# HISTORY OF NAVAL DENTAL RESEARCH

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OFFICE OF NAVAL RESEARCH

DEPARTMENT OF THE NAVY • WASHINGTON, D. C.

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# FOREWORD

"The History of Naval Dental Research," prepared by Commander Carl A. Schlack, Head, Dental Branch, ONR, is a complete chronological presentation of dental research under Navy auspices since World War I. The extensive bibliography that ends the report should prove valuable to the research scientist interested in the dental program.

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B-4994

# HISTORY OF NAVAL DENTAL RESEARCH

Research in the Naval Dental Corps was initiated with the establishment of the Naval Dental School in February 1923.[1,2] Rear Admiral E. R. Stitt, MC, USN, the Surgeon General in those early days, gave much impetus to studies correlating oral and general systemic disorders. Most of these were of a clinical nature only, since facilities for laboratory and animal investigation were not available. Consequently the oral clinical manifestations of general systemic disorders, and oral diseases contributing to general disorders, were studied with the objective of a direct clinical practical application. Captain H. E. Harvey, DC, USN, was among the first of naval dental officers in those days who attempted a correlation between the blood picture and periapical infections in order to determine a means of evaluating the effect of periapical lesions as foci of infection; no reports were published.

The attempt to find simple, expedient, practical, clinical measures caused the expenditure of too much effort on practical objectives, rather than experimentation forcing the objective to become self-evident. Here was the typical picture of teleologic versus ateleologic investigation. Such work, however, occupied the time and effort of the majority of dentists in the United States up until 30 or 40 years ago.

Establishment of the Naval Medical Center on 20 June 1935,[3] and the Naval Dental School as a separate command on 17 March 1936[4] was a considerable aid to naval dental research as an entity. Oral pathologic research played no mean role in this endeavor. Among those studies undertaken and reported were healing of jaw fractures (as shown by the X-ray), methods of apicoectomy, treatment of gingival disturbances, blood sedimentation rates in relation to periapical disturbances, and improvements in dental prosthetic procedures. At this time naval dental research was still concentrated on clinical phenomena, although some coarse attempts were made at epidemiologic studies on caries prevalence in naval personnel. Research in all fields still depended upon the initiative of the individual and the expense involved was still his burden.

Although research under the cognizance of the Bureau of Medicine and Surgery was supported with the help of the National Research Council as early as 1934,[5] it was not until 1939 December that the Navy Department decided to coordinate all research activities of the Navy.[6] A Naval Research and Development Board was organized in 1941,[7] and in July of that same year Rear Admiral Harold W. Smith, MC, USN, was designated by the Secretary of the Navy to represent the Bureau of Medicine and Surgery as advisor to Dr. Jerome C. Hunsaker, the Coordinator of Naval Research and Development.[8] By a letter from the Coordinator of Naval Research and Development to the Bureau of Medicine and Surgery in October 1941, Rear Admiral Harold W. Smith was designated to establish liaison between Naval Medical Research and the Coordinator of Research and Development.[9] Finally, in 1942 January a Research Division was established in the Bureau of Medicine and Surgery with Rear Admiral Harold W. Smith as Chief of the Division.[10]

Immediately prior to the commencement of hostilities, dental research in the Medical Department was under the cognizance of the Naval Dental School.[11-14] (See Fig. 1.) The first dental Research Project X-44 (later changed to X-131) was approved by the Bureau of Medicine and Surgery on 24 June 1942.[15] It was a large statistical survey and five reports have been published.[16a-f]

On 29 October the first naval dental officer was officially ordered to the new Naval Medical Research Institute[17] which had been commissioned 27 October 1942. By these orders the first dental facility, for dental research alone, was established in the Navy. Later, in 1942 December a naval dental officer was designated for the first time by the Research Division of the Bureau of Medicine and Surgery to act as liaison between Naval Dental Research and the Research Division, Bureau of Medicine and Surgery.[18] In February 1943 another Naval Dental officer was ordered to the National Medical Research Institute with additional duty at the United States Naval Dental School.[1]

Dental research as conducted in the Navy from 1939 to the present, with few exceptions, is best described in a resume which appeared in the December issue of the Journal of Dental Education, 1942.[19]

By the end of hostilities the position of the Research Division in the Bureau of Medicine and Surgery and the relation of Naval Dental Research as a component of this Division, as well as the

dental facilities of the Naval Medical Research Institute, are illustrated in the organizational charts. (See Figs. 1-3.)

