to DOFL and worked alone until June 12, 1961. But he needed a plastics technician to help him produce the delicate artificial ventricles and tricuspid heart valves, a task for which Roy High proved admirably suited. Next to join his team was George Mon, 27-year-old mechanical engineer born in China, and on June 19 came 22-year-old Henrik Straub, born in Germany and son of DOFL physicist Dr. Harold W. Straub. The elder Straub later won numerous honors for his HDL research.

Dr. Mon, still employed in research at HDL (doctorate in fluid mechanics from Catholic University, Washington, DC, in 1970), and Straub were products of DOFL's summer training program for university students. Dr. Woodward credited them with a "valuable contribution" to the experimental, fluidic-controlled heart pump with their system tests and evaluation of prototype design.

In 1960, Billy M. Horton received the Arnold O. Beckman Award, the highest award of the Instrument Society of America. Since that time–during the years Woodward was continuing his research and working toward his doctorate–Horton has become one of the U.S. Army's most honored scientists and has distinguished himself as the technical director of a research organization that has achieved international renown.

Dr. Kenneth E. Woodward

Among Dr. Woodward's awards are the Decoration for Exceptional Civilian Service, the highest honor the U.S. Army can bestow upon a civilian employe (1962); the Technical Achievement Certificate of the American Society of Mechanical Engineers, Washington, DC, Section (1964); and the Honors Achievement Award from the Angiology Research Foundation and Purdue Frederick Co. (1966).

With a PhD degree added to his credentials, 12 patent awards, more than 40 technical publications, and long list of honorary awards, Dr. Woodward–at age 46–appears destined to continue demonstrating for many years the rewards of a career in U.S. Army science.

Army Stresses Improved Aircraft Safety, Survivability

Focusing all available R&D resources on the safety and survivability objectives of the U.S. Army Aviation Program was the purpose of a recent 2-day meeting attended by representatives of more than 45 Army agencies and laboratories.

Sponsored by the Eustis Directorate of the Army Air Mobility R&D Laboratory, and held at Fort Eustis, VA, the meeting was highlighted by presentations that accented a critical fact. The problem considered was that noncombat operational losses in both aircraft and personnel during the Vietnam conflict were almost equal to those attributed to enemy action.

COL William L. McKeown, head of the Eustis Directorate, an element of the U.S. Army Air Mobility R&D Laboratory, Ames Research Center, Moffett Field, CA, said at the outset of the meeting:

"Because of the diverse and widely dispersed laboratory complex developing technology for aircraft safety and survivability, this AMRDL effort seeks to improve communications among the user agencies and developing activities. Our aim is to insure that all available resources are applied to provision of desired levels of aircraft safety and survivability."

Speakers from the Ballistic Research Laboratory, the Army Agency for Aviation Safety at Aberdeen (MD) Proving Ground, and the Eustis Directorate reported on actions responsive to the surprisingly high noncombat losses of crews and aircraft.

COL William Schane of the Army Aeromedical Research Laboratory stated:

"The most critical component in the aircraft system has not undergone any significant improvement in the last 30,000 years–and unless the needs and functional limitations of the aircrew are carefully considered in a system context, no amount of mechanical sophistication will compensate for the oversight."

The need for efficient approaches to overcome more than one threat was stressed by William Sickles, chief, Safety and Survivability Branch, Military Operations Technology Division, Eustis Directorate, who said:

"Critical weight constraints of VTOL aircraft dictate that every structural and dynamic component of the aircraft be designed in the light of its ballistic blast tolerance, detectability, reliability and resistance to future combat environments as well as for performance and cost.

"Unless an aircraft has a reasonable assurance of continued operation under all anticipated combat exposure, it cannot be considered mission effective."

The two days were devoted to discussions of the threat environment, anticipated exposure in various mission combat experiences, and programs by the various laboratories to improve aircraft safety and survivability.

Corps of Engineers Evaluating White Amur for Aquatic Weed Control

Aquatic plants that infest many navigable and recreation waters of the United States, particularly in the Atlantic Coast and Gulf States, may be subjected to the biological control of the white amur, an herbivorous fish native to Siberia, Manchuria and China.

More than four years of research efforts by various federal, state and academic investigators have provided the background knowledge for current consideration of the use of this natural predator of obnoxious water plants —but collection of information for a decision is continuing. The amur has been introduced to control water weeds in Malaysia, Taiwan, Japan, Eastern Europe, England, the Netherlands and Germany.

In the U.S., the Army Chief of Engineers administers the inland waterways weed control program under direction of the Secretary of the Army, in cooperation with federal and state governments. Federal agencies involved in the program include the Department of Agriculture, Public Health Service, Bureau of Sport Fisheries and Wildlife, Tennessee Valley Authority, and the Environmental Protection Agency, formerly the Water Pollution Control Administration.

Dr. Edward O. Gangstad, in charge of the Army Corps of Engineers program, is assigned to the Office of the Chief of Engineers in Washington, DC.

Congress accelerated the program of research and development to determine more effective methods of control by enacting, in 1958, Section 104 of Public Law 85-500, followed in 1965 by Section 302 of PL 89-298, more commonly known as the River and Harbor Act of 1965.

Biological, chemical, mechanical, laser irradiation and other methods have been tested in experimental programs during the past 15 years. In addition to clogging many navigable waters—even to the point of blocking the flow of water in dense growth around bridges and abutments—water hyacinths, alligator weeds and numerous other species of aquatic plants provide breeding grounds for mosquitos, reduce fish catches, impair use of recreational waters, and lower adjacent real estate values (see Fig. 1).

Reaction of environmentalists has raised serious questions about the continued use of the most effective means of controlling the proliferation of water plants to date—the carefully studied use of herbicides to avoid destroying fish populations. Use of herbicides also is often limited by particular situations, leading to research on alternate methods.

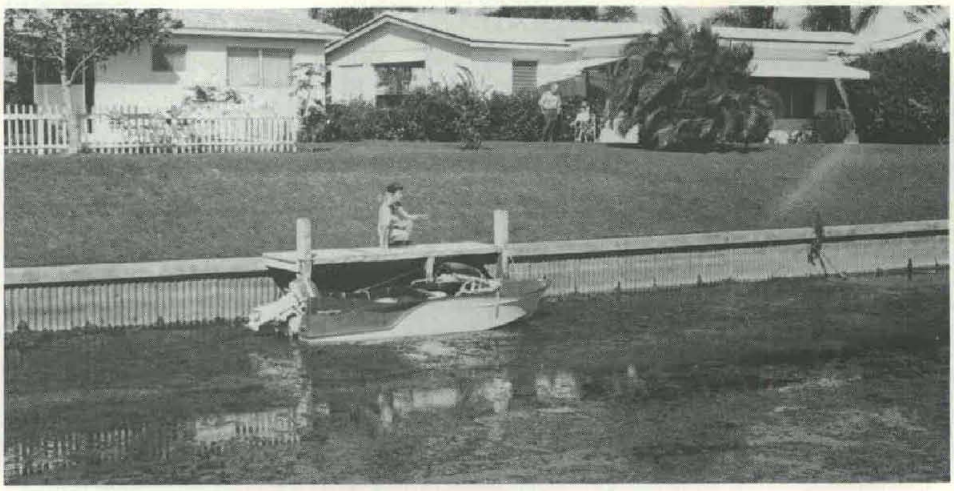


Fig. 1. OBNOXIOUS aquatic plants infest many U.S. navigable waterways.

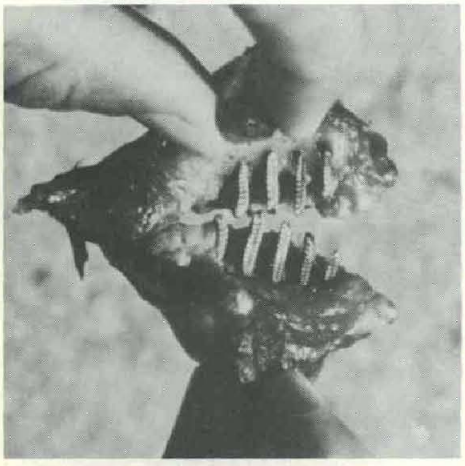


Fig. 2. AMUR's teeth are adapted to tearing and macerating underwater weeds.

Articles on laser beam experimentation to exterminate water hyacinths appeared in the April 1969 (p. 1), July-August 1970 (p. 24) and December 1972 (p. 14) editions of the *Army Research and Development Newsmagazine.* Tests with a low-intensity laser beam started at Redstone Arsenal, AL, and are being continued by the Mobility and Environmental Laboratory of the U.S. Army Waterways Experiment Station, Vicksburg, MS.

To compensate for shortcomings of mechanical harvesting and chemical methods to control aquatic weeds, more recent research efforts have turned to biological techniques. Insects, such as alligator flea beetles, and herbivorous fish, such as the white amur, that eat submersed aquatic weeds are among the destroyers being subjected to extensive studies to consider all foreseeable environmental and ecosystem impacts.

An initial report was made to the Research Planning Conference on the "Biological Control of Aquatic Weeds With the White Amur." Dr. Gangstad and F. J. Guscio, chief of the Environmental Engineering Branch, South Atlantic Division, OCE, summarized the state-of-the-art and plans for further research essential to a properly knowledgeable decision regarding implementation of a control program.

Their report discussed the cooperative research programs of the Army Corps of Engineers, other federal and state agencies, and educational institutions on the feeding characteristics of the white amur and related ecosystem factors such as environmental tolerance and growth, possible predatory tendencies for marine life, disease susceptibility, and reproduction habits and control.

Special studies on the sport fishing aspects of the white amur are being carried out at the present time at Fort Gordon, GA, by the University of Georgia, and at Fort Benning, GA, by the University of Alabama. The white amur is a cyprinid fish with a superficial resemblance to the chub known to U.S. anglers.

Classified as a carp, the amur is distinguished from other carp by double-rowed, compressed and comblike pharyngeal teeth (see Fig. 2). These teeth, actually falciformed pharyngeal bones, are adapted to tearing and macerating plant material. Other food, such as high protein pellets, are swallowed whole.

In general appearance, the amur has a slightly elongated body which is moderately compressed. The head is broad with a short snout, the mouth is large with the upper jaw slightly longer than the lower. The upper parts of the body are dark grey to olive brown to golden brown, with a silvery colored belly. The scales are of moderate size. (See Fig. 3.)

The short dorsal fin has no serreated osseous spines, like the common carp, and is slightly in advance or opposite to that of the ventral fin. The mature male can be distinguished from the female externally by the structure and relative size of the pectoral fins.

The white amur has flourished in temperate and cold climates. In an Arkansas pond, 38 fish endured five weeks of solid ice cover, then in the summer they survived temperatures of 35.6° C.

The growth rate appears to depend mainly upon the climate. The amur feeds intensively at temperatures above 16° C.; therefore, a faster growth rate with a higher weight gain would be found in temperate regions.

Under normal conditions, the newly hatched amur will grow up to 25 cm and 0.57 kg in 1 year, 1.81 to 2.28 kg in 2 years, and mature in about 4 years, weighing over 4.54 kg. After maturity, the fish grows rapidly, 2.28 to 4.54 kilograms annually, and will reach a weight of 22.77 to 45.54 kg (about 100

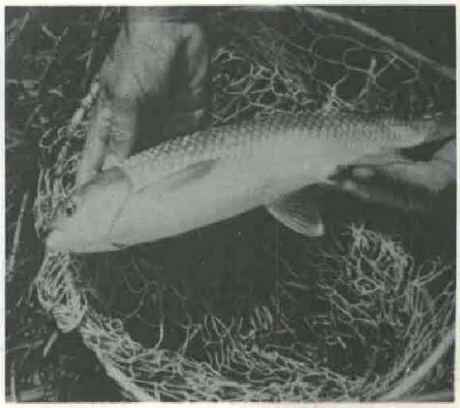


Fig. 3. AMUR bears a resemblance to the chub well known to U.S. anglers.

pounds) after 10 years.

