

FIRST DRAFT
OF
PROPOSED C.M.R. CHAPTER
for
IRVIN STEWART'S
ADMINISTRATIVE HISTORY OF CSRD.

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The Committee on Medical Research was established by Executive Order of President Roosevelt on 28 June 1941 (Appendix I). The order created, in the Office for Emergency Management, an Office for Scientific Research and Development as a parent organization and placed within it as separate components the pre-existing National Defense Research Committee and the newly-formed G. M. R. The N.D.R.C. was to concern itself primarily with instrumentalities of warfare, the G. M. R. with medical problems affecting the national defense. The salient medical functions thus assigned to the O. S. R. D. were 1) to initiate and support a research program which should utilize the scientific personnel and resources of the nation and 2) to aid and coordinate the research activities carried on by other Governmental Departments and Agencies.

The civilian members of the Committee, appointed by the President, were Dr. A. N. Richards^{enter} of the University of Pennsylvania, Chairman, Dr. Lewis H. Weed of Johns Hopkins University, Dr. Alphonse E. Dochez of Columbia University and Dr. A. B. Hastings^{aid} of Harvard University. These men served throughout the life of the organization and, by terms of the Order, without special compensation. The Secretaries of War and Navy and the Federal Security Administrator were directed to appoint to the Committee representatives of the Surgeons General of the Army, Navy and Public Health Service respectively. The members thus appointed were Colonel, later Brigadier General, James Stevens Simmons, Rear Admiral Harold W. Smith, and Dr. L. R. Thompson^{no}. Dr. Thompson resigned because of ill health in November 1942 and was succeeded by Dr. R. E. Dyer^{alla}. As a result of actions taken at the first meeting of the Committee on 31 July 1941, Dr. Weed was named vice-chairman and Dr. Irvin Stewart, Executive Secretary of OSRD, was appointed Executive Secretary.

GOVERNMENT COMMITTEES CONCERNED WITH MEDICAL PROBLEMS

1. Health and Medical Committee. The formation of C.M.R. resulted from conversations in the spring of 1941 between President Roosevelt and Dr. Vannevar Bush, at that time Chairman of N. D. R. C. and subsequently Director of O. S. R. D. The President was informed that the medical research problems of national defense were not a subject of major concern to any civilian Governmental Agency. This was eminently the case. A Health and Medical Committee had been formed 19 September 1940 under the Council on National Defense to "coordinate health and medical activities affecting national defense." Two months later the Committee was transferred to the Federal Security Agency when the Administrator became coordinator for all health, medical, welfare and related activities. The Committee concerned itself with the broader aspects of medical care as the role of its Subcommittees indicates: medical education, hospitals, dentistry, industrial medicine, negro health, nursing. It formulated plans for the Office of Procurement and Assignment of Physicians and Nurses in October 1941 and made various recommendations in connection with changes in medical school curricula, deferment of medical students, and enrollment of nurses. Although it lay within the province of this Committee to "enter into contracts with educational and research institutions for studies and experimental investigations" its only contribution to medical research had been the transfer of \$57,000 to the Division of Medical Sciences of the National Research Council in May of 1941. ^

2. Division of Medical Sciences, National Research Council. The National Research Council was established in 1916 as the operating agency of the National Academy of Sciences under the congressional charter of the Academy. Throughout the first World War it had functioned as the Department of Science and Research of the Council of National Defense and, at the end of the war, was perpetuated by Executive Order of President Wilson. Thus established as a quasi-governmental

~~He~~ was available to "give advice to the Government on any subject of science or art." In May 1940 the Surgeon General of the Army, James G. Magee, requested advice from the Chairman of the Division of Medical Sciences, Dr. Lewis H. Weed, on certain medical problems. In response to this request two committees were formed to advise the Surgeons General in the field of transfusions and chemotherapy. As these committees met during the succeeding year and as further inquiries on special subjects were received from the Services the need for additional groups became apparent. At the time the C. M. R. was formed there were eight major committees and thirty-three subcommittees within the Division of Medical Sciences with a membership totaling 221. The fields and specialties covered by these committees are indicated in Table 1. Their members came from 28 States, the District of Columbia, 47 Universities, a number of foundations, Governmental Agencies and press associations.

These Committees on Military Medicine were of very real value to the Surgeons General. They made numerous recommendations regarding therapeutic procedures, particularly in chemotherapy and in venereal and tropical diseases. They assisted in revising the standards for physical examination of recruits (WD MR 1-9). They cooperated with the American Medical Association in preparing a roster of medical graduates and supplied an evaluation of specialists to the Surgeons General. To the Red Cross they gave professional advice and supervision in the procurement of human blood plasma for the armed forces. In response to a request of the Services they commenced the preparation of six military surgical and three military medical manuals which were published in 1942 and thereafter. The Surgeons General had designated Colonel, later Major General, Charles C. Hillman and Captain, later Rear Admiral, Charles S. Stephenson as their official representatives to the Division of Medical Sciences and medical officers had been delegated to attend meetings of the various committees.

RELATIONS BETWEEN COMMITTEE MEDICAL RESEARCH AND N. R. C.

X It was against this background that the C. M. R. was formed. There was an integrated and active organization within the N. R. C. which had given advice to the Surgeons General on medical matters for more than a year, an advisory function for which the N. R. C. had been established and which it continued to fulfill throughout the War. Some cordial personal relationships had developed between committee members and representatives of the Surgeons General. In effecting their advisory function the committees had projected research programs. In some cases these plans were specific and detailed, in others rather nebulous. In all cases the necessity of research was fully realized. It could not have been otherwise. Many of the procedures which the committees recommended to the Services were admittedly imperfect, many of the questions put to them by the Services could not be answered ex cathedra. ^(Services & NRC) They had found it impossible to embark upon these research projects with any vigor because there were no considerable funds available to them. The first important decision which had to be made by CMR was whether to employ the Government funds at its disposal for the conduct of research by accepting the program and advice of the NRC organization or to establish a new organization of its own. The former alternative was adopted.