As the war progressed an Office of Rehabilitation was formed in the Bureau of Medicine and Surgery[20] in order to remedy, as far as possible, the results of war wounds, particularly in cases where amputations of arms, legs, hands, eye enucleations were necessary. The construction and application of prosthetic appliances was part of this office's activity, and requirements led to the establishment of a Prosthetic Appliance Board [21] at the National Naval Medical Center. This Board, besides medical officers and hospital corps officers, included several dental officers. In connection with the construction of prosthetic appliances, the Bureau of Medicine and Surgery approved the research project "Esthetic and Functional Hand and Digit Prosthesis and Eye Prosthesis," Project X-573, on 11 May 1945, initiated by the Commanding Officer of the Naval Dental School, National Naval Medical Center, Bethesda, Maryland.[1]

Since 1939, when concentrated effort was made by the Dental Division to promote organized naval dental research, approximately 100 naval dental research investigations in all classifications were published or accepted for publications.[22] Of these, about 19 were projects which were approved and supported by the Bureau of Medicine and Surgery.[22]

Among other projects, upon which reports were made but which as yet have not been published in civilian or other journals, were:[1]

a. Research Project X-345, Efficacy of penicillin in the treatment of oral fusospirochetosis, proposed 11 February 1944 and approved by the Chief of the Bureau of Medicine and Surgery 15 March 1944.[23] This was the first attempt in the Navy to determine accurately, and in sufficient numbers of patients, a method whereby large numbers of patients may be treated quickly and still keep the men at their duties. The intramuscular injection of penicillin was shown to be most effective. On 8 September 1944 the final report was sent through official channels.[24] In all, 105 cases had been treated and observed.

b. Presence of Vincent's organisms in the mouth of patients being treated for syphilis.

c. A portable dental operating light for field use, Project X-664, approved 12 September 1945.

d. Effect of methyl methacrylate fillings on pulp tissue of dogs, incompleted, Project X-412, approved 4 July 1944.

e. Relationship of dental occlusion to ear block in the low pressure chamber, Project X-157, approved October 1942.

f. Project X-434, approved 9 November 1944:

1. Results of dental therapy in 50 cases of aerotitis media in submarine personnel based upon a new functional concept of eustachian tube blockage.

2. A rapid dental treatment for the prevention of aerotitis media.

3. Evaluation of a dynamic concept of dental treatment based upon a functional classification of mal occlusion.

4. Dental treatment of trismus, tinnitus, otalgia and obscure neuralgia.

h. Investigation of the functions and diseases of the temporo mandibular articulation NM 008-004, app 11 Feb 1947.

i. Factors involved in acute ulceromembraneous stomatitis (Vincent's Disease) NM 008-005, approved 15 Apr 1947, Joint Study with National Institute of Health.

j. Oral manifestation of systemic disease. A survey in Middle Eastern Population. NM 008-006, approved 23 May 1946.

k. Qualitative and quantitative determination of the organic content of the enamel and the enamel cuticle (Nasymth's Membrane)--possible significance to human dental caries. NM 008-007, approved 3 June 1947.

l. Preliminary study of the suitability of dental field operative equipment and supplies for use in the Arctic area NM 012-002. Approved 19 June 1946.

m. Preliminary study of the suitability of dental field prosthetic equipment and supplies for use in the Arctic area NM 012-003, approved 19 June 1946.

n. Use of oral color photographs as a means of personnel identification and restoration of oral lesions and deformities. NM 012-004, approved 18 March 1947.

o. Study of novocain (procaine) sensitivity among Naval Medical Officers based upon answers to questionnaires, NM 008-008, approved 29 June 1948.

Naval dental visual educational research was begun in 1939. The Naval Dental School, National Naval Medical Center, was extremely interested in this study. By September 1941 when the first board (to which a dental officer was attached) to investigate the possibility of use of motion pictures was appointed by the medical officer in command of the Naval Medical Center;[25] six full length color motion picture films had been produced, three were in production and three contemplated.[26] Most of these films were revised and/or reproduced for distribution throughout all Naval activities and abroad where dental instruction was given. By November 1942[27] three were chosen and made available for duplication; "Duties of a Dental Technician," "Treatment of Jaw Fractures," and "Oral Surgery (apico-ectomy) Two Methods." Another board was appointed by the Commanding Officer of the National Naval Medical Center, Bethesda, Md. to develop motion pictures in April 1942.[28] A dental officer was also assigned to this board.

The medical audio visual educational program developed to such an extent that by July 1942 a section of audio visual education had been established in the Division of Preventive Medicine in the Bureau of Medicine and Surgery.[29] By January 1944 a total of eight dental instruction films, which had been produced at the Naval Dental School prior to March 1943, were made available for duplication & distribution to training centers.[30] In the Naval Catalog of the U. S. Naval Training Films (cumulative supplement) an additional film, which was produced by the Naval Dental Activity in Brooklyn, New York was added.[31]

As the war progressed the volume of audio visual educational needs became so great that local naval technicians could not care for them as had been done previously in the spare time of naval dental officers and enlisted men. Civilian organizations were called upon to render the technical assistance required. Medical training films, still and moving, sound and silent, were produced to such an extent that separate lists in the form of a catalogue became necessary;[32] fourteen naval dental training films were listed. At present others are being completed and contemplated, as well as construction of new editions to former original text books for officers and enlisted men among which the one on oral pathology deserves particular mention. It is needless to state that all such teaching aids, written and visual, were and are more than welcome at all educational facilities throughout the Navy and contribute more than any other single effort in standardizing and increasing the efficiency of teaching procedures in the Naval Medical Dental Corps.

At the beginning of World War II no dental officers were conducting investigations full time. The routine duties of performing operative procedures on patients was all that was expected of them. Consequently, very few were interested in assuming the additional responsibilities that research involved. This in itself was the best screening procedure possible since it quickly and effectively weeded out those dental officers who might be interested in research as a "lark."