Unlike most freshwater fish, the amur withstands considerable changes in salinity. Research shows that eggs of the amur can develop in brackish water and fry will grow directly in saline water. They can withstand 7 to 12 percent salinity, respectively. This adaptability of the amur facilitates its acclimatization in a variety of environmental conditions.

The amur is almost exclusively a vegetarian at lengths greater than 30 mm. In the fry stage, the diet consists of rotifers and crustaceans, with occasional larvae of chironomids and algae. At 17 to 18 mm, macrophyte material is first eaten, while the importance of retifers declines and that of chironomids increases. Macrophyte materials form the main basis of the diet at 27 mm, and from 30 mm onward the fish is vegetarian, the proportion of animal food being negligible.

Reproduction of the amur has received considerable attention because its spawning requirements are quite restrictive. In its natural habitat, its spawning season starts in March-April and extends to about the middle of August, reaching its peak in June and July.

Until 1959 the amur were known to spawn only in their native habitat. Then spawning was reported at the Al kung Lien Reservoir in Southern Taiwan and again in 1960 in the Tone River in Japan. With the obvious advantage of breeding the fish under controlled conditions, experiments in artificial propagation then were started.

In summarizing their research findings, Gangstad and Guscio opine that introduction of the amur into waters of the world would probably ameliorate the aquatic weed problem. The comment: "Its tremendous appetite for aquatic growth with its incredible ability to convert noxious growths into marketable flesh, while lessening eutrophication processes in canals, rivers and lakes, are qualities most attractive when considering an agent for biological control of aquatic weeds.

"The amur's tolerance to temperature changes, salinity, oxygen deficiencies and disease further enhances its selection as a control agent. Thus, as an efficient contributor to the world's food supply, and as an effective consumer of aquatic vegetation, the amur should certainly be considered for more intensive research to more adequately evaluate its potentialities."

Weights, Measures Reports Indexed From 1905 to 1971

An Index to the Reports of the National Conference on Weights and Measures From the First to the Fifty-Sixth, 1905 to 1971 has been issued by the National Bureau of Standards (NBS), U.S. Department of Commerce.

The 46-page document is designed to aid users of these reports in locating information on a specific subject or a presentation of a specific speaker. Texts of several hundred speeches by government and industry leaders active in weights and measures and related topics are listed.

Entries in the index include aerosol containers; belt-conveyor scales; bread; consumer protection; fabric measurement; Fair Packaging and Labeling Act; Food, Drug, and Cosmetic Act; gasoline pumps; interstate shipments; Metric System; model law on weights and measures; paints; and specifications and tolerances.

ACSFOR Sponsoring Operations Research Meet

Arrangements for the 12th annual U.S. Army Operations Research Symposium, being made by the Office of the Assistant Chief of Staff for Force Development as sponsor for the first time, assure participation of high-level dignitaries at Durham, NC, Oct. 3-5.

All invitational space allocations have been made, promising the attendance of about 220 OR specialists.

General William E. DePuy, commander of the new Training and Doctrine Command (TRADOC), has accepted an invitation to give the keynote address. The symposium theme is "Operations Research and the Army of the Seventies," with emphasis on the 1973 reorganization of the Army in the Continental United States (CONUS).

Banquet speaker will be LTG Glenn A. Kent, U.S. Air Force, commander of the Weapon Systems Evaluation Group.

Invitational speakers are: BG Kenneth E. Dohleman, director, Doctrine and Organization, OACSFOR; BG (MG designate) Hal E. Hallgren, commander, U.S. Army Concepts Analysis Agency, Bethesda, MD; and BG (MG designate) Elmer R. Ochs, commander of the U.S. Army Operational Test and Evaluation Agency, Fort Belvoir, VA.

Chairmen of working group sessions have been named in major areas of consideration of the symposium theme, specifically: antitank warfare; force planning; arming and simulation; systems effectiveness; costing and resource analysis; logistics; program analysis; test and experimentation.

Deputy Under Secretary of the Army for Operations Research Dr. Wilbur B. Payne and Dr. Seth Bonder, associate professor, University of Michigan, Ann Arbor, head the OR experts who will be panel chairmen.

Invitations to head working groups also have been accepted by Richard J. Trainor, chief, Office of Materiel Programs, Office of the Assistant Vice Chief of Staff; Dr. Joseph Sperrazza, director, U.S. Army Materiel Systems Analysis Agency (USAMSAA), Aberdeen (MD) Proving Ground; MG Erwin M. Graham Jr., commander, U.S. Army Logistics Center, Fort Lee, VA; Walter W. Hollis, U.S. Army Operational Test and Evaluation Agency; Keith A. Myers, USAMSAA.

Tenative commitments to serve as working group chairmen have been made by Jack Newman, designated as technical director of the U.S. Army Concepts Analysis Agency, and David Hardison, former scientific adviser, Army Combat Developments Command.

LTG E. H. Almquist, assistant chief of staff for Force Development, is expected to welcome attendees. Abraham Golub, OACSFOR scientific adviser, is the symposium general chairman. Although the Office of the Chief of R&D has bowed out as symposium sponsor after 11 years, the Army Research Office, Durham, NC, is again the host agency.

AMC Deputy Director for Operations, RD&E Directorate, BG Joseph E. Fix III is congratulated by AMC Commander GEN Henry A. Miley Jr., who conferred his new rank insignia. Following his promotion. BG Fix was assigned as the AMC Director for International Logistics.

Army, Florida Institute Sponsor Logistics Management Courses

Approval of two cooperative resident master of science programs between the U.S. Army Logistics Management Center (ALMC), Fort Lee, VA, and the Florida Institute of Technology (FIT), Melbourne, FL, has been announced by the Department of the Army.

Leading to an MS degree in logistics management and contract and procurement management, the programs are believed to be the first military and civilian efforts of their kind.

Both programs will use the Army Logistics Management Center's 19-week logistics executive development course as a core curriculum. This will be supplemented by graduate courses offered through the Management Science Department of FIT.

The logistics management course will be in the format of a resident graduate program offered on site at the ALMC. Following completion of requirements for the logistics executive development course at Fort Lee, VA, candidates will be eligible for the contract and procurement degree program at FHT.

An educational activity of the U.S. Army Materiel Command, the 18-year-old Army Logistics Management Center is recognized as a leader in Army and defense school systems. The FIT is a fully accredited university offering associate, bachelor, master and PhD degrees in more than 38 programs.

ARI Reports Cover Problems Of Classification, Attrition

Two recently released publications by the U.S. Army Behavior and Systems Research Laboratory, now an element of the Army Research Institute for the Social and Behavioral Sciences, deal with aptitude classifications of Army enlisted personnel.

Technical Research Note 239, titled *Development and Evaluation of a New ACB and Aptitude Area System,* analyzes a new Army Classification Battery (ACB) for use in selection of enlisted men and their classification to training and jobs. The stated objective in developing a new ACB was to reduce attrition from Army training schools.

Technical Research Note 231, titled *Attrition in Ordnance School Courses,* deals with problems of attrition at the Army Ordnance School. This document presents an analysis of scores on Army Classification Battery predictors and written and performance tests given during three ordnance courses in an effort to account for failures.

USAEHA Serving as Army's Environmental 'Guardian'

Long before the term pollution control became a national byword of a populace aroused by publicity generated by environmentalists, the U.S. Army Environmental Hygiene Agency (USAEHA) was deeply immersed in the problem.

Commanded by COL James E. Anderson, the USAEHA is assigned responsibility as the Army's water pollution watchman. It is similarly concerned with air quality, solid-waste management, radiation effects, and other factors bearing upon the health and living environment at and in the area adjacent to military installations.

Water-Quality Engineering. The mission of determining if Army activities are contributing to water pollution—for example, an Army munitions plant if uncontrolled might discharge as much pollution as a city of a million people—is assigned to USAEHA's Water Quality Engineering Division. Consisting of Consultation, Studies, and Aquatic Biology Branches, the division provides a variety of potable water and waste-water services to U.S. Army installations.

Services offered to more than 400 customers, mostly afield, are essentially of four types: general water-quality engineering (GWQE) surveys, water-quality biological (WQB) surveys, in-depth industrial waste studies, and water-quality monitoring consultations.

Using well-equipped mobile laboratories, surveys and studies are conducted by teams of sanitary and chemical engineers, biologists, geologists, hydrologists, chemists and technicians.

GWQE Survey. To collect essential information, the division routinely sends a team to each Army installation every 3 to 5 years.

Survey targets—potable and wastewater—often present a different set of problems at each installation, explains LTC D. C. Muntz, chief of the Water-Quality Engineering Division. "One of the biggest problems is lack of uniformly defined standards for effluent quality."

Army regulations and operational control procedures provide guidance to insure that the toughest federal, state and local standards are met. Drinking water standards are set down by the U.S. Environmental Protection Agency (EPA). Many installations have their own water supply and treatment facilities; some even sell to civilian communities.

A GWQE survey looks extensively into operational procedures. A typical survey will cover the water supply, swimming pool operation, domestic waste treatment, industrial wastewater treatment and trash (solid waste) disposal in sanitary landfills. Surveys are the eyes and ears of the division, since they are designed to draw attention to areas needing more extensive study.

Survey teams pay particular attention to wastewater management, making sure no cross-connections exist between a sewer and potable water supply, and that industrial and domestic wastes are treated separately.

Industrial wastes frequently contain substances that cannot be treated in domestic waste-treatment plants. LTC Muntz said, "This creates an occasional problem when the wastes find their way into domestic sewage. People on a military post, like people in civilian communities, tend to dump everything down the drain."

ON LOCATION at an Army munitions plant, water-quality experts set up a station to sample and measure treated waste water flowing from the plant into a nearby stream.

Typical problem areas are vehicle maintenance facilities where by-products include oil, grease and sediment. These find their way into domestic sewers via both deliberate dumping and inadequately maintained traps. Photographic processing chemicals, which the Army uses more of than anyone in the world, are also a bane to domestic sewers.

LTC Muntz pointed out that since the 1940s it has been Army policy to provide secondary treatment for domestic wastes. Secondary treatment is fairly new as a regulatory requirement in a number of areas.

The water-quality biological survey and in-depth industrial-waste study serve to define in hard numbers the extent of waste discharges and pinpoint their sources.

WQB Survey. Aquatic biological surveys assess the effects of waste discharges on receiving streams. They measure the effects of prolonged normal discharges, as well as accidential spills, on the aquatic plant and animal life.

SCIENTISTS aboard one of the U.S. Army Environmental Hygiene Agency's mobile laboratories conduct an in-depth study to define water pollution loads at an industrially operated Army facility.

For Army purposes, the biological studies are very effective, LTC Muntz said, noting that the kinds of organisms and their numbers are the best indicators of the condition of an aquatic environment. Biological indicators are diatoms (microscopic single-cell plants), macroinvertebrates (animals without backbones, e.g. worms, snails and insects) and fish.

How much an installation's discharge is degrading water quality, if at all, is determined by computing biological indices for plant and animal life in a suspected area.

The same indices are used in a control area upstream of the point of discharge (or other points dictated by the situation) and comparing indices.

Biological techniques, LTC Muntz said, can determine slight, moderate, or severe degradation but will not tell what is causing the problem. To pinpoint the problem, in-depth industrial waste studies are called into play.

These studies are the more traditional approach to water quality surveillance and quantifying the cause of water quality degradation. Direction formulated in an aquatic biological survey helps limit this approach which—since it measures physical and chemical parameters—is laborious, time-consuming and expensive.

Industrial-waste studies are made mostly at munitions plants, but also are conducted at maintenance depots. Reportedly, both usually have significant problems of industrial waste.

The studies are quite specialized, LTC Munz said, and only six can be done yearly, for analytical reasons, usually taking about three weeks. A 2-week preliminary study is conducted, in which engineers and chemists survey and assess the problem, define the objectives, develop a study plan, and obtain wastewater samples to be analyzed in labs.

A major portion of the industrial water pollution work precedes and follows installation of pollution abatement equipment. An example is a system soon to be put into service at a

new TNT plant in Newport, IN. When the plant starts up, a second study will be made to ensure that applicable water quality requirements are fulfilled.

