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BR 95/1 Draft #2

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CONFERENCE SUMMARY:

First Meeting of Basic Research Group, 17 and 18 March 1953

INTRODUCTORY RELIARKS

The first meeting of the Basic Research Group, Research and Development Board, convened at 0945, Tuesday, 17 March 1953, Dr. Marren Meaver presiding. The meeting opened with an orientation address by Mr. Malter G. Whitman, Chairman of the RDB. In outlining the aims and mission of the Group, Mr. Whitman had this to say:

"In organizing the Basic Research Group, we had in mind that this tremendously important field needed some policy guidance which we would like to get in a somewhat less formal manner than the usual RDB committee set-up. Therefore, we called in the Basic Research Group, and, in this group, we want those people who are most concerned with the basic research of the Department of Defense, men of vision and understanding, outstanding men who can apply to the guidance the thinking which cannot come merely from those of us who are actually engaged in the process itself.

"We are particularly anxious to have Alan Waterman join with us because what the Department of Defense does in basic research in a general way should of course be related to the total governmental program, and the Mational Science Foundation has that responsibility heavily on its shoulders.

"I think that my views with respect to what you might do can be rather simply expressed, but I am not so sure they can be so simply carried out. However, it seems to me this group should concern itself with what the Department of Defense is doing in the way of basic research, and it should come up with the best advice possible to me and the Board as to what the policy and the programs should be in terms of basic research. One might think, therefore, of the primary function as giving guidance and advice so that policy can be properly executed, but I think that, at the same time, a second important function is to stimulate a closer understanding and cooperation as well as the unification of the basic research effort in the Department of Defense. That is done, I think, not so much by reports as by the mutual exchange of ideas and the education that comes to each of the responsible Department of Defense people by thrashing this out in a forum where they get the benefit

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of the advice and counsel from others who are not immediately responsible for the execution of the program.

hat are we doing? What should be the policy and the program of the Department of Defense? We need to know the answers to such questions so that the Board and I can be informed of your best views.

"Thirdly, and this is very important, we need the forum effect of mutually getting together across the table, looking at the program and increasing the competence of the individuals most closely involved in carrying out the basic research that is under their supervision. Each of the three departments is here to represent that ability to carry out what is decided to be advisable."

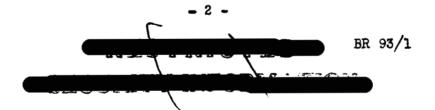
Mr. Whitman's remarks were followed by an appraisal of the American science scene by Dr. Weaver, in summary as follows:

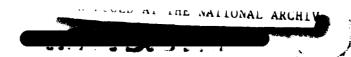
In the course of the last two major wars, a good many people began to realize that science had something to do with our national capacity to defend ourselves am, more broadly, to maintain our way of life — in an economic sense, in a social sense, and in a cultural sense.

During the last ten years, more or less, there has been a tremendous development, a change in the general organization and support of science in the country, with a much greater degree of centralization in the organization and in the support of science than there used to be.

As yet, there is altogether too modest support of science through the Mational Science Foundation. This is still, most of us hope, in the embryonic stage rather than in the stage of real development. There is very substantial support of pure science through the Government by the Department of Defense, the Atomic Energy Commission, the U.S. Public Health

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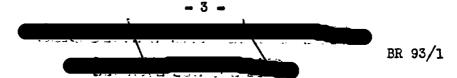
Service, and the Department of Agriculture; and the question as to what is really a healthy relationship between the support of science through these agencies of the Federal Government and the support of science through all of the other agencies in this country has become a rather ourious, troublesome, and a rather pressing problem.

Variety of support of science seems to be a very important thing-variety is a great source of strength to American life. Now, are we losing
balance in that variety? Are we channeling too much of it through certain
types of channels? American science still remains somewhat weak in its
capacity to develop truly imaginative, deep, original ideas. We are very
good at the application of fundamental ideas in science, but the fact is that
we still are not as good as we ought to be in the development of original,
imaginative ideas. We are still living on a good many of the truly imaginative
ideas that were generated in other parts of the world and by people of other
nationalities. In some way or another, we have to get some of these original,
imaginative ideas into American science. Are we producing in our country the
kind of intellectual climate for the advancement of science under which that
kind of development really prospers? If we are not, then we are, in the long
run, headed for trouble for our country.