Shortly following the end of hostilities of World War II the complement of the Dental Facility, Naval Medical Research Institute, was officially increased to two naval dental officers to engage in full time dental research.[33] Three enlisted men (dental technicians) were assigned to the same activity. Early in 1946 a naval dental officer had been assigned to establish a dental research facility in Guam, M.I. However, this was unsuccessful. Another naval dental officer was assigned at the same time to the Naval Medical Research Unit No. 3 in Cairo, Egypt.[1] This officer was more successful, and at present a dental research facility is functioning in Cairo, Egypt, where recently the King of Egypt signed a lease to build a Naval Medical Research Institute.[1] The physical

facilities for dental research laboratories have been authorized and, as far as can be determined, construction is about to begin.[1]

The Director of the Bureau of Standards, during the latter part of 1946, authorized acceptance of two naval dental officers for assignment to the Dental Research Laboratories for training in dental materials. Two naval dental officers were so assigned.[34]

On the 17th of August 1948 a naval dental Reserve officer was assigned for two weeks active duty to the Naval Medical Research Institute in a training capacity.[35] This represents the first time a naval Reserve dental officer was ordered to a dental research activity within the Medical Department of the Navy.

The activities of the Research Grants-in-Aid Division of the National Institute of Health required formation of a Dental Panel. On this panel are also represented members of the Armed Services Dental Corps who have full voting privileges. The Naval Dental Corps representative was appointed 12 July 1946.[36] Under the Research Grants-in-Aid Fellowship program, fellowships for research at civilian institutions were also made available to Naval Dental Officers in 1946.[37]

On 17 February 1947 a naval dental officer was assigned to the Medical Sciences Division, Office of Naval Research, in an additional duty capacity to act as dental consultant on proposals on dental research submitted to the Office of Naval Research.[38] By a memorandum of 14 May 1947 from the Director, Medical Sciences Division, Office of Naval Research, to all branch heads, 4% (later increased to 5%) of all funds made available to the Medical Sciences Division went to support the program of the Dental Branch. This represented the first time in the history of the Armed Services that a fund was created for dental research purposes. The dental program for the fiscal year 1949 was approved by the Assistant Secretary of the Navy. Shortly thereafter the Dental Branch was created with the naval dental officer consultant designated as Head of the Branch.[41] (See Fig. 4.) By October 1947 the amount of funds actually designated for support of the dental research program was $79,500,[42] and part of this dental research program was begun in the fiscal year 1948 instead of waiting until 1949. Part of this program included ordering Naval Reserve Dental Officers requesting such duty to a two week course delivered by the Office of Naval Research. Two such dental officers were ordered to attend the Scientific Seminar held by Office of Naval Research in Washington, 9-22 June 1948.[43] This represents the first time a Naval Reserve Dental Officer was ordered to active duty in connection with research in dentistry by the Office of Naval Research.

At present the following universities are receiving Office of Naval Research support for dental research: (1) "Dietary and other factors concerned in mouth and tooth deterioration," Cornell University, C. M. McCay, principal investigator; (2) "Use of germ-free animals in the study of dental caries," University of Chicago, J. R. Blayney, director; (3) "Recognition and evaluation of factors influencing microorganisms of the mouth," University of Pennsylvania Dental School, J. L. T. Appleton, principal investigator; (4) "Study of dental casting materials," University of Michigan, Norris O. Taylor, principal investigator; (5) "Hormonal effects on oral hard and soft tissues," Columbia University, E. Ziskin, principal investigator; (6) "Bacteriemias resulting from tooth extraction and scaling," Tufts College, J. P. Lazansky, principal investigator; (7) "Relation of vitamin C in inflammatory conditions of the gingivae," Georgetown University Dental School, W. C. Hess and E. Everett, principal investigators; (9) "Investigation of salivary ammonia and its relation to dental caries and peridontal diseases," Western Reserve University, J. P. Muntz, director; (10) "Influences of dietary protein on dental caries," Massachusetts State College, Julia O Holmes, principal investigator; (11) "Determination of masticatory efficiency," Tufts College Dental School, R. S. Manly, principal investigator. The progress made on these proposals may be found in the Quarterly Project Summaries of the Office of Naval Research for October 1947, January and April 1948.

In addition, proposals have been received from the University of California, Oklahoma University and Harvard University Dental School; these are being reviewed by the Dental Division and the Committee on Dentistry, National Research Council.

Through the efforts of Surgeon General C. Swanson, U. S. Navy, a Committee on Dentistry was established in the Medical Sciences Division of the National Research Council.[44] The purpose of this Committee was to study the dental standards for entrance into the Armed Services since the shortages of dental personnel and lowering of dental entrance standards precipitated a situation precluding any clinical dental treatment other than of an emergency character. The impossibility of

rendering a complete dental treatment service to all personnel of the Navy considering the number of dental officers allowed by legislation in the time permitted, even when entrance dental standards are high, was brought out in a Naval Dental Corps study on the problem.[16a-e] Although no solution to the problem has as yet been reached many significant recommendations were made by the Committee to aid dental research in the Services.[45] Many of these recommendations have already been placed into effect by the Surgeon General and the Dental Division of the Navy.