A follow-up study was completed recently at Atlanta Army Depot one year after a new industrial waste treatment facility was installed to handle oil, grease, phenolic compounds and metal finish wastes associated with aircraft rebuilding.

One study presently being made aims to resolve a state's claim against an Army installation. The contention is that the Army was the sole source of discharge into a receiving stream. A team from the U.S. Army Environmental Hygiene Agency has already found four polluters just upstream.

USAEHA activities increased recently after the Army ordered installations to monitor the quality of air and the water effluents.

A waste-water monitoring consultation service is currently being provided to 35 installations. Eight of these are large, complex munitions manufacturers and water quality teams have made on-site studies. The teams recommend suitable types of monitoring equipment, where to sample, what to sample for, sample frequency and analytic techniques.

Advancing technology and ever-more-stringent regulatory requirements make water pollution engineering a changing science, like all environmental sciences, LTC Muntz said.

"Water quality standards over the years have been a controversial issue. With few exceptions, while the technology is there to clean up any water, money is a major factor; so is politics. Now uniformity is on the way.

"Until the 1972 amendments to the 1965 Water Quality Act, the main focus was on interstate waters and water quality requirements were difficult for us to sort out. Now, with the advent of EPA, there's been a good deal of change, notably within state regulations, with more to come. And as more is learned technically about pollutants, standards will become tighter.

"The trend is toward specifying standards for specific chemical substances and there are thousands of them. In the future, we're told, pollutants will be looked at in terms of chronic toxicity, rather than acute, as is the case now. Acute toxicity is an expression of lethality; chronic toxicity looks at the effects on, say, reproduction over a period of several generations."

The USAEHA does not set standards but is working to recommend them for some pollutants considered militarily unique. An extensive and exhaustive literature search is being made of toxic potentialities of pollutants that have already been studied. Acute toxicity levels in print will be extrapolated to define below-chronic levels.

Good Neighbor Policy. "The Army position," LTC Muntz said, "is that we are going to police ourselves and demonstrate we are meeting standards and guidelines. We want to satisfy the interests of both the Army and the regulatory people. We encourage communication with the EPA, state groups and educators. Copies of our reports go to EPA; we have liaison with them when we make a study.

"Based on our experience, Army installations most successful in environmental areas are the ones who cooperate closely with local and state regulatory authorities, working in the spirit of good neighbors to solve problems of mutual concern."

Awards . . .

MERITORIOUS CIVILIAN SERVICE. *Alvan J. Hoffman* and *Leland A. Watermeier,* U.S. Army Ballistic Research Laboratories employes, were presented the Meritorious Civilian Service Award (MCSA), the Army's second highest honor for civilian employes.

Hoffman was cited for his organization and management of a new laboratory established to meet vital requirements concerning vulnerability of military equipment and personnel. Watermeier was credited with revitalizing research and development efforts of the Interior Ballistics Laboratory.

DISTINGUISHED SERVICE MEDAL. *MG Henry C. Schrader,* U.S. Army Computer Systems Command, received the second award of the Distinguished Service Medal at retirement ceremonies ending 30 years of military service. He was recognized for leadership and professional expertise in resolution of problems associated with data processing operations.

LEGION OF MERIT. *LTC George N. Simcox,* deputy commander, U.S. Army Engineer Topographic Laboratories (AETL), Fort Belvoir, VA, was presented the Legion of Merit (LM) prior to retirement following nearly 20 years of Army service. Presented by COL John E. Wagner, AETL commander, the award cited LTC Simcox for technical management and ability.

SCIENTISTS AND ENGINEERS from Department of the Army, U.S. Navy and U.S. Air Force exchanged diverse scientific information at Frankford Arsenal's 3-day annual Technical Symposium.

John Brinkman (left) deputy director, Research and Development, USA Weapons Command, keynote speaker, also presented awards.

Albert Carr (right) an electronic engineer in the Fire Control Development and Engineering Directorate at Frankford received an Incentive award for the best development paper, "Doppler Radar Signal Processing Technique." Carr, a graduate engineer of Drexel University with BS and MS degrees in electrical engineering, began his federal career at Frankford in 1958.

LTC William H. Scanlan, commander, U.S. Army Transportation Engineering Agency, received the LM for exceptionally meritorious duty in Vietnam. He was cited for service as G-3/director, Operations, 4th Transportation Com, and logistics adviser, Joint General Staff.

Test Set Device Earns $835 for WSMR Employe

Design and construction of a test set enabling technicians to determine, quickly and reliably, proper functioning of tracking mount encoders has earned an $835 award for Thomas E. Trevizo, a White Sands (NM) Missile Range (WSMR) employe.

Trevizo is an electronic equipment repairman assigned to the Data Collection Division, National Range Operations Directorate and has served more than 14 years at WSMR. He built the test set from obsolete equipment and stock items in nine months at an estimated cost of $648 for labor and $940 for parts.

Expected to result in annual U.S. Government savings of $26,824, the test set is his third cash award suggestion. He received $150 for a 1965 safety idea and $100 for a 1969 suggestion that improved reliability and performance of a tracking mount.

Prior to acceptance of his latest suggestion, it was necessary to bring an entire tracking mount into the shop for repair work. A great deal of time was consumed in isolating the malfunction by standard troubleshooting techniques.

Dr. Kalmus Wins Georgetown Sigma Xi Membership

Full membership in the Georgetown University chapter of the Society of Sigma Xi has been awarded to Dr. Henry P. Kalmus, chief scientist, U.S. Army Harry Diamond Laboratories, Washington, DC.

Selection for membership in Sigma Xi is based on outstanding accomplishments in science. Dr. Kalmus was cited specifically for radar signal processing as well as for his work with electromechanical devices, electronic measurement instruments.

Author of more than 35 technical papers and articles, Dr. Kalmus has more than 50 patent disclosures to his credit. A federal government employe since 1948, he has earned numerous awards including the Department of Defense Civilian Service Award and the Army Decoration for Exceptional Civilian Service.

QUOTE: "If communication is to be accurate and meaningful, the definitions of many of the words used in the social sciences must be construed with some consideration of the meanings current in popular speech, as well as the specialized meanings created by the social scientists." *William Albig.*

Conferences & Symposia . . .

24th Annual ISEF . . .

Judges Select Winners of Japan, Sweden Trips, Other Honors

U.S. Army judges in the 24th annual International Science and Engineering Fair at San Diego, CA, selected 22 from nearly 400 high school finalists for special honors. One received a trip to the Japan Student Science Awards, another a visit to the Nobel Prize ceremonies in Sweden, and all were given a choice of summer jobs or expense-paid visits to Army in-house laboratories.

The Air Force and the Navy also selected one representative each to attend the Nobel Prize ceremonies, and chose numerous others to be rewarded for their research exhibits in the ISEF. Participants represented 46 states, Puerto Rico, Canada, Japan, Egypt and Sweden. They emerged as winners in over 200 ISEF affiliated local, state and regional fairs.

Administered by Science Service, a nonprofit organization supported in the United States by a large number of major professional scientific societies, U.S. Government agencies and industrial organizations, the ISEF is designed to popularize science and to stimulate gifted students to decide on scientific research careers.

Until 1971, when its scope was expanded to include awards in engineering, the ISEF was called the International Science Fair, and was known as the "World's Biggest High School Science Show." Categories for award purposes currently include behavioral and social sciences, biochemistry, botany, chemistry, earth and space sciences, mathematics and computers, medicine and health, microbiology, physics and zoology.

June Anne Vayo, 17, a senior at James Madison H.S. in San Diego, is the Army representative for the "Operation Cherry Blossom" trip to Japan. She will be only about 40 miles from her place of birth (Sagamihara) when she visits Tokyo next January for the Japan Student Science Awards. She is the daughter of Mr. and Mrs. Herbert E. Vayo (USN, Ret.).

Miss Vayo also was honored with a $100 first-prize in the ISEF behavioral and social sciences category, a Navy Science Cruiser Award, a scholarship to attend an institute this year at Northwestern University, and a certificate from the American Psychological Association.

Her ISEF project was titled "Mental Retardation and Eidetic Imagery: A Correlative Study." Sometimes termed "photographic memory," eidetic imagery combines visual memory and after-images—such as one may see momentarily when suddenly looking away from a bright object.

Miss Vayo developed an original method to detect eidetism and then tested and evaluated 500 normal persons and 50 mentally retarded teenagers. The study yielded new information that may be of value in identifying retarded eidetikers, and could provide clues to find the physiological basis of eidetism.

Many normal children are eidetikers, but lose their imaging ability at puberty as abstract thought processes are developed. Many retarded persons are eidetikers but, unlike normal counterparts, retain imaging power.

ARMY ISEF Special Award winners, flanking Director of Army Research BG Charles D. Daniel Jr., are (from left) Mark A. Martin, alternate, and Robert D. Silverman, winner of Nobel Prize ceremony trip to Sweden; June Anne Vayo, winner of Cherry Blossom trip to Japan, and Anne Magdalen Pawlak, alternate.

Charming in speech and appearance, Miss Vayo plans to enroll for university studies in biological sciences, psychology and literature.

John C. MacGuire, 17, from Mount Michael Benedictine H.S., Elkhorn, NB, was selected by General Motors Corp. to attend the Japan Student Science Awards. He is the first student to win the "Operation Cherry Blossom" award for a project in engineering.

MacGuire's research project, "Slats as High-Lift Devices," also earned him an Army Superior Award week-long visit to an Army Research facility this summer, a General Motors Corp. silver medal and $125, a NASA award including a trip to the John F. Kennedy Space Center, a Society of Aeronautical Weight Engineers award of a $100 bond, and an ISEF engineering category award of $75.

His project was a test on the effectiveness of certain slats (thin, curved plates in the airstream over a wing) in combination with other high-lift devices. The slats were tested with smoke-flow and lift-and-drag measurements, using model wings in a wind tunnel he constructed.

A leading-edge slat was found to be superior to the most common slats used now. It proved more consistent in offering good performance with slight modifications in shape than more commonly used devices; also, that it could improve performance of the other devices tested in conjunction with them.

Anne Magdalen Pawlak, 17, senior at Ladywood H.S., Livonia, MI, was selected as the Army alternate representative to the Japan Student Science Awards for her exhibit on "Radiation-Immunology-Cryosurgery: Effects on the Neuroendocrine System."

Miss Pawlak also earned an Army Superior Award and a visit to an Army research facility, an Atomic Energy Commission (AEC) award for a "Nuclear Research Orientation Week" at Argonne National Laboratory, an Eastman Kodak Co. award of $100, and a fourth-place ISEF medicine and health category award of $25.

Christopher S. Willson, 16, Merritt Island (FL) H.S. is the General Motors Corp. selectee for alternate representative to the Japan Student Science Awards Exhibit. His project was "Piezoelectricity: An Investigation of its Properties as Observed in Potassium Sodium Tartrate Tetrahydrate."

The U.S. Army, Navy and Air Force have alternated as executive agents in sending ISEF selectees to the Japan Student Awards program which was initiated in 1963 under sponsorship of the Japanese newspaper *Yomiuri Shimbun.* Under a new program inaugurated last year at the 23d ISEF in New Orleans, LA, the Army was joined by General Motors Corp. in sending one winner each.

NOBEL PRIZE AWARD. In 1972 the U.S. Army, Navy and Air Force joined in sending one student representive each to the annual Nobel Prize ceremonies in Stockholm.

Robert D. Silverman, 18, from Chelmsford (MA) High School will represent the Army at the ceremonies. His exhibit, "The Biochemical Process of Genetic Change", also won a Superior Award including a visit to an Army laboratory and a fourth-place ISEF biochemistry award of $25. His exhibit depicted how chromosomal genetic aberrations are induced by irradiation.

Mark A. Martin, 18, Ogden (UT) H.S., was selected as Army alternate for his exhibit, "Study of the Feeding Habits of Trout." The project included dissection and analyses of 72 trout stomachs from 13 areas in Northern Utah, including types, numbers and percentages of food consumed.