In accordance with this decision the CMR, at its first meeting, took several steps which formalized this relationship, and made it the cornerstone in developing a research program. It decided that the working offices of CMR should be within the building occupied by the NRC at 2101 Constitution Avenue. It recommended a contract for \$150,000 with the National Academy of Sciences, the parent body of NRC, to cover expenses incident to meetings of the NRC committees and subcommittees and the preparation and distribution of reports. The terms of this contract, renewed at annual intervals during the War, were sufficiently broad to cover a number of administrative expenses which would have otherwise been difficult to

At the same meeting CMB appointed as its consultants the Chairmen of the eight major Committees on Military Medicine: Eugene F. DuBois in aviation medicine, Perrin H. Long in chemotherapeutic and other agents, Milton C. Winbarnitz in gas casualties, Morris Fishbein in information, O. H. Perry Pepper in medicine, Winfred Overholser in neuropsychiatry, Everts A. Graham in surgery, and Walter B. Gannon in transfusions and shock. The chairman of the Division of Chemistry, W. R. C., ^{Wm. Mansfield Clark,} was designated as an additional consultant. These consultants met with CMB at its second meeting on 8 August 1941 and outlined the research programs which they had planned or envisaged in their various fields. It was declared at that time that CMB would lean heavily upon the advice of the NRC committees and subcommittees in formulating its program and the consultants undertook to inform their subcommittee chairmen of the relationship between CMB and NRC and of their responsibility to initiate and recommend research projects.

There can be no question but that the research program of CMB was activated much more rapidly by this utilization of the NRC organization than would otherwise have been the case. This was its advantage. The committee members were already familiar with the needs of the Services, insofar as these needs had been explained by the military liaison officers, and had spent some days over a period of weeks or months in cogitating how these needs might best be met. Specialists as they were in many fields, their advice upon the personnel and resources of laboratories throughout the country was indispensable to CMB. Had the committees not existed their counterparts must have been created.

There were however disadvantages, less obvious but real, to this relationship between CMB and NRC. They stemmed from the dual functions which the NRC committee members were asked to exercise and from the divided loyalties which resulted. The members had been appointed by the NRC to NRC committees. Insofar as they sat around a table and formulated advice for the Surgeons General they

~~They~~ as members of NRC. When, sitting around the same table, they discussed or recommended research projects and when they conducted or supervised such projects, it was difficult for them to realize that they were functioning as advisers or investigators for OMR. Serving without compensation except for per diem and traveling expenses, the fact that these expenses were assumed by OMR was scarcely noticed. Several committees went happily through the War only vaguely familiar with OMR and incompletely aware that the ultimate responsibility and entire expense of the research program was its province. There was, in consequence, a certain amount of jealousy, of dispute as to where credit was due, at the lower levels of both organizations. It is fair to say that these feelings did not have any important effect on the success of the cooperation and that they were minimized by complete confidence in the integrity of the principals concerned.

From July 1941 till the end of the War the NRC committees met frequently in Washington, the more active groups as often as once a month, to consider proposals for research in their special fields. As need for their creation arose, additional committees were formed. In August 1945 there were 14 major committees and 42 subcommittees with (Table II) a total membership of 315 whose geographical residence is indicated in Table III. The predominant representation of North Atlantic and North Central States is obvious but no more so than is the case in the distribution of medical schools or in the membership of learned societies. The chairmen of the newly-created major committees became consultants to OMR: William S. Tillett in convalescence and rehabilitation, Walter W. Palmer in drugs and medical supplies, Clarence D. Selby in industrial medicine, Robert F. Loeb Jr. in malaria, Howard T. Karsner in pathology and Abel Wolman in sanitary engineering.

METHODS OF INITIATING AND SUPPORTING THE RESEARCH PROGRAM.

1. Proposals for Contract. It was the assignment of C.M.R. to utilize the scientific resources of the country for medical research "in the national defense". It was not contemplated that the Committee should itself perform research or have work done under its direct supervision. Rather, the necessity was to recognize the problems of military importance, to see that work upon them was undertaken by competent investigators and to support the investigations under contract with Government funds. In theory this function was easier of fulfillment than that of N.D.R.C., for the prevention and cure of disease and the treatment of injuries was a peacetime object of medical research. To the extent that this was true the program was relatively easy to initiate. In practice the quantitative shift of emphasis, the dislocation of interest, was so great that much of the research had to be conducted practically de novo. This was a slow and difficult process. The control of disease-bearing insects, or even of malaria for example, had been rather academic insofar as the health of the United States was concerned. They now became of controlling importance. Similarly the necessity of flying aircraft at unprecedented heights and unprecedented speeds introduced quite new problems.

C.M.R. neither published nor sent to investigative groups a list of subjects upon which research was desired and for which financial support might be expected. Such a list might have assisted workers who were anxious to be utilized in the program, but security precautions prevented anything more than a very general statement of fields of interest in secret, confidential or restricted subjects; and, in unclassified subjects, it was felt that the military requirements were already sufficiently obvious. Instead of using such a procedure the C.M.R. relied on the membership of the N.R.C. committees and on its own staff to make known to investigators the subjects upon which proposals would be entertained and the mechanism of their submission.

A proposal for contract, was prepared in which the investigator was required to state: 1) a description of the subject of investigation with its background, present state of knowledge, significance in national defense and plan of attack; 2) the personnel, materials and financial requirements of the investigation; 3) the investigative facilities available for the research; 4) an estimate of its duration. The proposals were submitted by individuals, the so-called "responsible investigators", from universities, hospitals, foundations, governmental agencies and commercial firms throughout the country, sometimes spontaneously but more often at the instance of N.R.C. committees or C.M.R. staff. The proposals were sent either to the N.R.C. or the C.M.R. and, in either event, were usually considered by the appropriate N.R.C. subcommittee and parent committee before being presented at the weekly or ^{bi-weekly} semi-monthly meetings of C.M.R.

951 proposals for contract were examined by the NRC committees. The amount and adequacy of consideration noted to them of course varied with the calibre of the committee and particularly with that of its chairman. On the whole they were fairly and conscientiously regarded. 638 of these proposals were approved and recommended to the C.M.R. for contract, 313 were disapproved. At first, rejection of a proposal was made final by the N.R.C.; later, as the incorrectness of this procedure was recognized, responsibility for the rejection was assumed by C.M.R. The C.M.R. uniformly upheld decisions of the N.R.C. committees in the matter of rejections. They approved 501 of the 638 proposals recommended by the N.R.C.; the recommendations refused by C.M.R. had, for the most part, been forwarded by the committees with a "B" or "C" rather than with an "A" rating.