ARMY PRESENTATION

Summary of Introductory Remarks by Dr. Lloyd E. Swearingen, Director of Basic Sciences Research, Research and Development Division, G-4, Army:

Research and development responsibilities in the Army begin with the Office of the Chief of Staff and are delegated to the Deputy Chief of Staff



for Plans and Research. The G-4 section* of the General Staff coordinates the R&D activities of the seven Technical Services of the Army (Ordnance Corps, Signal Corps, Chemical Corps, Engineer Corps, Quartermasters Corps, Transportation Corps, and Medical Corps).

The FY 1953 and FY 1954 basic research programs were planned on the basis of RDB policy on basic research (RDB 173/9, dated 17 January 1951, since revised) which stipulated that not less than 6% of the average R&D budgets for the preceding 5 years be obligated for basic research.

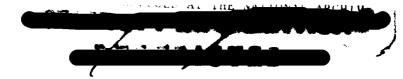
The basic research program of the Army has the following over-all characteristics:

- (1) About two-thirds of the total Army basic research effort is strictly programmatic in character in that it seeks answers to specific problems, This type of basic research is defined as "supporting basic research" and is programmed throughout the operational and supporting categories of the RDB Classification System. (See Appendix to this Conference Summary for terminology.)
- (2) The remaining one-third is defined as "exploratory basic research". This type of research is of interest to the Army but has no immediate specific application. It is programmed under the Basic Research category of the RDB Classification System.
- (3) Approximately half of the exploratory basic research is sponsored by the Ordnance Corps; the remaining half is sponsored by the other six Technical Services.

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^{*} The Army General Staff is comprised of four staff sections: G-1, Personnel; G-2, Intelligence; G-3, Operations; and G-4, Logistics.



of the Ordnance Corps, administer exploratory basic research in the same manner as they administer other types of research and development; that is, no separate office has been established for the administration of research performed under contract. The worthiness of proposed exploratory basic research projects is evaluated by the permanent scientific staffs of the Services.

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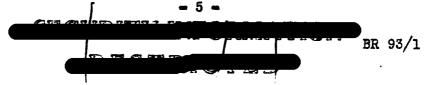
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Office of Ordnance Research to administer its exploratory basic research program. The Office is physically located at Duke University; it operates as an Army facility and is independent of the Duke University administrative organization. The worthiness of proposed basic research projects is evaluated by the permanent OOR scientific staff, by the scientists at the Ordnance arsenals, and in a large number of cases by advisory committees which are established by the National Research Council of the National Academy of Sciences under a contract arrangement for this purpose between OOR and NRC. The contract provides for the services of elerical help and administration; the scientists serving on the advisory committees receive no compensation for their services.

The Army recognizes that much of its total basic research effort will be performed through the medium of contracts with universities, but to foster creative productivity and to further technical interest and competence within the Army, it is felt essential that a portion of the basic research effort be performed within the Army's own laboratories. The annual rate of this portion of the basic research performed internally in Army facilities is roughly \$1 million.



The accompanying tables show the present and planned funding of basic research in the Army. The exploratory basic research program is supported entirely by funds explicitly budgeted for that purpose; that is, there is no indirect source of funds to augment this program. The supporting basic research program is funded indirectly, inasmuch as the effort is programmed to provide the scientific investigations underlying the attainment of end objectives of development programs intended to satisfy Army weapons requirements. The three tables provided are as follows:

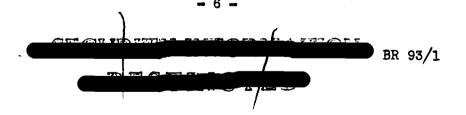
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- (1) Table I: The exploratory basic research program (BR category), showing funding levels for FY-53, 54 and 55 by fields, and detailed subdivisions of these fields with appropriate remarks.
- (2) Table II: The supporting basic research program (funded in categories such as Land Combat, Air Defense, Air-borne Landing, Supporting Research and Development, etc.), not captured in data provided in Table I.
- (3) Table III: Summary of Army's total basic research program.



NOTIFICATIONS TECHNONO

TABLE I

SULLIARY OF ARLY EXPICRATORY BASIC RESEARCH PROCRAM

DIRECT FUNDS*

(In Millions of Dollars)

edities, 2 with National Bureau of Standards, 1 with U.S 1) Contracts distributed as follows: 66 with univer-Bur. of Mines, 3 with non-profit institutions, 1 with FY 53 is about 1.3 million. About 13 contractors in (4) Office of Ordnance Research program in Physics (3) Includes 1.2 million as Army support of joint Physics sponsored by OOR also receive funds from a Millimeter Wave Research - Western Electric Co. (2) Includes 0.4 million for infrared studies. Research Lab. of Electronics - MIT Army, Navy, Air Force contracts at: or both of the other two services. Electionics Lab. - Stanford U. Cruft Laboratory - Harvard U. Radiation Lab. - Columbia U. rofit-making company. FT 55 FT 54 F 23 sorption, reflection and transatomic, molecular structure; Physics of matter, materials raphy; accustics and ultratronics; optics and photogsonics; interface structure instrumentation and design; propagation and properties; particle physics and elecand processes: Solid state materials; crystal, mucle ar and properties; energy abphysics, high temperature ther mody namic cryogenics; mission; wave generation, electricity, magnetism, ginearing Sciences Physical and En-