Martin also won a trip to an Army laboratory and an ISEF zoology award of $25.

Marvin J. Slepian, 17, Stuyvesant H.S., Brooklyn, NY, is the Navy's choice to attend the Nobel Prize Award ceremonies for his exhibit "Bacteriophage T5 Pseudovirions." He also won a Navy Science Cruiser Award, a summer job sponsored by the Department of Agriculture Research Service; an American Chemical Society Award of $25; an American Society for Microbiology Award of $100; and an ISEF microbiology award of $25.

Glenn Joel Greene, 16, the Air Force winner for the trip to Nobel Prize Ceremonies, is a senior at Crawford H.S., San Diego. He exhibited "Fusion Containment Using Plasma Shock Waves." The display demonstrated his research to show that electromagnetic shock waves can prolong the confinement of a plasma, a hot gas, in one dimension. This achievement relates to problems encountered in efforts to create controlled fusion—the melding of atomic nuclei to obtain energy.

Greene's exhibit won visits to Army and Air Force research facilities and a week at the AEC Argonne National Laboratory. He also received an American Patent Law Association Award of a $100 bond, a Society of Photographic Scientists and Engineers Award of $75, and an ISEF first-prize award of $100 in the physics category.

Director of Army Research BG Charles D. Daniel Jr. presented awards to the Army's 11 Superior and 11 Meritorious Award winners, in the form of Certificates of Outstanding Achievement signed by the Secretary of the Army and by the Director of Science Service. Gold medallions were presented to the Superior Award winners, and silver medallions rewarded Meritorious winners. They were selected on the basis of research related to Army science interests.

The Association of the U.S. Army awarded $100 to each of the Army winners selected to attend Operation Cherry Blossom and the Nobel Prize Ceremonies.

ARMY SUPERIOR AWARD winners, in addition to Miss Vayo, Miss Pawlak, Silverman, MacGuire, Green and Martin, include:

Linda Marie Cox, 18, William Byrd H.S., Vinton, VA, for "Relationships of Chemical Retardants to Mineral Absorption in Plants"; *Rex Skodje,* 17, Bismark (ND) H.S., "A Study of Oxygen Atom Reactions with Propane"; *Deborah L. Birx,* 17, Carlisle (PA) H.S., "Paleobotany in Reference to the Carboniferous Period"; and

Frank T. Leighton, 16, Washington-Lee H.S., Arlington, VA, for "An Analysis of Prime Number Sequences and Goldbach's Conjecture"; and *Mark B. Spector,* 16, Wyoming (OH) H.S., "Location of the Bacteriophage Receptor Site of Group C Streptococci."

ARMY MERITORIOUS AWARD winners, *Joni L. Baeke,* Shawnee Mission South H.S., Leawood, KS, for "Orbital Photoperiodism and production of 17-Keto-and Corticosteroids in Gerbils"; *Peter W. Boerner,* North Alleghany H.S., Pittsburgh, PA, "Euonymus Extract"; and

Pedro A. Rivera, Manuela Toro H.S., Caguas, PR, for "Peels Used as Fertilizers and Flowering Inducers"; *Douglas L. Wade,* Argyle Secondary School, N. Vancouver, British Columbia, Canada, "Polymerization Reactions"; *Marshall S. Collins,* Woodrow Wilson H.S., Beckley, WV, "Structural and Dynamic Properties of the Corotating Magnetosphere Neutron Star"; and

Frank B. Jumonville Jr., St. John H.S., Plaquemine, LA, for "Experiments for the Development and Improvement of the Hydrogen Engine"; *H. Britton Sanderford,* St. John Vianney Prep. H.S., New Orleans, LA, "Computer: Electronic Brain II, Phase I"; *Malcolm K. McEwen,* Tylertown (MS) H.S., "Effect of Prostaglandin E on Adjuvant Arthritis"; and

Marvin J. Slepian, Stuyvesant H.S., Brooklyn, NY for "Bacteriophage T5 Pseudovirions"; *David A. Fish,* Wachusett Regional H.S., Holden, MA, "Hydrodynamics Applied to Yacht Stability Systems"; and *Rodney S. Kawahara,* Aiea (HI) H.S.; for "Neuroendocrine Regulation of Rhythmic Circadian Activity in Ocypode laevis (Dana)."

SPECIAL RECOGNITION. An exhibit on the "Measurement of the Wavelength of Sound" earned a special silver medal award for Yasunori Mori, 19, Kokura H.S., Kitakyusyu-city, Fukuoka-pre, Japan.

Administrative arrangements for the 24th International Science and Engineering Fair were coordinated by Science Service Director Dr. Edward G. Sherburne Jr., and Dorothy Schriver, assistant director of Science Service and acting coordinator of the ISEF.

U.S. Army participation in the ISEF was arranged by Mrs. William G. Taylor of the U.S. Army Research Office, Durham, NC, as project officer. COL Sidney L. Loveless (USA, Ret.), Bryan, TX, was the Reserve Affairs coordinator.

Dr. Gordon L. Bushey, Office of the Deputy for Laboratories, HQ US Army Materiel Command, was chairman of the Army judges panel. Other members and disciplinary areas of expertise in which they judged exhibits include:

Dr. J. E. Uhlaner, U.S. Army Research Institute for the Behavioral and Social Sciences, Arlington, VA (behavioral and social sciences); LTC Charles M. Dettor, Letterman Army Institute of Research (LAIR), San Francisco, CA (medicine and health); MAJ Thomas R. Temple, LAIR (medicine and health); Dr. Jefferson S. Bennett, Redstone Arsenal, Huntsville, AL (physics); Thomas G. Martin III, U.S. Army Natick (MA) Laboratories (NLABS) (chemistry); Dr. Robert I. Ellin, Edgewood Arsenal, Aberdeen Proving Ground, MD (biochemistry); John Barry, Deseret Test Center, Fort Douglas, UT (botany); and

Dr. John P. Petrali, Edgewood Arsenal (zoology); Dr. Durwood Rowley, NLABS (microbiology); Dr. Richard G. Carlson, U.S. Army Air Mobility R&D Laboratory, NASA-Ames Research Center, Moffett Field, CA (engineering); and

Dr. L. R. Shaffer, Construction Engineering Research Laboratory, Champaign, IL (civil engineering-operations research, computer-base management, structures, construction techniques); Dr. G. G. Quarles, Office of the Chief of Engineers, Washington, DC (electrical engineering, physics-missiles, space, mapping, hydraulics, soils); LTC Aubrey F. Messing, assistant for Reserve Affairs, Office of the Chief of R&D, Washington, DC (chemistry).

RESERVE OFFICERS on the panel included CPT Salvador L. Camacho, Raleigh, NC (physics); MAJ Kennard D. Fearing, Iowa City, IA (mathematics and computers); LTC John R. Montogomery, Houston, TX (medicine and health); COL John V. Perry Jr., College Station, TX (engineering, mathematics and computers); and

CPT Ronald D. Stricklett, Salt Lake City, UT (zoology); MAJ Harold Zallen, Stillwater, OK (biochemistry, medicine and health); LTC Daniel S. Lefkow, Carmichael, CA (behavioral and social sciences); MAJ States M. McCarter, Athens, GA (botany); and MAJ John A. Replogle, Tempe, AZ (earth and space sciences); LTC Raymond M. Stewart, Torrance, CA (microbiology).

ARMY JUDGES & RESERVE OFFICERS at ISEF. Front row (from left): LTC Daniel S. Lefkow, MAJ States M. McCarter, Dr. J. E. Uhlaner, John Barry, CPT Salvador L. Camacho, Dr. Durwood Rowley, Dr. Gordon L. Bushey. Second row: MAJ Harold Zallen, COL Sidney L. Loveless, LTC Raymond M. Stewart, LTC Charles M. Dettor, MAJ Thomas R. Temple, Thomas G. Martin, Dr. Robert I. Ellin. Third row: CPT Ronald D. Stricklett, MAJ John A. Replogle, MAJ Kennard D. Fearing, Dr. John P. Petrali, LTC Aubrey F. Messing, LTC John R. Montgomery and COL John V. Perry.

Hungarians Honor Dr. Gabor For Holographic Achievements

Inventor and scientist Dr. Dennis Gabor, best known for his photographic technique of holography, was recently presented the American Hungarian Studies Foundation's George Washington Award at ceremonies honoring American Nobel Laureates.

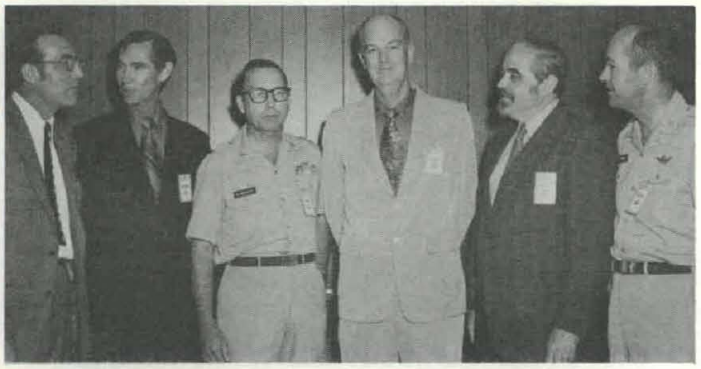
The award was inspired by the statue of Washington erected in the city park of Budapest in 1966. Built through contributions raised by Hungarian immigrants in America, it is the only statue of George Washington in all of Eastern Europe.

Dr. Gabor is a professor emeritus of applied physics of the Imperial College of Science and Technology in London and a staff scientist with Columbia Broadcasting System Labs.

Holography is a method of 3-dimensional lensless photography by coherent light in which a light wave issuing from an object is "frozen" into a photographic emulsion by means of a second beam of light. The resulting hologram can then be reconstructed by the second beam alone to give a 3-dimensional image.

Dr. Gabor established the technique in 1948 while trying to increase the resolving power of electron microscopes. The advent of the laser beam provided wider applications of holography and in 1971 Dr. Gabor received the Nobel Prize in physics for his invention.

AMC Laboratory Directors Meet at NVL



PARTICIPANTS (l. to r.) Dr. John D. Weisz, director HEL, APG, MD; Dr. Gordon L. Bushey, Office of the Deputy for Laboratories (ODL), AMC HQ; BG John C. McWhorter, NLABS commander; Dr. John L. McDaniel, director, RDE & Missile Systems Laboratory, MICOM; James H. Flanagan, technical deputy director for Engineering, NLABS; LTC Frank D. Cantwell, executive officer, ODL, U.S. Army Materiel Command HQ.

AMC Commander GEN Henry A. Miley Jr. and AMC Deputy for Laboratories Dr. Robert B. Dillaway had leading roles.

Dr. Robert S. Wiseman, director of Laboratories, ECOM; Dr. Benjamin L. Harris, technical director, Edgewood (MD) Arsenal; COL Lee M. Sherman, director of RD&E, WECOM; Melvin P. Marks, ODL, AMC HQ; Carroll H. Staley, deputy director for RD&E, MUCOM; James Bender, science administrator, AMC HQ.

Terence G. Kirkland, chief CM/CI Dept., MERDC; Dr. Sidney Ross, technical director, Frankford Arsenal, PA; Dr. Robert E. Weigle, director, Benet R&E Labs, Watervliet (NY) Arsenal; Norman L. Klein, assistant deputy, Laboratories, AMC HQ; Billy M. Horton, technical director, Harry Diamond Laboratories; Dr. Alvin E. Gorum, director, Materials & Mechanics Research Center.

Dr. Royce E. Beckett, director, Weapons Lab, WECOM; Dr. H. M. El-Bisi, ODL, AMC HQ; COL J. L. Holman, commander, and Harry W. Painter, technical director, Picatinny Arsenal; John W. Kramar, assistant director, Systems Effectiveness & Joint Service Activity, Army Materiel Systems Analysis Agency, Aberdeen Proving Ground; Dr. R. J. Eichelberger, BRL director.