Valuable as was the advice of the N.R.C. committees, C.M.R. was of course under no obligation to ask for it. As its members became more familiar with the interests of the Services and particularly after its reorganization in 1944 provided it with an adequate staff, the Committee recognized fields which were being insufficiently explored and requested particular groups to undertake work within them. 87 additional proposals for contract were approved by C.M.R. without prior consideration by the N.R.C. committees.

2. Number and Distribution of Contracts. Of the 588 contracts recommended by C.M.R., 193 were made in the year ending 1 July 1942. In the two succeeding years there were 182 and 103 new contracts respectively and, in the period ending August 1945, 110. The fields with which these contracts concerned themselves and the amounts of money devoted to each appear in Table IV. Table V lists the organizations with which contracts were effected and Table VI the geographical distribution of contracts by States. These tables may be summarized in a single sentence by the statement that ^{the cost to the United States of four hours of the War,} approximately \$24,000,000 was expended in 588 contracts with 133 organizations in 29 States, the District of Columbia and the Canal Zone.

3. Usual Terms of Contracts (Appendix 2). Approval of a proposal by C.M.R. resulted in a recommendation to the Director O.S.R.D. that a contract be prepared between O.S.R.D. and the (organization with which the individual preferring the proposal was connected.) With four exceptions the recommendations were adopted. The contracts were usually drawn for six or twelve months, though the right to cancellation by the O.S.R.D. after 30-days notice was admitted, and were extended or not thereafter as the progress of the research and the shifting demands of the program warranted. The contractor agreed to conduct investigations in the field which was defined, to furnish such progress and interim reports as CMR requested and to prepare a final report upon completion of the work. He was to be reimbursed at monthly intervals upon presentation of vouchers covering salaries and wages, materials and services, communications and shipping, travel and insurance. In the case of non-profit institutions, 50 percent of the salary and wages item was allowed as institutional overhead except in the case of universities which had a large number of contracts. The salaries of staff members of non-profit institutions who were working upon contracts were paid by the institutions until July 1943 but thereafter was considered an acceptable item for inclusion in the contract. In the case of classified investigations, the contractor agreed to observe provisions of the espionage act

concerning disclosure of information and not to employ aliens or permit them access to subject work without specific permission from O.S.R.D. A provision requiring adherence to the 48-hour week was included in the contract. The patent provisions are reserved for separate discussion (vide infra). Property purchased under the contract was to be returned to the Government at conclusion of the work or purchased by the contractor under terms considered fair and proper by the Government. This is the only clause which has given rise to some dissent on the part of the contractors. Its essential justice cannot be denied but highly specialized equipment is not likely to serve any useful purpose when returned to the Government and the Universities are often not in a position to pay a price for it which the Government considers "fair and proper".

4. "Token" Contracts. O.S.R.D. was frequently approached with requests for contracts to perform research in which no financial assistance was desired. In the first year of its existence it acceded to seven of these requests concerned with work in which it was properly interested. The procedure was, however, felt to be ~~under~~ undesirable for many of the requests appeared to be motivated by a desire to retain research personnel or to obtain priorities for material or to gain familiarity with the work of other OSRD contractors in the field. In May 1942 the OSRD therefore (ANR 7 correct) decided to reject such proposals "as a matter of policy"; thereafter only three such contracts were accepted and these under exceptional circumstances. OSRD continued to aid firms to retain key laboratory personnel on problems of particular concern to it, but did so as an expression of interest in the work rather than as a contractual obligation.

5. "Agreement" Contracts in Field of Penicillin Synthesis. Immense and time-consuming difficulties were encountered in the attempt to produce penicillin by cultivating the mold P. notatum. It was therefore highly desirable to produce the drug by synthetic means. To accomplish this synthesis the chemical structure of the drug had to be accurately identified. If this could be established an unlimited

amount of penicillin could be produced at what might well be an inconsiderable cost. Preliminary work had been carried on independently by a number of commercial firms since 1941 and considerable progress had been made. It appeared that a cooperative attack on the problem might be successful. Recognizing this possibility and its importance in the fall of 1943, the Director upon GMR's recommendation, appointed a special committee, with Dr. Hans T. Clarke of Columbia University as chairman, to survey the field. The committee reported that such an attack was justifiable and, indeed, expressed the hope that it might yield conclusive results within six months. On recommendation of Dr. Clarke's committee contracts were made with three Universities, the Dept. of Agriculture and eleven commercial firms. The contracts with commercial firms were unique in providing an agreement for complete interchange of information through the Government between all contractors in the field. No Governmental funds were involved. ^{refd} Each contractor agreed to give the Government all the information it had acquired concerning the purification and chemical structure of penicillin prior to signing the contract and to report the progress of his studies at monthly intervals. By this means each contractor was kept informed of the advances of all other contractors and, though the chemical structure of penicillin was not established at the end of the War, definite progress had been made in its elucidation. The patent provisions of these contracts will be described subsequently.

6. Non-Contractual Encouragement of Research in Field of Penicillin

Production. In the summer of 1941 Professor Howard Florey of Oxford University came to the United States to attempt to arrange for the large-scale production of penicillin. In his own laboratory Dr. Florey had produced enough of the drug to provide convincing evidence of its effectiveness against a wide variety of bacterial infections in small animals but the difficulties which attended its production were so great that nearly two years of work had only yielded sufficient to treat five patients. After visiting the Northern Regional Research Laboratory of the Department of

agriculture at Peoria, Illinois, and several commercial firms, Dr. Florey came to Washington to see the Chairman C.M.R. The Chairman appreciated the potential importance of the drug and it seems fair to say that the vigor and imagination with which he promoted its production entitled him to more credit than any other single individual in making penicillin available for use during the War. The early role of C.M.R. was to encourage the initial interest of commercial firms in the possibilities of the drug, to coordinate the results of their research and to arrange with the War Production Board so that they might receive priorities for the equipment of their laboratories and pilot plants. Meetings were arranged in September and December 1941 by the Chairman and were attended by representatives of the Division of Chemistry N.R.C., the Department of Agriculture and the pharmaceutical firms of Merck & Co., Chas. Pfizer & Co., E. R. Squibb & Sons and the Lederle Laboratories. The firms agreed to make the considerable financial outlays necessary to prosecute the research. They agreed that the findings of any one group would be conveyed to the others through the medium of C.M.R. The Peoria Laboratory of the Department of Agriculture agreed to report its findings to all the other groups and to make periodic visits to their laboratories and give such advice and assistance as seemed indicated.