The Surgeon General by a Circular letter dated 25 April 1948 has made it possible for medical and dental officers in the Navy to engage in full-time research affording those who so desire a continuous career in research.[46] The Dental Division increased the complement of the Dental Facility, Naval Medical Research Institute, from two to four full-time naval dental officers[47] to increase studies on oral bacteriology and effects of atomic radiation on oral tissues. A complete dental research facility has been set up at Great Lakes Naval Training Center, where field work on Bureau of Medicine and Surgery approved Project NM 008-005 (a study on oral fusospirochetosis) is being undertaken. This is a joint study between the dental research groups of the National Institute of Health and the Naval Medical Research Institute. Other dental research units are contemplated for all large Naval training centers.[48]

At the Naval Dental School, Naval dental research methods are being taught by personnel attached to the National Medical Research Institute[49] and the U.S. Naval Dental School, the subject matter includes a series of seven lectures covering the following material:

(1) History of Naval Dental Research;

   a. Previous work

   b. Aim of all naval research particularly that of Naval Dental Corps

   c. Organization of present Research Division of Bureau of Medicine and Surgery

   d. Research Units at present approved by Bureau of Medicine & Surgery

   e. Role of Naval Medical Research Institute

(2) Dental Literature;

   a. Methods of gaining reliable information on previous work and need for such

   b. Importance of differentiating between reports which represent actual scientific research and those which are unsubstantiated theory, conjecture and gross observation

(3) Consultants and collaboration;

   a. Cooperation of specialists in the various sciences which might be related to the main problem

   b. Need for statistics

   c. Principal investigator and his responsibilities

(4) Apparatus, Construction and Design;

   a. Experimental plan construction

   b. Workshops and skilled craftsmen

(5) Preparation of the Report;

   a. Method of construction advocated by the Navy; responsibility of report

   b. Classification of articles for publication in civilian journals

c. Editorial Board and their review of reports prior to printing

(6) Present Needs of Naval Dental Research;

a. Qualifications desired and present efforts expended on material and personnel available

b. Types of investigation which might be undertaken

(7) Mechanics for Authorization and Support of a Project;

a. Forms and requests

b. Route of all such forms and requests to Chief of Research Division, Bureau of Medicine and Surgery

As of 1 July 1948 a recent review of dental research conducted at the Naval Medical Research Institute reveals that colonies of strains of uniformly dental caries susceptible white and cotton rats have been developed, reared under vermin-free, humidity and temperature controlled conditions. All animals receive distilled drinking water and standard Purina Lab Chow. It is believed that these colonies are the only ones of this kind enabling the study of dental caries under such carefully controlled conditions. Such a colony of hamsters is also being developed.

To date the role of oxalates in dental caries of the white and cotton rat has been shown to be negative and seems to support that school of thought which contends that the acidogenic factor in initial dental caries is less important than probably the proteolytic factor. The congenital effect of oxalates on dental caries in first and second generations of these animals is being studied.

The effect of methyl testosterone, estrogenic substance and sea water on dental caries incidence and extent in the white and cotton rat is being investigated.

Application of an analysis of co-variance to the effect of weights of caries dietaries and water consumed ad libitum and weight gains on dental caries incidence has revealed that the application of this method aids in interpreting dietary effect lest an effect be attributed to a diet when in reality the effect may be more directly attributable to a concommitant variable such as water consumption, weight of food ingested and weight gains. Further investigations on such studies are being continued.

All of the above work is basic research with possible practical application.