Chemistry of matter, materials 2.4 and processes: Elastomers, plastics and polymers; lubricants, fuels, oxidants, propellants, explosives; adhesives and cellulose; ceramics and refractories; metallic and nonmetallic coatings; structure property relationships; combustion, detonation and explosion

2.8 (1) All chemistry research being done by OOR. About 33 contractors in chemistry sponsored by OOR also receive funds from one or both of the other two services.

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clear and theoretical physics.

mechanics and radiation; nu-

(2) Contracts distributed as follows: 129 with unsities; 7 with National Bureau of Standards; 1 will U.S. Bur. of Mines; 1 with Dept. of Agriculture; with profit—making organization; 7 with government arsenals.

* The Exploratory Basic Research Program receives no indirect funds.



Summary of Army Exploratory Basic Research Program (cont'd)

DIRECT FUNDS

(In Millions of Dollars)

SNEWNER		(1) Joint programs with other two services in applied mathematics and statistics. Army support for FY 53 is 0.1 million. (2) Joint sponsorship of Direction Systems
FY 53 FY 54 FY 55		6.0
FY 53 FY 54 FY 55		8 •0
FY 53	_1g	0.8
SUB-FIELD .	Chemistry (continued) phenomena; lubrication and surface phenomena; corrosion and deterior— ation; metallurgy, reaction kinetics and equilibria; inorganic, analytical, organic, physical, electro and colloid chemistry.	Mathematics, pure and applied: Statistics, probability, analysis, algebra, number theory, geometry, topology, numerical analysis,
FIELD		

research. (MCBILAC Computer)
(3) OOR effort for FY 53 is 0.6 million. About

mechanics, elasticity, plasticity, subsonic and transonic fluid dynamics and boundary value problems

on manifolds.

9 contractors in mathematics sponsored by OCE

also receive funds from one or both of the eq

two services.
(4) A total of about 44 contracts -- all with

universities.

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(1) All contracts sponsored by OOR, (2) 23 contracts with universities, 4 with man

Bureau of Standards, 1 with non-profit instit

tions, 1 with profit-making company, 2 with

government arsenals.

1.5	
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Engineering Sciences: Materials and materials processing, heat and mass transfer; soil mechanics, mechanics, vibration and acoustics; friction,	wear and lubrication; fuels, thermo- dynamics and combustion; heat re- sistant materials, low temperature materials, lightwelght metals and alloys; human engineering, instru- mentation and design.

6.1

PHYSICAL AND ENGINEERING SCIENCES - TOTAL

sponsored by OOR also receive funds from onthe

both of the other two services.

(3) About 6 contractors in Engineering Sciq

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EXPLORATORY BASIC RESEARCH - TOTAL

PENARKS	(1) All contracts sponsored by medical contracts. (2) 25 university and hospital contracts.	No contracts active. Two proposals are being considered.	(1) Transportation Corps has joint program with Navy on amphibious oceanography (52 thousand) (2) Corps of Engineers has cognizance of all basic research in cryological phenomena on earlace. About 0.6 million of FY 53 funds is the surface. About 0.6 million of FY 53 funds is the surface and Permafrost Research Establishmes. Snow, Ice and Permafrost Research Establishmestive university contracts are supported in addition to internal programs. For FY's 54 and 55. tion to internal programs. For FY's 54 and 55. this program is included in the Physics and the BR-1.	1
funds of Dollars	0.2 0.2 0.2	0.1 0.1	0.1 0.1	
Summary of Army Exploratory Basic Research Program (cont'd) DIRECT FUNDS (In Millians of Dollars)	D SUB-FIELD Sciences: Internal medi- ical Medical Sciences: Internal medicine,	0.1	ment; psychology of tearning perceptual processes in individual perceptual processes in individual and social behavior. Earth Sciences: Amphibious oceanography, environmental research, anow, ice, and phy, environmental research, anow, ice, and sand frozen ground.	