As the results of this research flowered and penicillin became available, C.M.R. assumed the responsibility of making a clinical evaluation of the drug. This responsibility was delegated to Dr. Ferrin H. Long, Chairman of the N.R.C. Committee on Chemotherapy and Other Agents and to his successor in that office Dr. Chester S. Keefer ^{date} who subsequently became Medical Administrative Officer of the C.M.R. Until ^{February} ~~January~~ of 1943 penicillin for the clinical testing program was supplied gratis to C.M.R. by the commercial firms to a value of several hundred thousand dollars. Thereafter C.M.R. expended nearly \$2,000,000 in purchasing penicillin for that purpose. The first patient was treated in March 1942. By March 1943 a series of 200 cases had been collected and sufficient penicillin was available to

to inaugurate an experimental study on wounded soldiers at Bushnell General Hospital. By the spring of 1944 the needs of our Army and Navy and those of our British Allies could be satisfied from current production and considerable amounts were being diverted to civilian use.

At the instance of C.M.R. the War Production Board cooperated vigorously and effectively in the production program. In May 1943 they provided AA-1 priorities for selected commercial firms. As a result, within a year, 21 large plants costing some 20 million dollars had been erected and equipped. The monthly production of penicillin, which had approximated 80 million units in May 1943, became 117,527 million units in June 1944. The W.P.B. arranged monthly meetings of the penicillin producers at which information could be exchanged and, for purposes of this exchange, the Department of Justice agreed to waive application of the anti-trust laws. On 16 July 1943 the W.P.B. issued allocation order H-338 partitioning all penicillin amongst the Army, Navy, Public Health Service and, for purposes of clinical testing, the C.M.R. On 1 May 1944 when the amounts available for civilian use were greater than could be handled by C.M.R., the W.P.B. established a Civilian Penicillin Distribution Unit in Chicago to allocate supplies to 1000 selected hospitals.

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7. Classification of Contracts. The classification of each project was determined by GMR at the time it was recommended for contract to the Director OSRD. 134 contracts were initially classified as "restricted", 62 as "confidential", 19 as "secret" and the remainder as "open", numerous changes being made in classification during conduct of the research. Assigning a subject to the restricted category did little but prevent publication of its results. ^{after a bar} On the other hand, assignment to confidential or secret categories involved numerous complications. All workers who were to have access to any of the plans or results of such investigations had to be "cleared" (i.e. investigated and approved by the Army, Navy and F.B.I.) prior to beginning work. This procedure required a minimum of two weeks and often much longer than that. All laboratory notes and records had to be kept in locked filing cabinets or safes. Information concerning the work could not be disclosed to persons not actively participating in it unless specific authorization was obtained. Progress reports of the investigation could only be circulated amongst cleared workers in the same field. All correspondence dealing with the contracts had to be transmitted in double envelopes by registered mail and its receipt had to be acknowledged.

These various procedures had more than a nuisance value. They delayed the initiation of research and interfered with its rapid accomplishment. They may have been desirable in investigations upon the synthesis of penicillin and new antimalarials and in certain phases of chemical warfare and aviation medicine though, in retrospect, it would seem that even these subjects could have been covered by restrictions on publication. Certainly it was unnecessary to blanket the whole subjects of chemical warfare and aviation medicine as GMR did. The overzealousness of GMR in this regard was a reflection of the fog of suspicion and secrecy which blanketed Washington and which was taken less and less seriously as one approached nearer the enemy. The street lights of Washington were dimmed but the Chinese lighted their night fires within a mile of Myitkyina.

Personnel. Throughout the existence of CMR 5431 individuals were employed on its contracts of whom 644 were doctors of medicine, 1038 doctors of philosophy or science and 3749 technicians, animal caretakers and so on. In July 1945 2462 individuals were actively engaged in the research program. The amount of time and effort which was expended in attempting to retain this relatively small group of personnel on research projects and prevent their induction into the Services was enormous and became increasingly so from 1942 onwards.

In the case of medical personnel the avenue of approach was through the Office of Procurement and Assignment of the War Manpower Commission. Responsible investigators with each contract were instructed to see that the names of their personnel were included on the roster of essential teaching and scientific personnel which was prepared by each institution and sent to the State Chairman of Procurement and Assignment. CMR appreciated that Procurement and Assignment was under compulsion to supply a monthly quota of doctors to the armed forces. It therefore instructed its investigators to utilize 4-F and female personnel as far as possible in their research and to include on the roster only those individuals who were devoting a large part of their time to the investigation and who were, in fact, essential to its effective prosecution. If, despite the presence of his name on this list, the individual was classified as 1-A or was directed to apply for a commission in the Medical Corps by the local Selective Service Board, his institution was directed to appeal the decision and to write both the State Chairman Procurement and Assignment and CMR about the case. CMR thereupon communicated with both Selective Service and Procurement and Assignment, endorsing the request for deferment and asserting its interest in the individual.

In the case of non-medical personnel the avenue of approach was through the Selective Service Boards. When the responsible investigator certified to CMR that such personnel was essential to his research, the institution under contract was instructed to file an application for deferment (Form 42-A) with the local Board

specifying, in accordance with Selective Service Bulletin #101, that the individual was "engaged in scientific research related to the war effort and supervised by a recognized Federal agency". CMR then wrote the local Board endorsing this request and, if it was refused, reaffirmed its interest when an appeal was made to the State Board. Since deferments were only granted for six months the procedure had to be repeated at the end of that time. In May 1943 the War Manpower Commission established a "reserve list for scientific and technical research workers" and responsible investigators were required to send lists of contract personnel, with monthly supplements, to CMR for submission to the War Manpower Commission committee which compiled this list. After August 1944 the deferment of non-medical personnel was handled by the scientific personnel office of OSRD rather than by CMR itself.

An occasional Selective Service Board was of course encountered which would not admit any connection between research and the War but, by and large, admirable cooperation was obtained from both Selective Service and Procurement and Assignment and there were few compulsory losses of research personnel into the Services. The trouble was not with cooperation from Federal agencies but with the system itself. Aside from the inordinate amount of work involved for CMR, no responsible investigator could be confident of retaining his research personnel except on a very temporary basis and there was a natural reluctance on the part of both medical and non-medical men to ask for repeated deferments in order to "escape" going into the Army. There was a very considerable loss of personnel by "voluntary" induction or enlistment into the Services and the progress of many researches was materially hampered thereby. The deferment of CMR personnel was of course but a small part of a very large problem. No one can say that the problem was handled adequately during the War. It seems obvious that scientific personnel, instead of being hesitantly and temporarily permitted to continue work upon research problems of national importance, should have been compelled to continue such work either in or out of uniform.