Dr. Richard Carlson, chief, Advanced Systems Research Office, U.S. Army Air Mobility Research and Development Laboratory (AAMRDL), Ames Research Center, Moffett Field, CA; F. Webb Taylor, Office of the Deputy for Laboratories, AMC HQ; Joseph Lindwarm, ODL, AMC HQ; Paul F. Yaggy, director, AAMRDL.

LTC Robert E. Henry, deputy director and commander, AMMRC; LTC George T. Neu, chief, Systems Engineer Support Division, AVSCOM; Benjamin Goldberg, director, NVL; COL David W. Einsel, commander, HDL; Dr. Russell D. Shelton, technical director, LWL; Dr. William F. Banks, deputy director, HQ TACOM; John A. Brinkman, deputy director for RD&E, HQ WECOM.

ADMINISTRATIVE COORDINATORS for the AMC Laboratory Conference included (from left) Jeff Slusher, John Burgess and Lawrence "Sonny" Burke, all with the Night Vision Laboratory.

AMC Commander Exchanges Views With Laboratory Leaders

Free-wheeling exchange of information and opinions regarding R&D programs, problem areas and some recent research achievements characterized a special U.S. Army Materiel Command Laboratory Conference June 6 at the Army Night Vision Laboratory, Fort Belvoir, VA.

AMC Commander GEN Henry A. Miley Jr., Deputy for Laboratories Dr. Robert B. Dillaway, Deputy Commander for Materiel Acquisition MG John R. Guthrie and most other members of the AMC command group concerned with laboratory operations participated in the exchange.

Periodic meetings with laboratory directors and commanders have been used by GEN Miley since soon after he assumed command, Nov. 1, 1970, following duty as deputy CG, to stimulate a candid and open expression of viewpoints relative to Army R&D activities, program planning and goals achievement.

Cost reduction intensification of over-all effort and accelerated transfer of new technology resulting from Army in-house laboratories or contractual effort shared primary attention at the June 6 conference.

GEN Miley headed a select panel for general discussion of presentations on some procedures being implemented in research and development and progress reports on noteworthy projects by laboratory directors.

Other members of the panel were COL David W. Einsel, commander of the Harry Diamond Laboratories; Dr. Robert J. Eichelberger, director, Army Ballistics Research Laboratories; and Paul F. Yaggy, director, Army Air Mobility Research and Development Laboratory, Ames Research Center.

In his introductory remarks, GEN Miley emphasized that he considers the laboratory directors and commanders "my field managers for technology," and that he desires continuing priority attention to measures that will help them to perform at peak efficiency.

Relative to improved responsiveness to Required Operational Capability (ROC) statements for new weapon systems and equipment, GEN Miley said he wants to keep currently informed about problems. "Red Team" treatment, he explained, should be used to integrate properly a comprehensive statement.

GEN Miley suggested that when laboratory leaders feel they have "a good idea," they should not hesitate to bring it to the attention of the commodity commander and project manager concerned.

In furtherance of the goal of bringing Army laboratories "into the main stream of development," he said he welcomes personal contact with him and his staff in the interest of adequate review and follow-up action.

MG Guthrie emphasized similarly this policy during his discussion of the "Cost Reduction Procedures Currently Being Implemented in Research and Development." He said he considers a close and continuing interface is essential to success in relations among AMC commodity commands, project managers and laboratory technical directors.

The new AMC Research, Development, Test and Evaluation 5-Year Program (FY 74-FY 78), he said, makes Cost Reduction an integral part of the Army priority objectives. MG Guthrie cited a May 2, 1973, Joint Chiefs of Staff Memorandum for the Secretary of Defense, "Major Weapons Systems Acquisition Cost Reduction," which strongly supports the CR Program as critical to national defense interests.

The Joint Chiefs of Staff believe primary objectives in this area are:

- The control of costs of major weapon systems and their impact on force structures;
- The provision of an audit trail from valid national security/military objectives for specific weapon systems which can meet the projected threats;
- Assurance that the Department of Defense planning systems provide reliable means for timely decisions to insure that national security/military needs are satisfied.

MG Guthrie concluded with an extensive question-and-answer session that generated a lively exchange of viewpoints on incremental versus decremental funding of research programs, trade-off decisions on weapons systems, funding authorization justification for major programs, and management methods.

Other morning-session speakers included Benjamin Goldberg, who gave the welcoming remarks as director of the host Night Vision Laboratory; Joseph Lindwarm, Office of the AMC Deputy for Laboratories, who discussed "Single Program Element Funding"; and COL J. H. Phillips, report on Project MASSTER.

Dr. Robert S. Wiseman, director of Electronics Command Laboratories, opened the afternoon session with a presentation on "How Technology is Transferred." He traced various ECOM activities that have produced significant research products as simplified color film processing, the atomic clock, radar technology, a new "truly simplified camera," and night-vision devices.

Dr. William F. Banks, deputy director, Tank-Automotive Command, reported on technology transfer activities involved in the new hybrid combustion engine to reduce discharge of pollutants; development of VHO (very high output) engines; an automatic fire detection and suppression system; and high-diffusion paint to cut detectability of vehicles in a combat environment.

Dr. John L. McDaniel, director of the Missile Laboratory and Missile Command RD&E, traced the chronological transfer of technology that produced the Air Force "Smart Bomb" a laser-guided system used in Vietnam and developed from 1962 to 1968.

Dr. Alvin E. Gorum, director, Army Materials and Mechanics Research Center, detailed technology transfer that has resulted in a revolutionary new process of steel production. The steel has highly superior qualities for armor, combat vehicles and other military applications, he said. Within the next decade, he predicted that the bulk of high quality steel will be made this way.

Dr. Gorum listed also, in the technology transfer area, the process of "growing" high-quality crystals, including 8-inch sapphires that have applications such as vision blocks for tanks and periscope windows for submarines that are dry the moment they come out of water. Currently, he said, a problem is the high cost of polishing sapphires.

Another AMMRC research and development effort Dr. Gorum considers significant is the process of making aluminum-graphite compositions with many superior qualities for military applications. The present cost is about $200 a pound and there is a shortage of producibility development funding.

AMC Deputy for Laboratories Dr. Dillaway concluded the session with a presentation on "Management by Objectives," in which he outlined some of the procedures and techniques that have proved successful in various U.S. Government agencies and in industry.

Norman L. Klein, AMC Assistant Deputy for Laboratories, chaired the conference, introduced several speakers and contributed to discussion of the exploitation of technology in military applications.

Technology Transfer Incentives Explored at Natick Symposium

The Experimental Technology Incentives Program (ETIP) of the National Science Foundation and the National Bureau of Standards was the prime topic of discussion at a symposium sponsored by the U.S. Army Natick Laboratories.

In addition to participating panalists, the symposium attracted more than 150 industrial, academic, and U.S. Government representatives, including several from the Navy and commanders or technical leaders of numerous Army laboratories.

Complementing a U.S. Department of Commerce program, the NSF-NBS efforts are designed to provide experimental evidence concerning various incentives which the U.S. Government might use to increase application of science and technology in the civil sector.

The objective is to test the effectiveness of various mechanisms for increasing the rate of transfer of new concepts or technology to goods and services manufactured and consumed in the private and public domain. The federal role in identifying and reducing institutional barriers to innovation will also be examined.

Additional information regarding the ETIP may be obtained by writing to: Mr. Evan Anderson, National Science Foundation, Room 549, 1800 G Street, N.W., Washington, DC, 20550, or by telephone (202-632-5863).

NSF Program Manager Evan Anderson (center) is joined by Dr. S. David Bailey (left), director, Pioneering Research Laboratory, and Dr. Dale H. Sieling, NLABS technical director, at a symposium sponsored by NLABS on the NSF-NBS Experimental Technology Incentives Program.

Personnel Actions . . .

Smith Heads Computer Systems Command

BG Paul T. Smith

Activities of the U.S. Army Computer Systems Command (CSC), Fort Belvoir, VA, are now commanded by BG Paul T. Smith, who succeeded MG H. C. Schrader upon his recent retirement.

BG Smith had served since 1972 as deputy commander, CSC. During 1971 he was assigned as deputy for Tactical Systems and has been involved with numerous data processing projects since 1959.

Enlisting in the Army in 1940, he was appointed a warrant officer in 1942 and commissioned in 1943. His academic credentials include BS and MBA degrees from the University of Maryland.

During World War II he served with the 1st and 6th Armored Divisions. He also has seen duty in Europe, Korea and Vietnam. Other key assignments have included Office of the Chief of Staff for Information and Data Systems and the Office of the Assistant Vice Chief of Staff, U.S. Army.

BG Smith is a graduate of the Army Command and General Staff College, Army War College, Armored School, Adjutant School, and numerous computer courses at the Department of Defense Institute and the U.S. Civil Service Commission.

Included among his military decorations are the Legion of Merit with two Oak Leaf Clusters (OLC), Bronze Star Medal, and Army Commendation Medal with OLC.

Anderson Commands Army Hygiene Agency

COL James E. Anderson

COL James E. Anderson assumed command of the U.S. Army Environmental Hygiene Agency (AEHA), Aberdeen Proving Ground, MD, succeeding COL Hunter G. Taft Jr. when he was assigned to Washington, DC.

During World War II, COL Anderson served as an enlisted man with the 101st Airborne Division in France, Holland, Belgium and Germany. He later earned a BS degree in biology and chemistry from the University of Southern Mississippi and completed work for a teaching certificate in secondary education.

Following duty as a physics officer and research assistant with the Division of Radiation Pathology, Armed Forces Institute of Pathology, Washington, DC, after receiving a 1954 Medical Service Corps commission, he was assigned as radiological hygiene consultant to The Surgeon General and assistant to the chief, Occupational Health Branch.

Other key assignments have included chief, Division of Environmental Quality, Health and Environment Directorate, Office of the Surgeon General; and Division of Nuclear Medicine, Walter Reed Army Institute of Research, Washington, DC.

Among his military honors are the Soldier's Medal, Bronze Star Medal with Oak Leaf Cluster (OLC), Army Commendation Medal, and the Purple Heart with OLC.

Crosby Named CRREL Commander/Director

COL Robert L. Crosby will succeed COL J. F. Castro Aug. 1 as commander and director of the U.S. Army Cold Regions Research and Engineering Laboratory, Hanover, NH.

COL Crosby formerly served as secretary, U.S. Army Engineer School, Fort Belvoir, VA. Other key assignments have included company commander, 271st Engineer Battalion (C), and company commander 9th Engineer Battalion (C), Fort Lewis, WA.

Additionally, he has served as assistant resident engineer, U.S. Army Engineer District, Fairbanks, AK; battalion commander, 92d Engineer Battalion, Vietnam; senior engineer adviser, IV Corps; and executive director, U.S. Army Engineer Institute for Water Resources, Alexandria, VA.

COL Robert L. Crosby

A 1953 graduate of the U.S. Military Academy, COL Crosby earned an MS degree in civil engineering from Iowa State University. He also is a graduate of the Army Command and General Staff College and the Air War College.

His military awards include the Legion of Merit with Oak Leaf Cluster (OLC), Bronze Star Medal and the Army Commendation Medal with OLC.

Petty Commands Atmospheric Lab at WSMR

COL William C. Petty

COL William C. Petty recently assumed command of the Atmospheric Sciences Laboratory (ASL). White Sands (NM) Missile Range after commanding the Defense Communications Agency, Vietnam.

COL Petty served with the Army Signal Corps during World War II in the European Theater. In 1950 he graduated from the Georgia Institute of Technology with an MBA degree and was commissioned in the Army Signal Corps.

COL Petty served during 1959–60 with the Military Assistance Advisory Group in Vietnam and from 1963–65 in the Office of the Chief of Communications-Electronics. Other assignments have included the Central Army Group, NATO; commander, 16th Signal Battalion; instructor, Army Command and General Staff College; and director, Officer Department, Southeast Signal School.

He has completed the Command and General Staff College and is a recipient of the Legion of Merit, Bronze Star Medal and Army Commendation Medal with first Oak Leaf Cluster.