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TABLE II

ARMY'S SUPPORTING BASIC RESEARCH PROGRAM (This type of basic research is assigned to the various categories of RDB Planning Guide other than the Basic Research category)

		BY FISC.	
	1953	1954*	1955
PHYSICAL AND ENGINEERING SCIENCES	\$14 . 8	\$ 9.4	\$ 8.8
MEDICAL AND BIOLOGICAL SCIENCES	4.0	7.1	6.6
SOCIAL SCIENCES	0.4	0.3	0.3
EARTH SCIENCES	0.4	0.4	0.5
TOTAL	\$19. 6	\$17.2	\$16.2

* As submitted to Congress

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TABLE III SUMMARY OF THE ARMY'S TOTAL BASIC RESEARCH PROGRAM

TYPE OF RESEARCH	FUNDING BY FISCAL YEARS (In Millions of Dollars)		
	1953	1954*	1955
EXPLORATORY BASIC RESEARCH (Table I)	\$ 7.1	\$ 9 .3	\$ 9.2
SUPPORTING BASIC RESEARCH (Table II)	19.6	17.2	16.2
TOTAL	\$26.7	26.5	\$25 .4

* As submitted to Congress

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HAVY PRESENTATION

Summary of Opening Remarks by Dr. E. R. Piore, Deputy Chief and Chief Scientist, Office of Naval Research:

The Office of Naval Research is the principal agency within the Navy Department involved in research. Historically, ONR started as a group organization late in 1945 and was established by Congress in 1946 under Public Law 588, 79th Congress. By law, ONR has distinct responsibilities in the Navy for: (1) planning, fostering, and encouragement of scientific research; (2) coordination of bureau activities in research, and Navy research activities with other agencies; (3) apprising the Chief of Naval Operations and the Secretary of the Navy of the impact of science on the Navy.

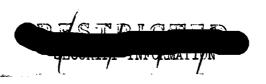
The Naval Research Advisory Committee (of which Dr. Warren Weaver was second chairman) consults with and advises the Chief of Naval Research on matters pertaining to research. The Committee has recently asked for a study by ONR of fields where funds are especially needed for research. This study by ONR is expected to be available by the close of FY-53

Summary of Remarks by Dr. Randal M. Robertson, Science Director, ONR:

The ONR contract research program includes basic research, applied research, and exploratory development. Annual operating funds of ONR derive from various sources, a rough approximation of source and distribution being as follows:

(a) The total program administered by ONR is roughly about \$55 million, of which about \$44 million is directly appropriated to ONR and

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Il million represents funds transferred to ONR from other agencies, such as the Navy bureaus and the AEC, for contract research.

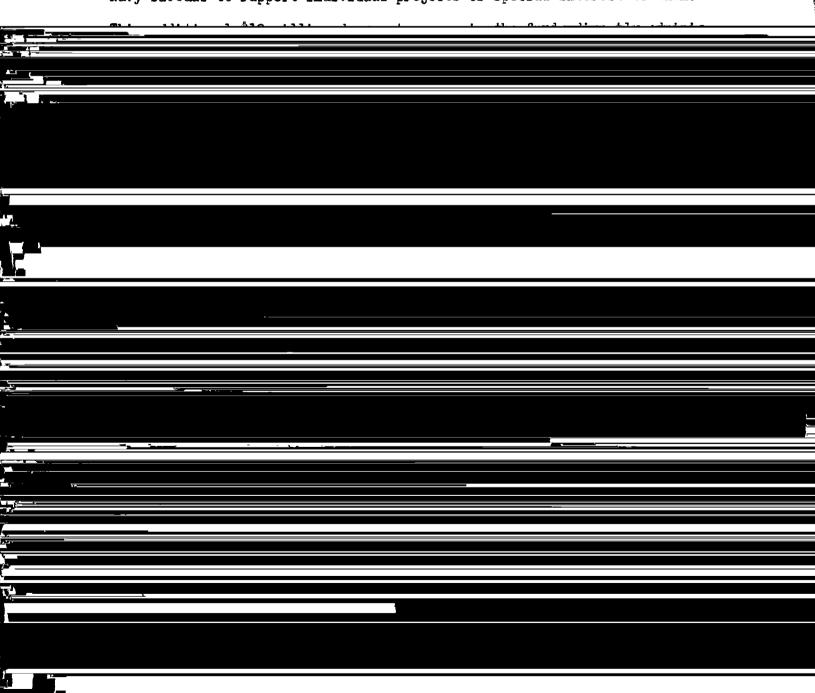
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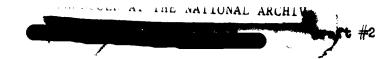
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- (b) Of the \$55 million total, about \$4 million is used by ONR to fund the Special Devices Center, a small amount for the Underwater Sound Reference Laboratory, and about \$9 million for the Division of Naval Sciences -- an organization carrying out applied research and exploratory development in special warfare fields. This leaves about \$42 million as funds under ONR management available for contract research and for funding of basic and applied research at the Naval Research Laboratory (a facility falling organizationally under ONR).
 - (c) This 342 million is apportioned annually roughly as follows:
- (1) About \$10 million is used to fund the Naval Research
 Laboratory. (In addition, NRL receives roughly another \$10 million from the
 Navy bureaus to support individual projects of special interest to them.