One way of circumventing the system as it existed would have been to allow

essential and then have Army or Navy assign them to work on research projects as long as their contribution was essential. In cases of special urgency this was attempted. The Navy was able to arrange such assignments for Medical Officers in a number of instances. The Army took its military requirements more seriously and never felt itself in a position to grant requests of this sort. In February 1944, as part of the malarial program which Army and Navy had repeatedly stated to be of primary importance for prosecution of the War, it became essential that CMR obtain twelve Medical Officers to assist in the clinical testing of new anti-malarial drugs. These Officers were only obtained from the Army after a personal appeal by the Director of OSRD to the Commanding General, Army Service Forces.

9. Human Subjects for Experiments. In several contracts it became essential to determine the effectiveness on human subjects of procedures which had been evolved in the laboratory before recommending them to the Services. Volunteers were obtained from groups of conscientious objectors and prisoners who agreed to serve as subjects in experiments which were always attended by discomfort and sometimes by danger. At conclusion of the studies the volunteers were given certificates of merit testifying to the very real usefulness of the roles they had played. The Army was properly unwilling to allow CMR investigators the use of military personnel for many of these objects but some experiments on measures for combatting fatigue were carried on with soldiers at Fort Sheridan, Illinois in 1942 and extensive studies of water requirements and the effects of water deprivation were conducted with desert troops in southern California between 1942 and 1944.

When the services of conscientious objectors were desired, application was made by CMR to the Camp Operations Division of National Selective Service Headquarters. If their approval was obtained and if no objection to the purpose of the research was made by representatives of the religious groups (American Friends, Mennonites, Brethren) who maintained the camps, the responsible investigator requested volunteers from amongst the occupants of a conveniently located camp. 246 subjects were obtained in this fashion

... dietary and climatic problems which involved, amongst other things, prolonged subsistence on starvation diets and at great extremes of temperature.

Prisoners were first used in the CMR program at the Massachusetts State Prison Colony in Norfolk, Mass., when 66 volunteers were injected with bovine albumin under terms of a contract with Harvard University. The Federal Penitentiary at Terre Haute, Indiana contributed 247 subjects for an investigation into the prophylaxis of gonorrhoea conducted by the United States Public Health Service and the Bureau of Prisons, Department of Justice. *(I suppose MPMs should or mention of this)* The largest and most important use of prisoners was made in connection with the testing of new anti-malarial drugs. 500 (ask G.C.) volunteers were concerned in these projects carried on under supervision of the Board for Coordination of Malarial Studies at the United States Penitentiary in Atlanta, Georgia, the Stateville Prison at Joliet, Illinois, the New Jersey State Reformatory at Rahway, New Jersey and the United States Army Disciplinary Barracks at Green Haven, New York.

Hospital patients who were to receive malaria as a form of treatment for their disease were logical candidates for participation in the malarial program and through cooperation of the appropriate State and City Departments, facilities of the following hospitals were put at the disposal of CMR investigators: Goldwater Memorial Hospital, N.Y.C., Bellevue Psychopathic Hospital, N.Y.C., Manhattan State Hospital, N.Y.C., Manteno State Hospital, Manteno, Illinois, Massachusetts General Hospital, Boston, Mass., Boston Psychopathic Hospital, Boston, Mass., Gaston Psychopathic Hospital, Memphis, Tenn. (check names and purpose with G.C.)

10. Results of Contracts. The scientific accomplishments of this program will be summarized in two volumes now (!!) in preparation and their quality and usefulness will speak for themselves. Their quantity deserves some mention in this place. A great proportion of the civilian medical research conducted during the years 1942-1945 was performed under contract with OSRD. As of 1 July 1946, 920 papers describing this work have appeared in scientific journals and 350 additional manuscripts have been approved for publication (NB these figures are as of 15 Dec. 1945 and will have to be changed). As unpredictable but considerable number must be still in gestation and will

continue to appear over a period of several years. Classification restrictions now prevent publication in but a few fields. In addition to journal publications a number of monographs and fasciculi have been and will be prepared. Three monographs totaling 1500 pages and summarizing advances in the field of chemical warfare are available for restricted distribution. In the field of malaria a four-volume monograph is in course of preparation which will describe the effectiveness and toxicity of over 14,000 anti-malarial drugs. The methods for synthesis of these compounds will be related in 300 papers of approximately 5000 pages to be published by the American Chemical Society.

11. Termination of Contracts. With almost incredible prescience the CMR began in the fall of 1944 to plan for the termination of its contracts. Such plans were essential since the Committee realized that Governmental support of medical research would be withdrawn soon after the end of the War. The majority of contracts were terminated as of 31 December 1945. About 50, of especial interest to the Army, were assumed by the Surgeon General's Office, the Office of the Quartermaster General, the Office of the Air Surgeon, and the Chemical Warfare Service and an additional 50 by the United States Public Health Service. Fifteen contracts were continued into 1946 in the hope that they would be taken over by the projected National Foundation. It was considered essential to continue the clinical testing aspect of the malarial program till the latest possible moment and for that purpose 14 contracts were extended to 30 June 1946, the termination date of OSRD activity.

ORGANIZATION OF C.M.R. AND SUPERVISION OF CONTRACTS.