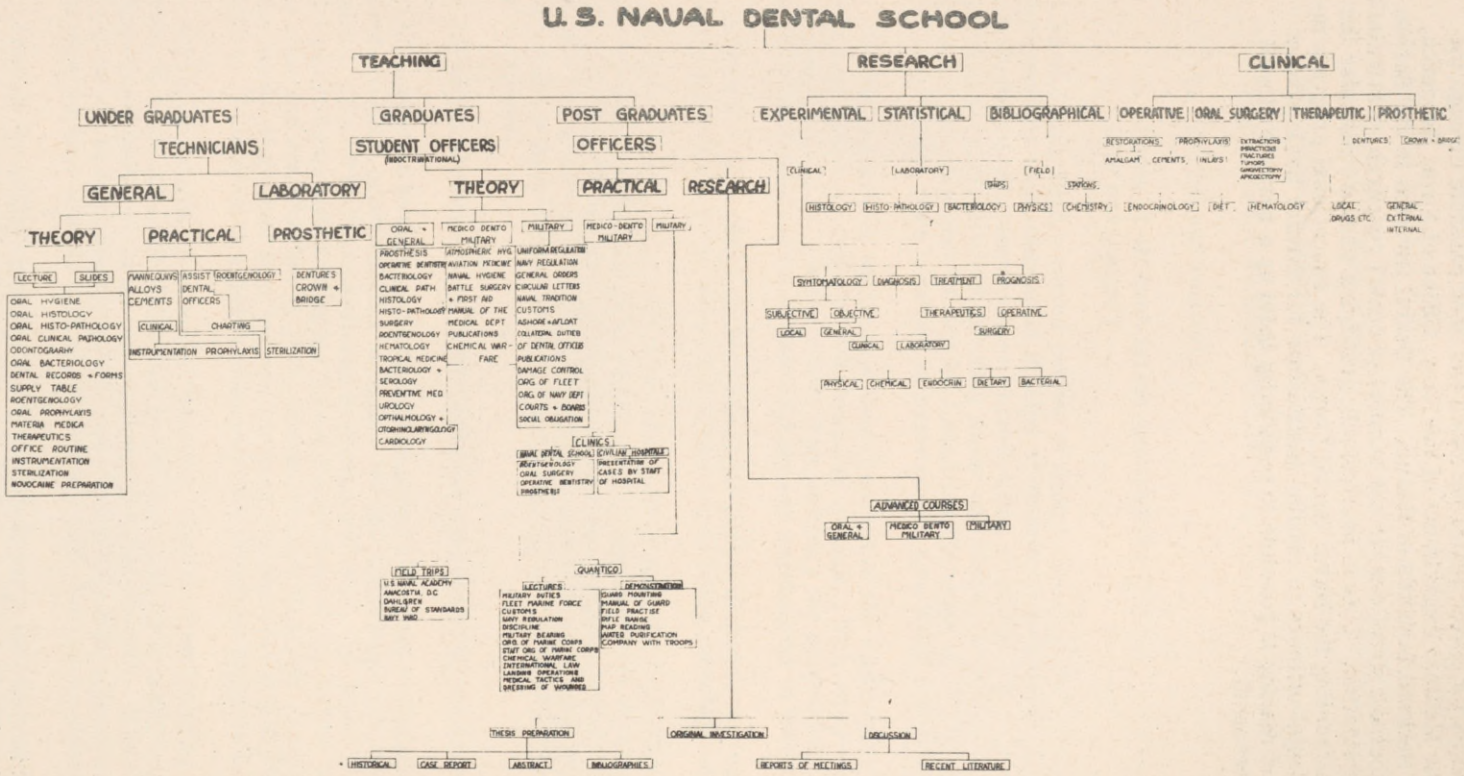
An apparatus to take mass oral photographs is about completed. Color prints have been made available to show practicability of such a method particularly in use of auxiliary personnel in performing a duty formerly undertaken by dental officers. By these means and bite wing X-rays, it is also possible to better evaluate the oral condition of the patient which means may eventually save much time and examination by naval dental officers directly. Suggestions for use of such a device for the latter procedure was recommended by the National Research Council, Committee on Dentistry. This work is applied research with practical application almost a forgone conclusion.

The joint National Institute of Health and Naval Medical Research Institute study on factors involves in acute ulcuomembraneous stomatitis (Vincent's infection) has progressed well in its organizational phase at Great Lakes Naval Training Center. Close liaison has been established with scientists at Northwestern University and it is contemplated to explore the possibility of organizing another similar unit at San Diego, Calif. for such epidemiologic studies.

Jaws of the Bikini animals are being decalcified, celloidin embedded, cut, slides mounted and stained for microscopic examination by a highly specialized technician, the position for whom was created at the United States Naval Dental School. These slides will be examined by the Dental Facility, Naval Medical Research Institute, and represent the only animal material in the world that may be evaluated for jaw changes due to atomic radiations.

Oral Bacteriologic studies are also contemplated in conjunction with other Service activities.

An enviable coordination of effort for Naval dental research has been possible through the understanding and cooperation of the Medical Department of the Navy, Office of Naval Research, National Research Council and the National Institute of Health. The Dental Division in the Bureau of Medicine and Surgery has contributed a great deal to the support of dental research, particularly that variety that may have naval application. This is particularly gratifying when we consider the present day personnel problems confronting the Naval Dental Corps. The educational program involving sending of qualified naval dental officers to civilian institutions for further basic studies leading to degrees in the sciences is making it possible to eventually build up a reserve of well trained dental research teaching personnel.