The Division Directors made presentations in the following order:

Mathematical Sciences
Physical Sciences Dr. Mina Rees
Dr. E. Montroll Dr. I. Estermann Material Sciences Dr. Orre Reynolds Biological Sciences Dr. H. E. Page Dr. J. N. Adkins Psychological Sciences

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Earth Sciences

The presentations are summarized in tabular form (attached) with the more important comments noted in the "Remarks" column.

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SUMMARY OF CONTRACT RESEARCH* PROCRAM, OFFICE OF NAVAL RESEARCH

*Contract research includes both basic and applied research.

1 Rate	
t Annua	
-Curren	
(\$ Million	Section Contracts
FUNDS	-

ROVAKKS	
TOTAL	
(Amount & Source)	
ONR DIRECT	
B-FIELD	
FIELD	**************************************

6.0 (1) Joint programs with the other two Services in applied statistics. (2) In cooperation with NBS finances Institute of Numerical Analysis (UCLA) (3) Mechanics Branch is largest of 5 branches, budget of \$2.0 million.	10.5 - (1) Many joint programs, especially to 11.5 in nuclear physics. Other joint contracts in large electronics programs at MIT, Stanford, Harvard, & Columban
2.0 Navy Bureaus	4.0 - ABC & to 5.0 Others t
0•4	6.5
Mathematical Analysis; applied math; Sciences theoretical and applied statistics; computers, primarily numerical analyses; logistics; mechanics	Nuclear physics———————————————————————————————————
Mathematical Sciences	Physical Sciences

Nuclear physics—— 6.5 elementary particles, cosmic rays; mathematical physics, solid state physics, radiation, molecular structure, low temperature physics; electronics——semi-conductors, ceramics, radio propagation, theory of communication and theory of information.

(2) Elementary particles program is largest, about 1.5 million. Cosmis rey program 0.5 million, matched by another 0.5 million by AEC.

physical science program: the support of the physical science program: the support of large groups (Harvard, Stanford Chicago), and the support of individuals, at average rate of \$15,000 a

(4) In physical sciences 4.0 millium the order of magnitude of all 1

year.

contracts.

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DA CARTAREN COLLIS INFORMALIO

Summary of Contract Research Program, Office of Mayal Research (Cont'd)

FUNDS (\$ Million) — Current Annual Rate	ONR DIRECT INDIRECT TOTAL	(Amount & Source)	
	SUB-FIELD		
	PTRID		

(1) Not more than one-third of OWR

%

REWARKS

0 7 5.0 power—transformation of chemical energy into and alloys; plastic deformation of metals; metallurgy; physical chemistry - metals chemical research; Organic materials: mechanical thrust Sciences Material.

7.7 micro-organisms; blologynutrition & genetics of marine biology environmunochemistry; microenzyme activity, imbiology—metabolism, chemistry—proteins, mertal physiology. physiology; bio-Physiology-biophysics, nerve

Biological Sciences

funds and wery little indirect funds are used for strictly basic research lurgy of titanium.
(4) Squid deals with fundamental aspects of jet propulsion; at level of 0.8 million per year, joint with Sciences Division. Total budget of Chemistry Branch is 1.75 million of which 1.5 is ONE funds; of this 1.5 million is basic research. (3) Joint program at 0.5 million on basic research in extractive metalprograms. (2) Chemistry Branch carries out the bulk of basic research in the Matem Mr Force. Bore 3.9 almost all this is on applied agencies (but 1.5 Navy Bur. and other Govit programs).

each of physiology, biochemistry, microbiology, and biology brends.
Two other brenches, strictly supliars ere Clinical Branch and Derkal Br each with budget of 0,1 or alight

There are some diseases not particular, important in civilian or public health supported laboratory in biological warcontent but important for the military services—these are supported by ONR. (3) Biol. Sci. Div. operates jointly (2) The Microbiology Branch is ne certed with principal disease stuth at are supported at present by

(4) Effort on marine biology is about

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SECOND 11 THEORY

(less USRL, SDC, and Naval Science Div.) (About 12 million is basic

research.)