1. Washington Office. The four civilian members of CMR had multitudinous and important responsibilities in their capacities as civilians of which it was impracticable to divest themselves. They all attended the daylong weekly or biweekly meetings of the Committee at 1530 "P" Street. From the time of the Committee's formation until the end of the War, the Chairman spent half of each week in Washington

and the other civilian members devoted two days a week to its concerns. Until the reorganization of the Committee in May 1944 its fulltime paid staff was exceedingly small. In September 1941 Dr. A. M. Walker was appointed assistant to the Chairman and in December Dr. S. V. Larkey became technical aide in charge of documents, a function which he had previously fulfilled for NRC. Technical aides were provided for the two most active NRC committees in December 1941, Dr. E. C. Andrus in Aviation Medicine and Dr. L. L. Waters in the Treatment of Gas Casualties. This personnel was reshuffled without being increased in June and July of 1942 when Dr. Andrus succeeded Dr. Walker as assistant to the Chairman, Dr. T. R. Forbes replaced Dr. Larkey and Drs. L.B. Flexner and Chester Stock replaced Drs. Andrus and Waters respectively with the NRC committees. Dr. Andrus remained the single technical aide responsible for CNR administration until January 1943 when he was joined by Dr. G. M. Guest. Shortly after this time the difficulty of maintaining research personnel on contract work became so acute that Dr. Guest was forced to spend the greater part of his energies in dealing with Selective Service Boards and the Office of Procurement and Assignments. Three additional technical aides were appointed during the remainder of 1943 but without directly affecting the administrative situation in the Washington office: Dr. J. T. Wearn undertook to coordinate projects in which the Quartermaster General was interested, Dr. J. L. Caughey was assigned to assist the newly-created NRC Committee on Convalescence and Rehabilitation and Dr. V. E. Hall became technical aide to the West Coast Consultant Panel (vide infra).

There are of course dangers in over-organization, perhaps particularly so in the field of medical research. It is also true that, in times of peace, supervision of research is unnecessary and coordination is gradually attained by ordinary channels of publication and scientific meetings. But CNR was dealing with a War. It had relied, perhaps too completely, upon the advice of NRC committees for formulating a research program. It was patently under-organized to effect ¹any effective ²supervision or ³coordination of the program it had launched. Supervision of the research was essential to appreciate rapidly the results which were being attained and to alter the direction

of its progress as the changing requirements of the War and the progress of other research here and abroad might indicate. Coordination was essential and could not be attained through publication of results for that was either impossibly slow or, in classified fields, altogether absent.

Several attempts were made to arrange for the supervision and coordination of research projects prior to the reorganization of 1944. In February 1942 the Chairman OMR directed a letter to the Chairman, Division of Medical Sciences, NRC, asking that the NRC committees undertake to supervise and correlate the projects which they had recommended to OMR and which had already been adopted. He suggested that meetings of investigators would be a useful means of effecting cooperation. This request does not seem to have been accepted as a definite delegation of responsibility. The effectiveness of the supervision necessarily depended upon the ability of the committee chairmen and the time at their disposal. In some instances effective integration was achieved: notably in the programs on aviation medicine, treatment of gas casualties, malaria, blood substitutes, venereal diseases and treatment of wounds and burns. In other instances little was accomplished. In the fall of 1942, again utilizing the services of the NRC committee chairmen, OMR asked for a critical evaluation of its OSRD contracts with the purpose of identifying those which should be prosecuted with vigor and those which should be terminated or not recommended for renewal. Seventeen chairmen made these surveys in their fields of special interest and reported their conclusions in meetings with OMR during December of that year. Utilizing another method, OMR appointed special advisers and consultants to inspect and report upon certain aspects of the research program; under this type of supervision Dr. F. C. Mann reviewed the investigations upon shock in March 1942 and Dr. W. H. Taliaferro those upon malaria in May of that year. These reviews were useful but, by definition, temporary and without continuity. In June 1942 Dr. J. C. Aub was invited to coordinate the investigations upon shock which were in progress in the vicinity of

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Boston and this coordination was continued with useful results throughout the War. A third attempt to establish coordination was made through the medium of the progress reports which, after February 1942, each investigator was required to submit to GMR at monthly and later at bi-monthly intervals. These reports were duplicated in the Washington office and distributed to responsible investigators under OSRD contract in the same field, to members of the NRC committees which had recommended the project, to the Offices of the Surgeons General and to the London office of GMR for distribution in England (15 copies).

These several attempts at supervision and coordination were all useful but were of themselves incomplete. As the research program expanded, as hundreds rather than scores of projects became involved, the Chairman and civilian members of GMR became loaded with an incredible mass of detail. Throughout the whole of 1943, indeed before that time, even the investigators' brief progress reports were scarcely read in the Washington office. Work under the contracts was proceeding, witness their results, but GMR was so underorganized that no one could have precise knowledge as to what was going on or had much time to devote to initiating new projects or to deciding whether existing projects should be expanded or curtailed. (GMR remained thus underorganized for two and a half years and the blame for this delay must rest upon the Chairman since the desirability for expansion was repeatedly pressed upon him.)

As a result of conferences initiated in February 1944 a reorganization of GMR was effected in May of that year (Table VII). A Chief Medical Administrative Officer was appointed with general responsibility for administering performance of all OSRD contracts. Under and responsible to him were five Division Chiefs in the fields into which medical military research was somewhat arbitrarily divided: medicine, surgery, physiology, aviation medicine and chemistry. A Records Section was established and, subsequently, a sixth Division of Malaria was added. All of the existing contracts were assigned to one or another of the Division Chiefs and they were permitted to recommend appointment of Deputy Chiefs, Consultants and Technical Aides to work under

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them. Each Division became responsible for supervising the contracts within its field. They assisted investigators in the problems of personnel and priorities for material which constantly arose. They coordinated the attack of several contractors upon a single problem not only by personal conferences but by group conferences and discussions. Through the Medical Administrative Officer they kept GMR informed of the progress of individual contracts and of general advancements within their fields. In the case of new projects the Division Chiefs maintained close liaison with the NEC committees and advised GMR on proposals which had been recommended by these committees. They were, of their own initiative, free to devise and submit to GMR proposals for contract. The personnel of these divisions was admirable and, within a few months after their formation, the program was integrated and actively supervised.

The Records Section established a central office which effected a greater degree of order in the acquisition and filing of progress, interim and final reports of contract investigators. It distributed progress reports more widely than had previously been the case though to the same general groups. It created a roster of contracts, listing under each the number and substance of the reports which had been received. In ^{April} ~~May~~ 1944 the Chief of the Section inaugurated a weekly bulletin which contained a summary of progress reports which had been received by GMR from open and restricted projects. The reports were abstracted and arranged by subjects in a useful and readable fashion. These bulletins were given a much wider distribution than the original reports and, by ^{July} April 1945, the edition had increased from 1000 to 2500 copies, 400 going to England, ³⁵⁰ ~~and 500~~ ^{and 200 3d Pacific} to the ETO. ~~Had the War continued it was planned to distribute the bulletin to all stable military installations in this country and abroad. This would have been a very valuable contribution for Army Medical Officers in the field had little knowledge even of published medical literature and none at all of research in progress.~~

This reorganization provided an organized and formal delegation of responsibilities whereby specific duties were assigned and accepted by specific officials of OMR. It insured against neglect of opportunity and inefficiency of execution of contract obligations. It had the most important effect of relieving members of OMR of excessive duties and to that extent freed them for the development of policies concerning choice of fields of investigation and formulation of investigative projects.