ECOM Chooses Darling as Plans Director

COL Gregory Darling

Director of Plans and Analysis, U.S. Army Electronics Command (ECOM), Fort Monmouth, NJ, is the new title of COL Gregory Darling, formerly executive officer, Communications-Electronics Systems Integration Office, ECOM. He was assigned to ECOM in 1972 following duty with HQ Military Assistance Command, Vietnam.

COL Darling has a BS degree in military studies from the University of Maryland, has done graduate work at George Washington University, and has completed the Army Command and General Staff College.

His military honors include the Legion of Merit with Oak Leaf Cluster (OLC), Bronze Star Medal with OLC, Air Medal (second award), Meritorious Service Medal, Joint Service Commendation Medal, and the Army Commendation Medal with OLC.

Buker Joins OTSG Health Care Directorate

COL Robert H. Buker, MC, became chief surgical consultant, Health Care Operations Directorate, Office of the Army Surgeon General, after completing a tour of duty as assistant chief, Thoracic and Cardiovascular Surgery Service, Brooke Army Medical Center, Fort Sam Houston, TX.

Since he was accepted into the Army Medical Corps in 1964, COL Buker has served at the U.S. Army Hospital, Fort Rucker, AL; Panama Canal Zone; and at the U.S. Army Hospital, Fort Ord, CA.

COL Buker has an AB degree from Boston University, an MS degree from the University of Maine, and an MD from the College of

Physicians and Surgeons, Columbia University.

He is a Fellow of the American College of Surgeons, American College of Chest Physicians and is a member of the Southern Thoracic Surgical Association, the American Medical Association, Society of Thoracic Surgeons, Aerospace Medical Association, and the Society of U.S. Army Flight Surgeons.

Author of numerous professional articles, he has designed exhibits and made presentations at national and international conferences.

Smith Named Director of HumRRO Division No. 7

Dr. Robert G. Smith is the new director of the Human Resources Research Organization (HumRRO) Division No. 7 (Social Science).

A member of the HumRRO staff since 1958, he has served as director for Program Development since 1969. He was director of Division No. 5 in 1962 when he was chosen as HumRRO representative at HQ U.S. Continental Army Command, Fort Monroe, VA.

Dr. Robert G. Smith

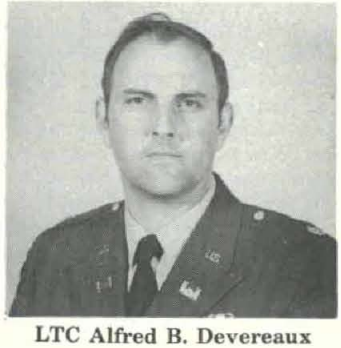
Dr. Smith served in 1966 as HumRRO director for Operations and is on the HumRRO Board of Trustees. Earlier he was an Air Force research psychologist and a psychology instructor at Texas Technological College. He has BA and MA degrees from the University of Florida and a PhD degree from the University of Illinois.

HumRRO Division No. 7 is currently engaged in studies of drug abuse in the military, race-relations problems, training Americans to improve working relationships with foreign nationals in overseas settings, and manpower research for the DoD.

PhD Graduate Assigned as ETL Deputy

LTC Alfred B. Devereaux Jr., a recent PhD graduate of Ohio State University, has been assigned as deputy commander of the U.S. Army Engineer Topographic Laboratories.

A 1959 graduate of the U.S. Military Academy, LTC Devereaux has served in Korea, Germany and Vietnam. In 1968-69 he was assigned to HQ Department of the Army in the Office, Assistant Chief of Staff, Intelligence.



LTC Alfred B. Devereaux

LTC Devereaux earned his master's degree from Ohio State University, has attended the Army Command and General Staff College, and has completed the Engineer Officer Advanced Course.

A member of the American Society of Photogrammetry and the Society of American Military Engineers, he has been awarded the Bronze Star Medal and the Meritorious Service Medal.

Dausman Appointed AMC Systems Coordinator

George E. Dausman was recently named systems acquisition coordinator, U.S. Army Materiel Command. He will serve as a special assistant to AMC commander GEN Henry A. Miley Jr. and also to Deputy Commander for Materiel Acquisition MG John R. Guthrie on major systems problems.

Currently a student at the Industrial College of the Armed Forces, Dausman has served as the Army's deputy project manager for the Advanced Attack Helicopter and its predecessor, the Cheyenne. He has BS and MS degrees in aeronautical engineering and an MS degree in management, all from the Massachusetts Institute of Technology.

Snyder Chosen Mid-Atlantic EPA Administrator

Responsibilities for monitoring federal environmental programs in Pennsylvania, Maryland, Delaware, Virginia and the District of Columbia were recently assigned to Daniel J. Snyder.

Snyder has been appointed by the U.S. Environmental Protection Agency as regional administrator for the Middle Atlantic Region. Joining EPA in 1972, he had been serving as acting regional administrator since February 1973. He is a graduate of Dickinson College and the University of Virginia Law School.

President Nominates 30 for 2-Star Rank

President Nixon has nominated 30 brigadier generals for permanent one-star rank and appointment to temporary major general rank. Promotions will be made as vacancies occur, subsequent to Senate confirmation. Nominees and present assignments include:

Robert J. Baer, project manager, XM1 Tank System, U.S. Army Materiel Command (AMC), Warren, MI; *William B. Caldwell III,* deputy director-designate, Security Assistance Plans, Policy, and Programs Office, Assistant Secretary of Defense (International Security Affairs), Washington, DC; and

John R. D. Cleland Jr., chief, Military Equipment Delivery Team, Cambodia; *Pat W. Crizer,* director of Systems, Office of the Assistant Chief of Staff for Force Development (ACSFOR), Washington, DC; *Albert B. Crawford Jr.,* project manager, Army Tactical Data Systems, U.S. Army Electronics Command, Fort Monmouth, NJ; and

Charles D. Daniel Jr., director of Army Research, Office of the Chief of R&D (OCRD), Washington, DC; *Eugene J. D'Ambrosio,* director of Maintenance, HQ AMC, Washington, DC; *Robert G. Gard Jr.,* director, Human Resources Development Office, Deputy Chief of Staff for Personnel (DCSPER); Washington, DC; and

Thomas U. Greer, assistant commander, 2d Infantry Division, Eighth U.S. Army, Korea; *Hal E. Hallgren,* commander, U.S. Army Concepts Analysis Agency, Bethesda, MD; *Rolland V. Heiser,* director, Plans, Office of the Deputy Chief of Staff for Military Operations, Washington, DC; and

Gordon L. Hill Jr., deputy chief of Public Information, Office of the Secretary of the Army, and deputy chief, Information, Office of the Chief of Staff, Washington, DC; *John E. Hoover,* deputy assistant chief of staff, Communications-Electronics, HQ DA, Washington, DC;

Eivind H. Johansen, director, Supply, HQ AMC; *Stan L. McClellan,* director, Logistics, J4, U.S. Support Activities Group, APO San Francisco, CA; *John W. McEnery,* assistant commander, 1st Cavalry Division (Tricap), Fort Hood, TX; *John R. McGiffert II,* deputy chief of staff, Resources Management, U.S. Army Training and Doctrine Command (TRADOC), Fort Monroe, VA; and

Edward C. Meyer, deputy commandant, U.S. Army War College, Carlisle Barracks, PA; *Elmer R. Ochs,* commander, U.S. Army Combat Developments Command Experimentation Command, Fort Ord, CA; *George S. Patton,* assistant commandant, U.S. Armor School, Fort Knox, KY; and

Alton G. Post, deputy chief of staff, Logistics, U.S. Army, Pacific; *Robert J. Proudfoot,* deputy for Materiel Acquisition, Office, Assistant Secretary of the Army (Installations and Logistics), Washington, DC; *Marion C. Ross,* deputy director, Operations, Office of the Deputy Chief of Staff for Military Operations, Washington, DC; and

Oliver D. Street III, assistant chief of staff, Land Operations, Allied Forces, Central Europe; *Gordon Sumner Jr.,* chief, Western Hemisphere Division, J5, Joint Chiefs of Staff, Washington, DC; *Orville L. Tobiason,* assistant chief of staff, G3, Eighth U.S. Army; *John G. Waggener,* commander, U.S. Military Group chairman, U.S. Army Mission, Argentina, Washington, DC; and

Richard L. West, deputy chief of staff, Comptroller, FORSCOM, Fort McPherson, GA; *John A. Wickham Jr.,* director, Management Information Systems, Office of the Assistant Vice Chief of Staff, Washington, DC; *Samuel V. Wilson,* deputy director, Estimates, Defense Intelligence Agency, Washington, DC.

Former ARO Chief Becomes Science Attache

Somewhat later than originally planned, about seven years to be reasonably precise, MG (USA, Ret.) Chester W. Clarke, former director, Army Research, Office of the Chief of R&D, HQ DA, departed June 13 for Taiwan to serve as a science attache with the U.S. State Department. It will be a third career after two "retirements."

When he returned from a 2-year tour of duty as U.S. Army commander for forces in Japan, MG Clarke had just about firmed up plans to retire and join the U.S. State Department science attache overseas program. Then came an opportunity too tempting to turn down, in the form of an offer to serve as vice president with the Research Triangle Corp. in Durham, N.C.

After more than six years with this organization—during which he continued his long association with the U.S. Army R&D community as a member of various advisory and working groups—MG Clarke "retired" again. As the months passed, the charm of a life of ease, of being able to do pleasurable things when and where he wanted, weighed upon his long-developed "driver" urge.

In Taiwan, serving as commander of the Military Assistant Advisory Group (MAAG), is one of MG Clarke's close friends of long standing, MG John Barnes, former head of the Development Directorate, Office of the Chief of R&D, HQ DA.

MG Clarke, whose title will be special assistant to U.S. Ambassador Walter P. McConaughy, will also serve with him in his role as U.S. commissioner on the Joint Commission for Rural Reconstruction—an area of primary interest to MG Barnes.

People in Perspective . . .

Nuclear Powered Heart . . .

Picatinny Engineer Receives Atomic Pacemaker

Stanley Runsky

Stanley Runsky, industrial engineer technician with Industrial Operations Directorate, Picatinny Arsenal, recently helped to make medical history as one of the first recipients of an implanted nuclear pacemaker. The operation took place at Beth Israel Medical Center in Newark, NJ.

In 1961 he suffered a slowing down of his heart beat, a disorder known as the Stokes-Adams syndrome, and became one of the first heart patients in New Jersey to receive a battery-operated pacemaker.

During the next 12 years he functioned normally with the conventional pacemaker, returning periodically to the hospital for replacement of batteries.

Stan says that insertion of the new nuclear device took about an hour. The doctors removed some of the original wiring and ran an electrode to the vein leading to the heart ventricle. Given a choice of an implant near the abdomen or the chest, he opted for the chest.

A number of questions are raised about Stan's pacemaker. Is it dangerous? Does it limit his activities? Can he still function as normally as before? Runsky has been assured by doctors that it is absolutely safe. He can still garden, bowl, swim, ice skate and walk briskly. However, he cannot engage in any "back-breaking" labor.

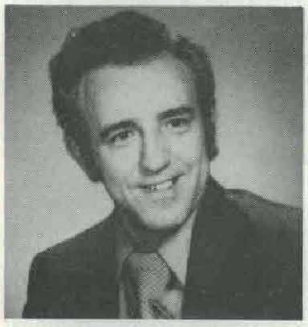
Stan wears an ID bracelet showing that a radio isotope powered cardiac pacemaker has been implanted and indicating the device emits a certain amount of radiation.

He also has a pacemaker checker, an instrument which connects to a conventional telephone, so that once a week he can transmit an electro-cardiogram printout to a monitoring system in Beth Israel.

According to medical specialists, the nuclear powered pacemaker will last 10 years or more before need of replacement.

The pacemaker was developed by the ARCO Nuclear Co. under a grant by the Atomic Energy Commission.