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Summary of Contract Research Program, Office of Naval Research (cont'd)

FUNDS (\$ Million) Current Annual ONR DIRECT SUB-FIELD FIED

(1) Physiological Psychology Branch has budget of 0.45 million from CMR, and about 0.2 million from Navy Bureaus.
(2) Personnel and Training Brench has budget of 0.4 million from CHR and about 0.6 million from Bu Per.
(3) Group Psychology Brench has bust of about 0.4 million from ONR (none (1) Joint contract (Sig. C. administered) on cloud physics at General (2) Classified activity in Artific - Contract research program of ONR REMARKS Electric Company. Cloud Mucleation. from outside). Rate 8 0,4 31.9 mount & Source 0.8 Navy Burs. 10.8 777 7.7 Meteorology; oceanography; 2.0 atckness, human engineer-ing; personnel and train-ing (differential peycho-logy); group psychology Physiological psychology—vision, sudition, motion submarine geology; earth physics; geochemistry; (includes perchological geography warfare) Psychological Sciences Salences Earth

supported by ONR: Other activities Naval Sciences Div of ONR USRL Spe

(small)

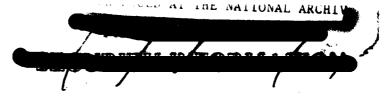
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54.9 - BOUGHLY THE TOTAL FUNDS ADMINISTERED BY OMR. OF THESE (a) 12 million is basic research

oontracted for by OWR (b) 3 million is basic research at MRL

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*Navy Bureaus support NRL in a like amount, roughly.



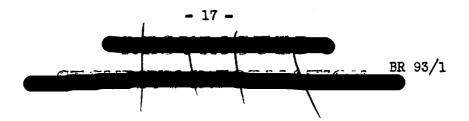
AIR FORCE PRESENTATION

Summary of Introductory Remarks by Dr. A. E. Lombard, Jr., Scientific Advisor,
Office of the Deputy Chief of Staff, Development

The Air Force program of basic research is administered through the Office of Scientific Research, of the Air Research and Development Command (ARDC), located in Baltimore, Maryland. The Commanding General, ARDC, is directly responsible to the Chief of Staff, U. S. Air Force, for the conduct of all Air Force research and development. Es exercises direct command over the research and development centers operated by the Air Force. ARDC is delegated virtually the full responsibility for the basic research program, while the Deputy Chief of Staff for Development, in Eq., USAF, deals with the over-all budget, the policy matters, and inter-departmental matters. The Office of Scientific Research (OSR) is a staff organization of the Headquarters of ARDC, and is responsible for the Air Force basic research program. OSR does not operate any laboratories for "in-shop" research but accomplishes its program by the contract support of research at universities and other institutions.

The over-all research and development program of the Air Force (to which the basic research program is broadly relevant) is aimed at the support of the roles and missions assigned by the Joint Chiefe of Staff to the Air Force. Of the Air Force facilities available for the over-all research and development program, the Air Force Cambridge Research Center, at Cambridge, Massachusetts, is the only establishment having a substantial facility for "in-shop" research within the Air Force. Most of the research at the Cambridge Research Center is in electronics and geophysics; the programs, however, are not classified as

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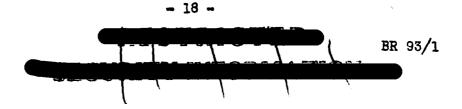
Air Force are primarily devoted to applied research, development and testing of equipment. Wind tunnel facilities make up a major part of the plant investment. Outside of the command structure of ARDC, the Proving Ground Command provides an operational test facility for evaluating the military effectiveness of new weapons and equipment. For a primary source of applied research on aerodynamics and propulsion, the Air Force looks to the MACA, which operates three large aeronautical research centers at Langley Field, Virginia; Moffett Field, Californic; and Cleveland Airport, Cleveland, Ohice

Summary of Remarks by Lt. Colonel W. O. Davis, Vice Chief of Scientific Research, ARDC, on Administration of Basic Research by the Office of Scientific Research

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The Office of Scientific Research is divided into five divisions for the purpose of administering the research program: Chemistry, Mathematics, Physics, Fluid Mechanics, and Solid State Sciences. Each division is so named as to encompass approximately the same level of effort in terms of funds. OSR has a field office on the west coast for evaluating proposals and maintaining contacts in that area. The Western European Office of ARDC in Brussels, Belgium is also in a position to aid OSR in taking adventage of the facilities and talent of Western Europe. The Brussels Office has a staff of one civilian and three military officers; it makes use of offshore procurement authority in contracting for research abroad.