2. West Coast Consultant Panel. The administrative activities of OMR and NRC were necessarily conducted in Washington. They were necessarily surrounded by a certain aura of secrecy. There were no representatives from the West Coast upon OMR and, initially, only eight upon the NRC Committees. Unavoidable as this lack of representation was from geographical considerations, it had the unfortunate effect of making investigators from that area feel that they were uninformed and inadequately utilized in the research program. This feeling was apparent in the early spring of 1942 and was crystallized in September of that year when thirty investigators from San Francisco directed a letter to OMR stating that their usefulness was handicapped by ignorance of the work in progress and of the relative urgency of problems in the fields of military medicine. In point of fact there was little basis for this feeling. At the time the letter was written ⁸⁸ 88 percent of the active contracts (22 of 250) were in the hands of three Californian Universities. The percentage of proposals for $\frac{1}{2}$ contract from the West Coast which had been rejected by NRC Committees and OMR (42 percent) was somewhat lower than that (47 percent) from the country as a whole. Nevertheless the feeling existed and it is true that no special effort had been made to keep the West Coast informed of OMR activities. OMR replied to the letter by inviting two representatives of the group to visit Washington and, after the necessary preliminaries of clearance had been arranged, Drs. V. E. Hall and Eric Ogden spent several weeks in January 1943 examining the proposals for contract and the reports of investigations in the OMR files. After familiarizing themselves with the situation in Washington the representatives consulted with their group in

San Francisco and, in May 1943, made a report in which they recommended the appointment of official advisory commissions in natural geographical areas and of additional technical aides for the NRC committees. In consequence of this suggestion a Consultant Panel to OMR was appointed on 3 July 1943. Its members, all from California, were Drs. A. L. Bloomfield, Howard Haffziger and Linus Pauling. Dr. B. O. Raulston was subsequently added as an additional member and, in October 1943, Dr. Hall was appointed ^{part} full-time technical aide to the Panel. Its function was to insure that the investigative resources of the West Coast were fully utilized by organizing research projects and by analyzing proposals for contract prior to their submission to OMR. The arrangement was both reasonable and profitable. It could have been organized earlier and with less expenditure of emotion.

3. Separate Boards and Committees. When problems arose which required a peculiar degree of coordination or which did not fall in the purview of any pre-existing group, special boards or committees were created to handle them. Problems of this sort were encountered in the fields of malaria and insect control and in connection with work upon prosthetic and sensory devices.

a. Board for the Coordination of Malarial Studies. The search for anti-malarial drugs which might prove superior to atabrine in potency and preventive effectiveness constituted a particularly difficult and laborious study. Each of the 14,000 compounds examined had to be prepared or synthesized and tested for both suppressive and preventive action on several types of avian malaria. The more promising compounds had then to be examined for toxicity on animals and man and their clinical effectiveness determined at first upon small groups of civilians and finally on large bodies of troops in the field. Such studies involved the accurate and continuing cooperation of many groups of investigators in different institutions and in different parts of the country. An Office for the Survey of Antimalarial Drugs was

established within the Division of Chemistry, NRC, in July 1942. The function of this office, under contract with OSRD, was to collect and codify the mass of chemical, pharmacological and clinical data which was to be developed in the succeeding years and to make this information available to investigators in this country and the British Empire within the limitations of military security and the commitments which had to be made to commercial firms. Initially the studies upon malaria were coordinated by a series of "conferences on malarial research" called by the Subcommittee on Tropical Medicine of the NRC. In January 1943 a more formal integration was accomplished by appointment of a Subcommittee on Coordination of Malarial Studies within the National Research Council. Dr. Frederick M. Hanes was Chairman of this Subcommittee which had three, later four, subsidiary Panels dealing with the chemistry, clinical testing, pharmacology and synthesis of anti-malarials under the chairmanship, respectively, of Drs. W. M. Clark, J. A. Shannon, E. K. Marshall, Jr., and C. S. Marvel. As the work was pushed with greater vigor and assumed greater importance, and as the need for closer cooperation with the malarial studies of the Services became apparent, the Chairman of the NRC Division of Medical Sciences suggested that an independent Board for the Coordination of Malarial Studies be established. Such a Board was appointed and held its first meeting in November 1943. It received its financial support from OSRD funds. As finally constituted under the chairmanship of Dr. R. F. Loeb, Jr., it contained seven representatives of the three Surgeons General, the Chairmen of the four NRC Antimalarial Panels, Dr. A. R. Dochez, Member CMR, and Dr. G. A. Carden, Jr., Chief of the CMR Division of Malaria.

The Board supervised and directed the malaria program with distinguished success and provided a model of effective cooperation between civilian and military which might well have been followed in other fields. The representatives of Army, Navy, and Public Health Service were not general liaison officers present to ask or

receive advice from an NRC committee but were voting members of the Board. They were investigators and specialists in malaria of their own right who were in a position within their Services to effectuate measures which the Board might recommend. They brought to the attention of the civilian members exigent military problems with which the latter were unfamiliar and arranged for prompt and adequate field trials of procedures developed in the course of civilian investigation.

b. Insect Control Committee. The number of Governmental agencies concerned with problems of insect control made coordination particularly desirable in this field, especially so after the importance of DDT was discovered. OSRD was concerned in the program not only through OMR, which had contracts with the Bureau of Entomology of the Department of Agriculture and the Fish and Wildlife Service of the Department of Interior as well as with numerous civilian institutions, but also through Divisions 9 and 10 of NDRC which were working upon the chemistry and dispersion of DDT. Outside of OSRD, the Federal Security Agency was involved through its Food and Drug Administration and Public Health Service and both Navy and Army were conducting research, the latter through the Quartermaster General and the DDT Committee of the Surgeon General's Office.

At the instance of Dr. M. C. Winternitz, Chairman of the OMR Division of Chemistry, ^{ABH} an Insect Control Committee was appointed by the Director of OSRD in September 1944. In the preliminary meeting which determined the organization of this Committee it was agreed that its primary function should be the coordination of research within the OSRD. The function of advising and coordinating the similar research in other Governmental agencies was specifically excluded from its province though the Executive Order establishing OSRD (Par 2 e) would appear to have permitted such an exercise. In consequence of this decision its membership was limited to representatives of the various OSRD groups which were immediately interested.