U.S. NAVAL DENTAL SCHOOL
TEACHING
RESEARCH
CLINICAL
UNDER GRADUATES
GRADUATES
POST GRADUATES
TECHNICIANS
STUDENT OFFICERS
(INDOCTRINATIONAL)
OFFICERS
GENERAL
LABORATORY
THEORY
PRACTICAL
RESEARCH
PROSTHETIC
LECTURE
SLIDES
ORAL HYGIENE
ORAL HISTOLOGY
ORAL HISTO-PATHOLOGY
ORAL CLINICAL PATHOLOGY
ODONTOGRAPHY
ORAL BACTERIOLOGY
DENTAL RECORDS + FORMS
SUPPLY TABLE
ROENTGENOLOGY
ORAL PROPHYLAXIS
MATERIA MEDICA
THERAPEUTICS
OFFICE ROUTINE
INSTRUMENTATION
STERILIZATION
NOVOCAINE PREPARATION
AMALGAMS ALLOYS CEMENTS
ASSIST DENTAL OFFICERS
ROENTGENOLOGY
CLINICAL
CHARTING
INSTRUMENTATION
PROPHYLAXIS
STERILIZATION
DENTURES CROWN + BRIDGE
ORAL + GENERAL
MEDICO DENTO MILITARY
MILITARY
PROSTHESIS
OPERATIVE DENTISTRY
BACTERIOLOGY
CLINICAL PATH
HISTOLOGY
HISTO-PATHOLOGY
SURGERY
ROENTGENOLOGY
HEMATOLOGY
TROPICAL MEDICINE
BACTERIOLOGY + SEROLOGY
PREVENTIVE MED
UROLOGY
OPTHALMOLOGY + OTORHINOLARYNGOLOGY
CARDIOLOGY
ATMOSPHERIC HYG
AVIATION MEDICINE
NAVAL HYGIENE
BATTLE SURGERY
+ FIRST AID
MANUAL OF THE MEDICAL DEPT
PUBLICATIONS
CHEMICAL WARFARE
UNIFORM REGULATIONS
NAVY REGULATION
GENERAL ORDERS
CIRCULAR LETTERS
NAVAL TRADITION
CUSTOMS ASHORE + AFLOAT
COLLATERAL DUTIES OF DENTAL OFFICER
PUBLICATIONS
DAMAGE CONTROL
ORG. OF FLEET
ORG. OF NAVY DEPT
COURTS + BOARDS
SOCIAL OBLIGATION
CLINICS
DENTAL SCHOOL
ORTHODONTICS
ORAL SURGERY
OPERATIVE DENTISTRY
PROSTHETICS
CIVILIAN HOSPITALS
PRESENTATION OF CASES BY STAFF OF HOSPITAL
FIELD TRIPS
U.S. NAVAL ACADEMY
ANNACOSTIA D.C.
DAHLGREN
BUREAU OF STANDARDS
NAVY YARD
QUANTICO
LECTURES
MILITARY DUTIES
FLEET MARINE FORCE
CUSTOMS
NAVY REGULATION
DISCIPLINE
MILITARY BEARING
ORG. OF MARINE CORPS
STAFF ORG. OF MARINE CORPS
CHEMICAL WARFARE
INTERNATIONAL LAW
LANDING OPERATIONS
MEDICAL TACTICS AND DRESSING OF WOUNDED
DEMONSTRATION
GUARD MOUNTING
MANUAL OF GUARD
FIELD PRACTISE
RIFLE RANGE
MAP READING
WATER PURIFICATION
COMPANY WITH TROOPS
THESIS PREPARATION
HISTORICAL
CASE REPORT
ABSTRACT
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DISCUSSION
REPORTS OF MEETINGS
RECENT LITERATURE
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ORAL SURGERY
THERAPEUTIC
PROSTHETIC
RESTORATIONS
PROPHYLAXIS
AMALGAM
CEMENTS
INLAYS
EXTRACTIONS
IMPACTIONS
FRACTURES
TUMORS
GINGIVECTOMY
APICOECTOMY
DENTURES
CROWN + BRIDGE
CLINICAL
LABORATORY
FIELD
CHIPS
STAINS
HISTOLOGY
HISTO-PATHOLOGY
BACTERIOLOGY
PHYSICS
CHEMISTRY
ENDOCRINOLOGY
DIET
HEMATOLOGY
LOCAL DRUGS ETC
GENERAL EXTERNAL INTERNAL
SYMPTOMATOLOGY
DIAGNOSIS
TREATMENT
PROGNOSIS
SUBJECTIVE
OBJECTIVE
THERAPEUTICS
OPERATIVE
LOCAL
GENERAL
SURGERY
CLINICAL
LABORATORY
PHYSICAL
CHEMICAL
ENDOCRIN
DIETARY
BACTERIAL
ADVANCED COURSES
ORAL + GENERAL
MEDICO DENTO MILITARY
MILITARY