Proposals are solicited from personnel and institutions interested in and able to contribute to the research effort. In general, work which is of



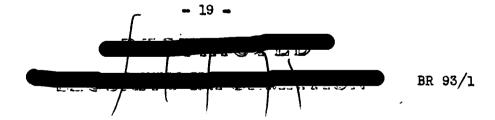
interest to the Air Force is supported. Proposals are then received, reviewed for merit and relevance to Air Force problems, and coordinated. Coordination is maintained with other governmental agencies; proposals are exchanged with the Office of Naval Research, Office of Ordnance Research, National Advisory Committee on Aeronautics, National Science Foundation, and Atomic Energy Commission. Such coordination serves to prevent duplication of effort and to keep the scientific agencies of the government informed of tasks under consideration.

The process of evaluation of coordinated proposals is similar to that followed by OCR and ONR. Proposals are forwarded to advisers individually for evaluation of merit. The advice of the referees may be followed depending on the weight given in OSR to any extenuating circumstances. Evaluation of proposals for their pertinence to the USAF program is performed largely by the OSR staff through coordination within the ARDC, and with Eq. USAF if policy matters are involved. The decision to support a program is made in OSR by the Division Chief. Responsibility for final approval is vested in the Chief of Scientific Research.

The Office of Scientific Research has a policy of selecting proposals and letting contracts on the basis of pertinence and quality primarily. The larger universities share the bulk of the contracts, resulting largely from the belief that the quality of the work will be enhanced if performed by individuals known to be highly qualified and having available excellent facilities for the conduct of the work. It is recognized, however, that where possible the smaller institutions should be supported.

The dissemination of information resulting from research contracts is

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likewise handled in OSR. Copies of reports are furnished the Armed Services

Technical Information Agency and distributed to agencies having an interest in
the research reported.

The staff or OSR includes 14 physical science administrators, of which 5 are military personnel and 9 are civilians.

The Division Directors of OSR who made presentations are as follows:

Dr. Simon H. Hersfeld Dr. M. M. Andrews Mr. William J. Otting Major Michael Zubon Mr. Charles F. Yost

Chemistry Division
Mathematics Division
Physics Division
Fluid Mechanics Division
Solid State Science Division.

The presentations are summarized in TABLE I: "Air Force Basic Research Administered by the Office of Scientific Research". Another tabulation is also included, TABLE II: "Supplemental Data on Additional Air Force Research, some of which is Basic Research", to indicate programs that have not been captured in the formal presentations by personnel of the Office of Scientific Research.



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RESTRACTED

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AIR FORCE BASIC RESEARCH PROGRAM

TABLE I: Air Force Basic Research Administered by the Office of Scientific Research (OSR) DIRECT PLANNED SUPPORT**(In \$ Millian) SUB-FIELD FIED

REMARKS FT 54# 1.48 (1) Pure chemistry: Composition, structure, properties, and transformation of matter. Chemistry

(2) Chemical principles and theories, applications to analysis and measurement.

(3) Chemical energetics.

(4) Chemistry of photographic processes

equations, variational theory, (1) Theoretical and applied methematics: differential algebra.

Mathematics

Projects are supported by funds directly budgeted for basic research; there is no indirect source of funds. Funds reported to RIB as of 9 March 1953 * *

(1) In pure chemis try, work is narrowed to elements, compounds, and mixtures, and includes work chemical reactions and the discovery of new reactions. 23 act projects, 14 more under consider

(2) Chemical principles includes thermodynamics and statistical e for chemical equilibrium, and chemical and photoelectric study (3) Energetics is aimed toward memoral a joint-service program on pro-pulsion and combustion.

methods as well as re-evaluation (4) Work in photographic processis aimed toward exploration of standard procedures.

rather than the application of methomatics to new problem areas (1) In applied mathematics, proise slarked toward new technique

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PIKID	SUB-FIELD	DIRECT PLANNED SUPPORT (In \$ Million) REMARKS
Mathematics (contid)	(2) Statistics and probability theory.	(2) Statistics and probability have many potential applications of interest: radar analysis, sutomatic

1.09
1.30
1.85
(1) Atomic physics: extra- nuclear properties of metter, molecular spectroscopy.
Physics

(3) Computer research.