ECOM Deaf Mute Gains in Full 'the Good Life'



Anthony Vito DiMaio

Attaining in satisfying measure "the good life" as a deaf mute has presented challenges but none insurmountable for Anthony Vito DiMaio, an employe who has distinguished himself at HQ U.S. Army Electronics Command.

Selected recently as one of seven U.S. Army Materiel Command nominees for the 1973 federal service Handicapped Employe of the Year award, DiMaio is an electronic accounting machine operator in the ECOM Information Systems Directorate at Fort Monmouth, NJ. He has progressed steadily during 12 years of federal service.

Communication with fellow workers is no problem. He uses physical indicative actions, sign language or, if necessary, written notations. Cheerfulness and an ever-willing attitude are among the attributes that have earned the esteem of associates as he carries out his assigned tasks. They credit him with a "constant desire for additional duties."

Normal at birth, DiMaio developed an imbalance of the inner ear at age two and lost his sense of hearing and speech. While attending the Knickerbocker School for the Deaf in Trenton, NJ, he made the honor roll for academic and vocational skills. He also met the woman he chose for his wife, Jean Ellen Perkain. They have a son and a daughter.

An enthustiastic participant in community affairs, he is scoutmaster to a group of 58 deaf mute Boy Scouts in Trenton, served two years as president of the Middlesex County chapter of the Deaf Association of New Jersey, and is active in other organizations. As a member of the New Jersey Alumni Association for the Deaf, he has been involved in numerous fund-raising campaigns.

Di Maoi's hobbies include skiing, swimming, football, golf and bowling. He has traveled extensively with his family.

Antique Phones Fascinate Redstone Employe

For persons who frequently find one telephone undesirably disturbing when it enables solicitors to summon them at will, the mere thought of having dozens of them in one home is almost beyond comprehension. However, for Alvin L. Esslinger, a genuine phone buff, 130 telephones in his home is a fascinating and most pleasurable reality.

Esslinger works as an equipment specialist in the Directorate for Maintenance, Redstone Arsenal, AL, but at heart he is a buff for antique phones. Modern technology has created a smaller streamlined more efficient device that comes in many colors to suit room decor, but he still cherishes the design and "character" of the older models, some of which had beautiful hardwood polished cabinets, fancy mouthpieces and a variety of receivers. Some were made of nickel, others of brass and still others of a combination of metal and wood.

During the past six years Esslinger has found these "gems" in basements, attics, garages, rubbish piles and even in chicken houses. Some are in pretty bad shape, but he reworks them to original appearance.

His oldest phone dates back to 1882 and he has authentic scale models of the original phone designed by Alexander Graham Bell. One of his most prized possessions is a 1906, pay telephone standing more than 40 inches high. Coin slots include spaces for denominations ranging from nickels to half dollars.

A unique feature of this model is that with insertion of each different coin type a distinct musical tone is produced—to assure the operator that correct payment has been made. For some unexplained reason, the insertion of a dime produces only a dull thump.

Esslinger's hobby is so compelling that he once drove from Huntsville to Washington, DC, to pick up a phone a friend had informed him about. Each year he and his wife spend part of their vacation in search of a desirable addition to his prized collection.

On one of these trips he was amazed to find a fellow in Wisconsin who had more than 250,000 old phones in a warehouse. Although he did some swapping, Esslinger believes that he has a better collection, a greater variety, than his Wisconsin friend.

On a more recent outing, he purchased an old telephone switchboard that was used in Jefferson, AL, during the 1910 era. It was capable of handling 32 subscribers and was owned by a private phone company.

When Esslinger began his collection, telephone prices ranged from $5 to $25. Today the same phones are costing $35 to $100.

Alvin L. Esslinger

Women in Army Science . . .

Crystal Gazing Into Future . . . Research Chemist Peers Into Possible Missile Flaws

Crystal gazing is a professional way of life for Shelba Brown, a U.S. Army Missile Command scientist at Redstone (AL) Arsenal, but she tries to peer only into possible future flaws in missiles. Her success recently made her one of six Army nominees for the Federal Woman of the Year Award.

Employed as a research chemist in the Research, Development, Engineering and Missile Systems Laboratory at HQ MICOM, Mrs. Brown was recognized for her work on cholesteric crystals.

Properties of both liquids and solids are present in cholesteric crystals. They are sensitive to and register changes in temperature, mechanical stress, electromagnetic radiation and chemical environment. Color changes occur in the crystals when activated by one of these stimuli.

Research by Mrs. Brown has been devoted to the detection of structural flaws in the fins and wings of Army rockets. Used in a film form, the crystals reveal whether a structure is properly bonded. If part of the structure is corroded or water is inside the area, the air or water may expand in flight, causing disintegration of the component.

The technique applied by Mrs. Brown involves nondestructive testing of structures by heating the crystal film through a liquid crystal range. Flaws are detected by the color differences which appear on the film.

Interest in her research results also has been shown by private industry. She recently provided the blend of liquid crystals used by a pharmaceutical company for applying adhesively backed discs as thermometers. Placed on the abdomens of nursery babies, these discs monitor their temperatures by changing colors.

Mrs. Brown has also conducted research in the area of thermally stable organometallic polymers. These can be used as coatings, insulators, or adhesives in Army rocket and missile systems.

"Other possibilities of liquid crystals," she says, "include television tubes, paper-thin, hung on the wall like a picture; digital readout auto dashboards without light bulbs; plastic strip thermometers and pollution detectors; displays for data processing and business machines; advertising displays, even billboards."

Prior to joining MICOM, she was involved with cyrogenic adhesives research at the National Aeronautics and Space Administration,

Mrs. Shelba Brown

Redstone Arsenal. She has an AB degree in chemistry from Central College, Danville, KY, and holds two U.S. patents—for synthesis of high-energy fuel additives, and for her ultrasensitive liquid crystal blends.

A member of the American Chemical Society, she has published a total of 15 research papers which have appeard in the *Journal of Organic Chemistry, Journal of Chemical Engineering,* and the *Journal of the American Chemical Society.* She has also authored a chapter in the *International Materials Handbook.*

Additionally, her papers have been presented at various national and international meetings, including the American Chemical Society Meeting, International Liquid Crystal Meeting, and the National Society for the Advancement of Science and Materials Engineering.

Woman in Operations Research Becomes 'Model'

Operations Research, involving such scientific analysis techniques as exceedingly complex probabilistic theories and mathematical modeling to aid high-level decision-makers in reaching properly calculated judgments on matters of major military importance, is not often "a woman's world."

In her work in the Systems Division of the Countermine/Counter-Intrusion Department, U.S. Army Mobility Equipment Research and Development Center, Fort Belvoir, VA, Barbara J. Conley is helping to alter that tradition. In fact, she is going to serve somewhat as a "Cover Girl" in doing it.

George Washington University in Washington, DC, where Barbara is studying for her master's degree in Operations Research, has selected her as a pictorial subject for a brochure that will be distributed to recruit high school girls for the GW School of Engineering and Applied Science.

Barbara was graduated Magna Cum Laude with a BS degree in mathematics (minor in physics) from West Virginia Institute of Technology in 1971, and was listed in *Who's Who Among Students in American Universities and Colleges.*

Mrs. Conley's husband, Douglas G., is also employed at the Mobility Equipment R&D Center as an electronics engineer and is likewise studying at GW University.

A 24-year-old brunette, she was employed, until she joined the MERDC staff last June, at the Center for Naval Analyses (CNA), University of Rochester, under a government contract. The CNA is headquartered in the Rosslyn area, Arlington, VA.

In her MERDC work, Barbara develops analytical models, assists project engineers in analyzing subsystems and test data, and compiles, organizes, evaluates and performs analysis of data in models/simulators related to solution of system problems.

"I have always liked mathematics and the applied sciences, and I enjoy the challenge associated with these fields," Mrs. Conley explains. She seems to find her life zestful in many other ways—dancing, swimming, tennis and "some other sports," bridge and chess, and as a counselor for the Senior High Youth Group at St. Paul's United Methodist Church in Woodbridge.

She is a member of Sigma Pi Sigma National Physics Honorary Society, Alpha Chi National Scholarship Honorary Society, Epsilon Delta Mathematics Honorary Society, and the Northern Virginia Alumni Association of the Sigma Sigma Sigma Sorority (national social sorority).

Mrs. Barbara Conley

BRL Metallurgist Recognized For Federal Service Award

One of the U.S. Army R&D Achievement Award winners in 1972, Mrs. Priscilla W. Kingman, a research metallurgist with the U.S. Army Ballistic Research Laboratories, was one of six Baltimore area selectees for Federal Career Service Awards in 1973.

Mrs. Kingman was a winner in one of six categories of competition. Congressman Paul S. Sarbanes presented her with the top award in the Outstanding Professional category during an honorary luncheon.

Other Aberdeen (MD) Proving Ground finalists included Mrs. Francis T. Smith, chief of the U.S. Army Test and Evaluation Command Administrative Services Division, along with: Floyd B. Brinkley, research biologist; William H. Taylor, materials tester lead foremen; and William M. Miller Jr., chemical engineer.

Mrs. Kingman was recognized for major contributions to metallurgy, mechanics, and crystallography. She was termed an expert in X-ray techniques for determining the reaction of solids to intense shock. Author of some 15 technical papers, she has a master of engineering science degree from Johns Hopkins University, Baltimore, MD.

The citation for her 1972 Army R&D Achievement Award acclaimed her for "unique approaches" for the application of metals to Army weapons systems. She was credited with contributing to the understanding of the structure of heavily deformed metals, and for "developing the first proof of the existence of perfect, small crystalline structural building blocks of metals in alloys having high ductility."

Reader's Guide . . .

PRL Releases CY 1972 Research Abstracts

Abstracts of 122 research tasks at the Pioneering Research Laboratory (PRL), U.S. Army Natick (MA) Laboratories (NLABS) are presented in a 100-page recent report compiled for work during CY 1972.

Basic and applied research is performed by 17 groups within the Behavioral, Life, and Physical Sciences Divisions at PRL, as an input to the solution of problems within NLABS' mission assignments.

Presidential emphasis on technological assessment and transfer, the new technology incentives program, the national and state environmental improvement activities, and other federal and state efforts suggest a greater use of Department of Defense and other federal laboratories in these programs to supplement their primary missions.

For example, biological research, originally directed to methodology for the prevention of biological degradation of military materials and materiel, is now involved in the application of this capability to the solution of Army problems relating to foods preservation and packaging and to environmental pollution control and prevention.

Research to provide biological control of insect pests was initiated at NLABS long before current Environmental Protection Agency limitations on the use of hard pesticides. NLABS' programs also have been established for other biological agents research.

Chemistry and physics research at NLABS provides support for developmental work on food, materials and pollution control systems. Analytical chemistry in the Department of Defense Food Program has received special emphasis in recent years, particularly in determining compositional changes occurring in irradiation preservation of food.

Basic studies in radiation and photochemistry have been established to identify primary events in the radiation of basic food components and in organic molecular systems used in camouflage and eye protection. The new field of laser spectroscopy has demonstrated the vulnerability of military camouflage systems through induced luminescence using pulsed laser radiation.

Complementing the programs in the physical and biological sciences are the investigations in psychology. Primary emphasis has been directed to improved understanding of the physiology and psychology of taste and odor perception.

In a continuance of effort to define more precisely acceptance preferences of military personnel for development of improved food and menu planning, researchers are expanding use of the hedonic scales first developed and widely used within Army food research.

The range of PRL research capabilities is evidenced by the research tasks summarized in the report.

In basic research, 75 abstracts tell of investigations in microbiology, mycology, entomology, biochemistry, biophysics, analytical chemistry, organic chemistry, photochemistry, radiation chemistry, quantum physics, thermodynamics, taste and olfaction, and analysis of appetite and food choice.