Fig. 1

NAVAL MEDICAL RESEARCH INSTITUTE
ORGANIZATION CHART

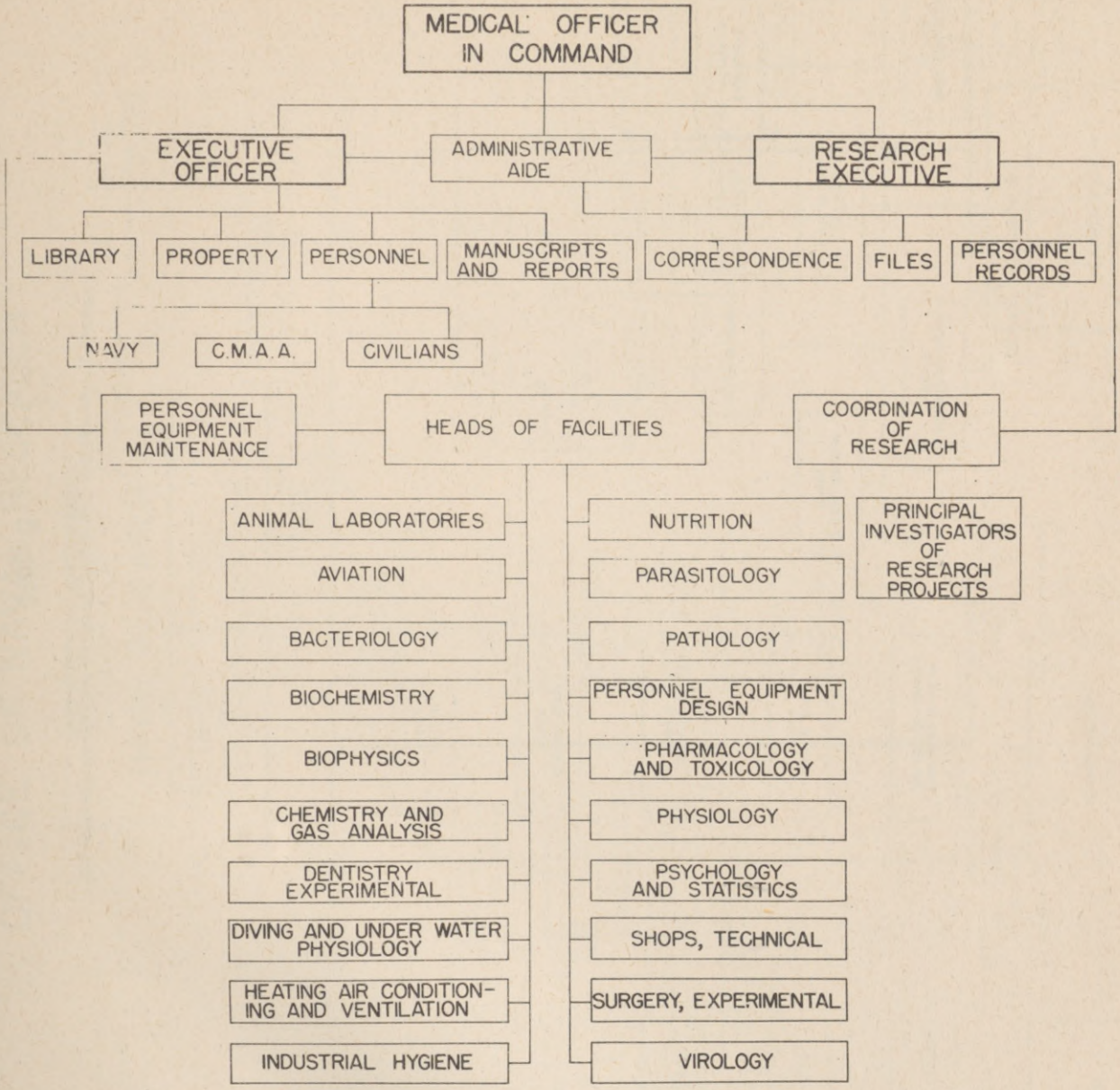
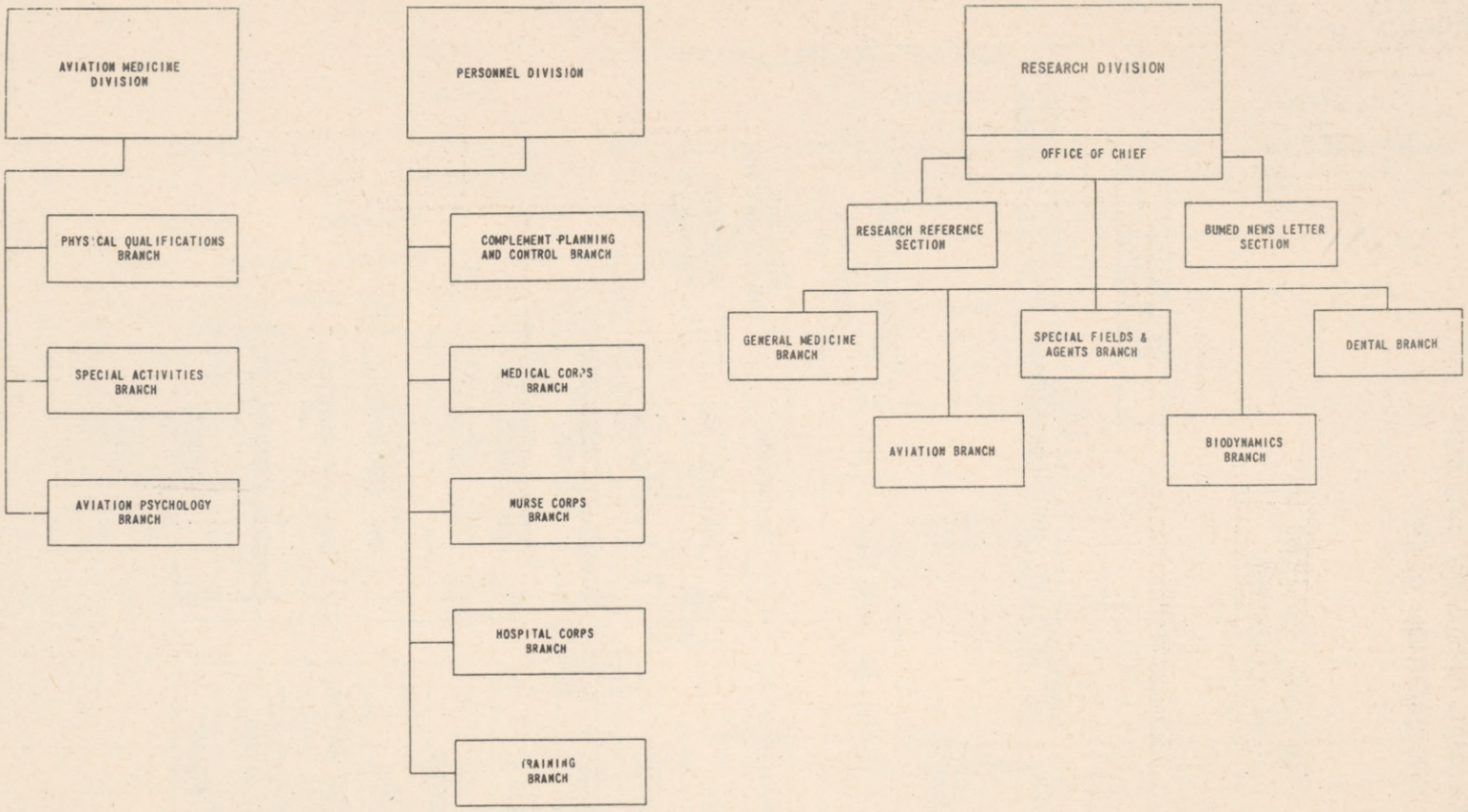