(3) Joint support with ONR and con of computer research at Institute for Advanced Study, Princeton.

(1) Instrumentation is aimed to

ontrol systems, gunnery systems.

(2) Nuclear physics

(3) Instrumentation

electrodynamics, acoustics, (4) Basic physics: quantum dynamics, and genetics. (5) Electromagnetic radiation: radio, infrared, x-rays.

turbulence, unsteady flow, (1) Incompressible flow: drag.

Mechanics Fluid

1.30 - 22 -1.98 SECORTIC 1.98

new instruments to me asure physical phenomena in new and better ways. Main contract is with Burean of Standards (joint with other served and AEC). cludes joint service projects in electronics concerned with (2) Electromagnetic radiation to aimed toward problems associated (1) Fluid mechanics program is radiation.

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with high speed, high altitude

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				(D. Jupa) man (S		
	T. I.	SUB-FIELD.	DIRECT P	DIRECT PLANNED SUPPORT (In \$ Milliam)	Pr (In \$ 1	
	Fluid	Ta cinco (a)	FT 53	FT 54	FY 55	HEMARKS
	Mechanics (cont'd)	layer, fluid turbulence,				(2) Not included in funds
		(3) Compressible flow: flutter and vibration				and structures sponsored by Aircraft Laboratory at Wright-Patterson AF Base. This is not classified at BR. Ore rectanglished at BR.
		(4) Internal aerodynamics: flow through pipes, nozzles, diffusers, compressors.				cludes work on boundary layer command is funded at about \$1 million per year.
		(5) Aerothermodynamics.				
	Solid State Sciences	(1) Physical properties of solids.	1-40	0.0	1,00	(1) Major aims of program are the
		(2) Structure of solids.				metallurgy) and infrared photo- conductors.
		(3) Surface physics.				
· •		(4) Special physical structures: semi-conductors, alkali halides, ferrites.				
		(5) Extreme temperature physics				

TABLE I: Air Force Basic Research Administered by OSR (Cont'd)

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	•	A CONTRACTOR	E O B D I O T E T E D		
리	TABLE II: Supplemental Data on Additional Air Force Research, Some of Which is Basic Research.	al Air For arch.	Ce Resear	नी	
FIELD	ມຣ _ີ	PLANNE	D DIRECT	PLANNED DIRECT SUPPORT* (In & Millian)	
	Administered her con	FT 53	FY 54	FT 55	-OII) INSMARKS
Physical Sciences	Chemistry, physics, methematics, (see Table I)	8.00	77.9	5.50	Entire program is carried on by contract. OSR reports \$6.225 for FY 53 and \$4.775 for FY 54 as
Electronics					west elight.
	ce rundamental electronics	1.24	1.20	1	The electronic program 4.
Geophysics	s Meteorology, climatology	5.17	777-9	ı	under "Basic Research". The meteorology program is above
7	Air University				X. contracted, 50% in-service research. This research is classified under IO-14 as a progress petaining to meteorology.
Sciences		5.49	2.03	1	rojects classiffed mimi rella
Sœial Sciences		3. 22	2•21	P 4	under "Personnel Operations" rather than "Bagic Research."
i	Flight Research Laboratory, WADC				
Physical Sciences	Mathematics, physics	7.60	7.35	д I	Both applied and basic research
* Source:	Tabulations of fiscal data submitted to RDB by the USAF. These figures reflect the situation as of 9 March 1953.	to RDB by	the USAF. ch 1953.	ਤ ਬਾਲ	wrected toward solution of specific problems. Includes research on boundary layer control.

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TABLE II: Supplemental Data on Additional Air Force Research (cont'd)

FIELD	SUB-FIELD	PLANNED FT 53	DIRECT FY 54	PLANNED DIRECT SUPPORT (IN \$ Million) FY 53 FY 54 FY 55	Militon)	REMARKS
Physical & Social Sciences	Proj. Rand encompasses basic and applied research, sub- contracting as required	п°9	u.,	е•11 6•11 -		Project Rand encompasses some work in basic research in both the physical and social sciences. Rand is classified under "Intellige- rd Planning" rather than under "Bank
		32.73 31.78	31.78			NOTE: Not all of the total can be

the Basic Research Program. construed as applicable to

> and half on a contract basis. The bulk of this program is carried out in service laboratories, Supports work in the biosciences through the program is carried as "supporting research". AF Base. The Euman factors program involves Research in the Biosciences: The Air Force associated with flight. About half of the Aeromedical Laboratory at Wright-Patterson Director of Human Factors in ARDC and the psychological and physiological problems