Forty-seven applied research abstracts review activities in microbiology, entomology, chemistry, engineering and psychology. Listed here is a sampling of the basic research tasks in the various scientific disciplines and the investigators who conducted the research:

Enzymatic Hydrolysis of Cellulosic Materials, Mary Mandels, John Kostick, Lloyd Hontz and Dixon Brandt; Taxonomic Studies of Fungi, E. G. Simmons and B. J. Wiley; The Lethal Effect of Ultraviolet Light on Insects, S. H. Cohen, J. A. Sousa, J. Roach and L. M. Roth;

Production of Antibody Against Dipicolinic Acid, R. C. Clapp, Elizabeth W. Green, C. Lamanna (U.S. Army Research Office), H. S. Levinson, F. M. Robbins, and M. S. Silverman (University of North Carolina); Far Ultraviolet Solvent Spectroscopy, M. Fox and E. Hayon; Laser Photolysis, E. D. Black and E. Hayon; and

Investigations on the Photo-Induced Excited State Properties of Dyes, M. Nakashima, J. Roach and J. Sousa; The Physics of Foods: Studies of Freeze Drying, M. N. Pilsworth Jr. and H. J. Hoge; Perceptual Attributes of the Taste of Sugars, H. R. Moskowitz.

Applied research tasks include investigations in Culture Collection of Fungi, B. J. Wiley and E. G. Simmons; Plastic Ammunition Boxes, M. Greenberger, T. M. Wendt and A. M. Kaplar; Protection of Materials and Materiel Against Insects, H. Markari and J. J. Pratt Jr.; and

Oil Spill Recovery by Shredded Waste Paper, C. DiPietro, L. H. Bailey and L. Spano; Computer Aided Menu Planning, H. R. Moskowitz, T. Wehrly and L. Klarman; Development of Survey of Consumers' Opinions of Food Service Systems, L. Branch and H. Meiselman; and

Development of Arctic Hearing Cells, T. L. Nichols; Effects of Various Instructions on Physiological and Subjective Responses to Cold Stress, R. F. Johnson; and Effect of Ambient Temperatures on Short-Term Memory, F. T. Eggemeier, C. K. Bensel, J. M. Lockhart and J. M. Bassett.

The report also lists the organizational chart for PRL, personnel and their publications or seminar presentations, visiting scientists, consulting staff, and services performed for other organizations.

NBS Publishes Federal Data Processing Standards

Objectives and Requirements of the Federal Information Processing Standards Program is a newly issued National Bureau of Standards 8-page publication.

It deals mostly with the Department of Commerce responsibility for recommending uniform automatic data processing standards to the President, who has delegated authority to approve standards to the director of the Office of Management and Budget.

The publication is available from the Superintendent of Documents, U. S. Government Printing Office, Washington, DC 20402, or local U.S. Department of Commerce Field Office, as SD Catalog No. C13.52:23. The price is 35 cents and must be prepaid.

BESRL Studies Effective Image Interpretation

Two technical reports relating to effective image interpretation were published recently by the U.S. Army Behavior and Systems Research Laboratory (BESRL), now a part of the U.S. Army Research Institute (ARI) for the Behavioral and Social Sciences, Arlington, VA.

Technical Research Note 233, *Evaluation of Selected Pictorial Characteristics of Reference Materials for Use in Image Interpretation*, is designed to facilitate rapid and accurate identification of significant objects through use of key variables. These interpretation keys may be used for both field operations and training purposes.

Technical Research Note 230, *Effectiveness of an Error Key for Image Interpretation in Vietnam*, utilizes error avoidance research for producing more accurate and complete interpretations of operational imagery as applied to Vietnam.

EPA Booklet Summarizes Statutory Authority

A nontechnical description of the laws under which the U.S. Environmental Protection Agency operates is contained in a recently published EPA booklet titled *The Challenge of the Environment: A Primer on EPA's Statutory Authority.*

Oriented toward the interest of private citizens, the document contains a brief summary of the complex statutes and amendments enacted by Congress during the past decade to improve and protect environmental factors pertinent to good living conditions.

Discussions of the measures enacted by the 92d Congress are also presented. These include the Federal Water Pollution Control Act Amendments, the Marine Protection, Research and Sanctuaries Act, Noise Control Act, and Federal Environmental Pesticides Control Act.

U.S. Army Flood Control Programs

(Continued from inside front cover)

flooded, 637,000 people displaced.

"In today's dollars, a recurrence of the 1927 flood without the flood protection we now have would have caused several billion dollars more damage. And, considering the development that has taken place in the valley during the past 45 years, we might today have been reading of millions of displaced people all the way from St. Louis to New Orleans.

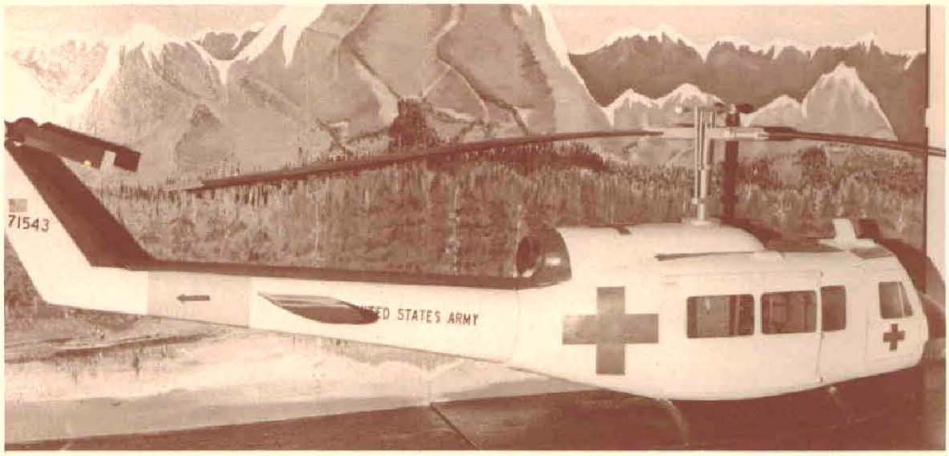
"Hell and High Water' was an expression born of experience. Those who lived in the valley before the Corps' flood control projects well remember the big floods and scenes of devastation—the rioting river pouring over its banks, cutting across fields and backing into streets and homes.

"The song 'River, Stay 'Way From My Door' testified to the emotional depth of such tragedies. Maybe the people whose homes are flooded today and those whose lands were unprotected by our flood control structures should have a louder voice in the deliberations on the future protective measures.

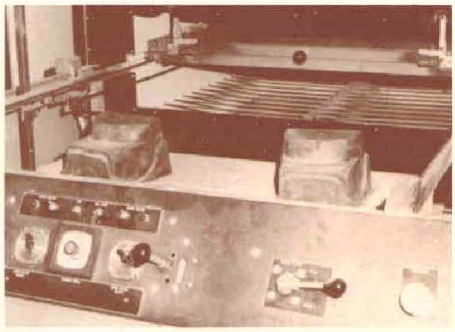
"The point I would like to make, then, is that in assessing the environmental impact of any flood control system, we had better give serious thought to the adverse environmental impact of Mother Nature when left to her own whims. And, come 'Hell and High Water,' we had better never neglect to consider the engineering alternative as a viable solution to the environmental problem. That's your National Society's theme and I cannot think of a more topical one at this time. . . ."

Low-Cost Plastics Fabrication Devices Easing Army Training Requirements

WORKING MODEL of M51 jeep differential, fabricated and machined from a clear plastic material to permit viewing of all parts when used as a training aid.



MOCKUP of Huey helicopter used for Medevac personnel training. Parts were fabricated from Uvex, Lexan, and high-impact styrene plastics.



VACUUM MACHINE with timing device activated to allow carriage placement of high-impact styrene between coils that will heat the material to 250° F.

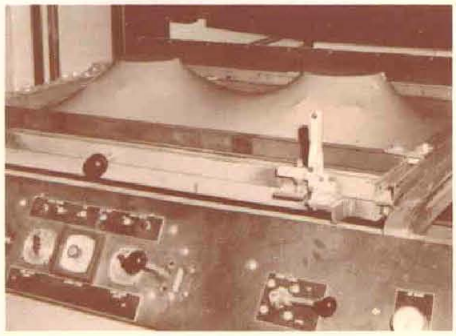
Increasing use of training devices to substitute for real items of U.S. Army materiel, as a practical approach to problems of cutting costs in all-volunteer Army training requirements, is giving prominence to the Training Aids Service Office.

Located at Fort Carson, CO, this plastics fabricating center is capable of producing a deceptively realistic training device. The range may be from helmets to a blind flying hood for aircraft, M16 rifle, M60 machinegun, scale-model helicopter and, with the aid of a completely equipped machine shop, the housing for a jeep differential.

"All we need is the information on what the military needs and we can produce a good training aid to satisfy the requirements," a TASO official states.

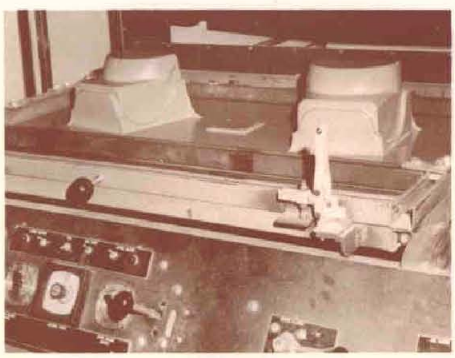
Vacuum forming processes are used in working such materials as ABS (acrylonitrile butodiene and styrene), polyvinyls, Uvex, Kydex, and high-impact styrene. Kydex is used when strength and durability are needed, though it will not conform to detail as well as some other sheet material and requires more heat. Thermoset is a 2-component material that sets into a very rigid material.

Polyurethane has proved practicable for fabricating parts for the M16 rifle, M60 machineguns (both with simulated firing) and various solid-state training aids, although epoxy is preferable for some needs. Foam components in general can be formed to have the strength of wood but only half the weight. Low cost, comparatively, and the speed of fabrication of plastic components are attractive advantages.

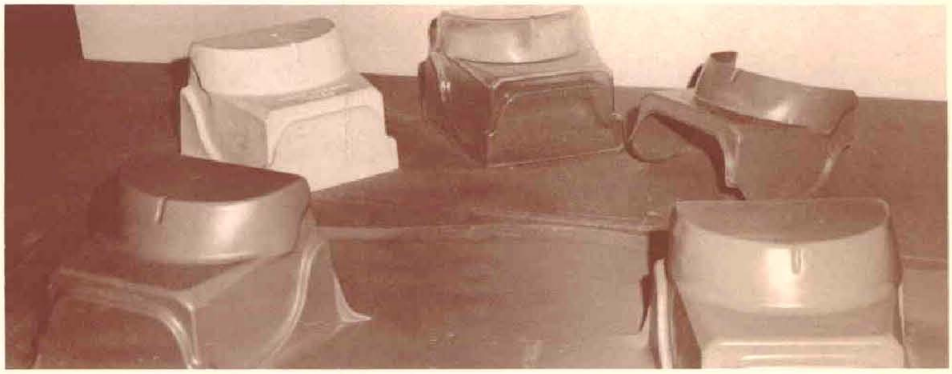


MASTER FORM is brought up to make contact with heated high-impact styrene.

M16 rifle and plastic working model (2:1-scale) fabricated by vacuum forming.



VACUUM VALVE is opened to draw air from material during molding process.



PARTS formed from high-impact styrene and finished product (top-right), a hood for training pilots in instrument flying, sometimes called a blind-flying hood.

CITED AS THE MOST ADVANCED building of its kind constructed for Army biological research, this is the home of the United States Army Medical Research Institute of Infectious Diseases (USAMRIID) at Fort Detrick, MD. Occupied by USAMRIID in December 1971, it is a part of the complex of facilities, including the expanding Frederick Cancer Research Center, which is making Fort Detrick one of the major military-civilian medical research establishments in the nation. The U.S. Army Medical Bioengineering Research and Development Laboratory (USAMBRDL) was relocated to Fort Detrick in mid-1972, and was formed by the merger of two independent labs. When fully operational, as planned during 1976, the Frederick Cancer Research Center will employ approximately 600 persons. President Nixon visited Fort Detrick Oct. 18, 1971, to announce plans for converting its basic mission and said that cancer in the U.S. is the cause of more deaths each year than in World War II combat.