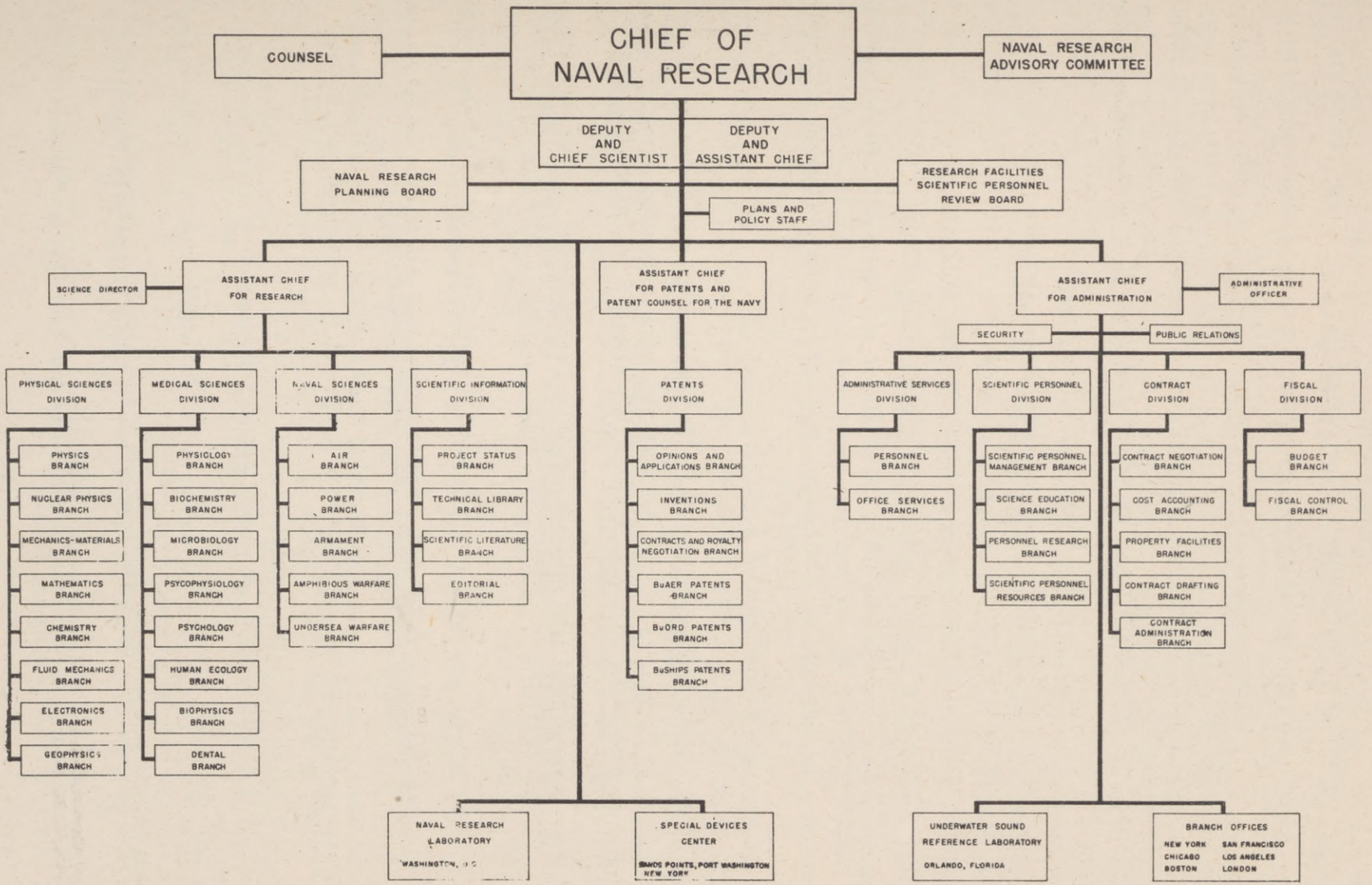

Fig. 2




ORGANIZATION OF AVIATION MEDICINE, PERSONNEL, AND RESEARCH DIVISIONS
BUREAU OF MEDICINE AND SURGERY

**Fig. 3**

# OFFICE OF NAVAL RESEARCH




1 JANUARY 1948

Approved: _____

Chief of Naval Research

Fig. 4



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