Dr. Winternitz was designated Chairman and its members included Drs. Roger Adams, W. R. Kirner, W. A. Noyes and A. T. Waterman of NDRC and Drs. A. B. Hastings and J. T. Wearn of OSRD.

The Committee fulfilled capably its assigned function of coordinating the research projects upon insect control within OSRD. It was able, informally, to assist in the wider coordination of the insect control program by inviting attendance of liaison officers from Governmental agencies at its meetings and by distributing a semi-monthly bulletin containing abstract reports of classified and unclassified research in progress within this country and abroad. It also established an Information Centre where it collected and made available to interested agencies a vast amount of data on the chemical and biological characteristics of insecticides and repellents, upon the mechanism of their action and the methods for their dispersal. By these means it sensibly improved the situation which existed at the time of its organization, when agencies outside of OSRD were not only unfamiliar with the details of each other's activities but were even unaware of one another's interest in the field. In view of its effective conduct it seems a proper subject for regret that the formation of the Committee was so long delayed and that it was not designed to formally integrate the OSRD program with that of other Governmental agencies.

e. Board for Prosthetic and Sensory Devices. In December 1944 the Surgeon General of the Army requested the Panel on Amputations of the NRC Subcommittee on Orthopedic Surgery for assistance in establishing standard specifications for artificial limbs. Since the problem went beyond the field of orthopedic surgery into that of engineering and required cooperation of the industrial firms concerned

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in the manufacture of limbs, the Panel on Amputations arranged for a conference in late January 1945 at which representatives of the NRC Division of Engineering and Industrial Research and of the industrial organizations were present as well as liaison officers from the Surgeons General and the Veterans Administration. At this meeting specific recommendations for standardization were made to the Surgeon General of the Army. The desirability of conducting research and development to improve artificial limbs was recognized by the conference and a Committee on Prosthetic Devices was therefore appointed by the NRC Divisions of Medical Sciences and Engineering and Industrial Research under the chairmanship of Dr. P. E. Klopsteg. The personnel of the committee included three orthopedic surgeons, Drs. H. R. Dean, P. B. Magnuson and P. D. Wilson, three engineers, Dr. R. R. McMuth, Messrs. Mieth Maser and E. M. Wagner, two consultants, Dr. C. F. Kettering and R. D. McClure, and an Executive Secretary, Dr. M. J. Martin and liaison personnel from the Army, Navy, Federal Security Agency, Veterans Administration and National Bureau of Standards. Army and Navy amputation centres were designated by the Surgeons General to serve the Committee as testing facilities. The research program was supported by recommendation of OMR under contract between OSRD and the National Academy of Sciences, subcontracts to industrial firms and foundations being let upon advice of the Committee on Prosthetic Devices.

With the design of developing reading and guidance aids for the blind, a Committee on Sensory Devices was formed in February 1944. Since the subject work of this group did not fall clearly within the purview of either NDRC or OMR it was

at first appointed outside of both groups and directly under the Director of OSRD. Dr. G. W. Corner was Chairman of the Committee. Its membership included a physicist, Dr. H. A. Barton, two physiologists, Drs. A. J. Carlson and W. O. Fenn, a physiologist, otologist, Dr. S. R. Guild, and a psychologist, Dr. K. S. Lashley. Drs. A. A. Bombe, Brian O'Brien and E. G. Wever served the Committee as consultants. Eighteen months after the formation of this latter committee it was decided to align its work with that of the Committee on Prosthetic Devices because of their common concern with the rehabilitation of wounded veterans. Accordingly a Board for Prosthetic and Sensory Devices was established within the NRC in August 1945. The research upon sensory devices was thereafter supported, as had been that upon prosthetic devices, by GMR through the medium of a contract between OSRD and the National Academy of Sciences. The membership and consultants of the Board included the Chairmen of the two preexisting Committees, the consultants of the Committee on Sensory Devices and Dr. O. E. Buckley of the Bell Telephone Laboratories. Since the subjects of investigation were of continuing importance, the Army undertook to carry on the researches after termination of the OSRD contract 31 October 1945.

LIAISON

1. London Office. At the first meeting of CMR in July 1941 the desirability of establishing a liaison office in London was voiced. NDRC had established such an office for exchange of information in the mechanisms and devices of warfare and the arrangement had proved profitable. The Rockefeller Foundation was approached with the thought that its London representative, Dr. Daniel P. O'Brien, might be induced to conduct liaison for CMR in addition to his other duties. This proved to be impracticable. At the meeting of 19 November 1941, Dr. Kenneth B. Turner of New York was selected to establish the London Office. After familiarizing himself with the plans and procedures of the NRC committees on military medicine and visiting a number of OSRD research projects Dr. Turner reached London in February 1942. He remained there until 1943, with an interlude of three months in this country, and was succeeded by Dr. Joseph W. Ferrebee. In December 1943 Dr. Ferrebee was in turn replaced by Dr. Hamilton Southworth, who was already in England representing the Office of Civilian Defense and who remained in charge of the office until it was closed in June 1945. On the single occasion (November 1944 to February 1945) when he returned to this country, his place was filled by Dr. L. L. Waters, a CMR Technical Aide who had been sent to England with two other CMR investigators to work in the Porton chemical warfare laboratories.

The primary purpose in establishing the London office was to keep CMR informed of British research in military medicine at a time when security classification and delay in mails grossly impeded the usual interchange of information. The NRC had already arranged for an exchange of the minutes of its committee meetings with those of the English Medical Research Council but the exchange was not prompt and minutes are rarely an adequate summary of transactions. The successive liaison officers established relations with the Medical Research Council, attended meetings of their numerous committees and visited laboratories where research was in progress.

~~Investigations~~ they sent weekly news letters to GMR and special reports of investigations for distribution to the committees and investigators who were concerned with similar matters in this country. By way of return they distributed to British investigators copies of the progress reports of GMR projects and of the Summary of Reports issued by the GMR Records Section after 10 April 1944. Another function of the liaison officers was to arrange and facilitate the visits to England which were periodically made by GMR investigators. The exertions of the London office were profitable to both countries and, if the evidence of formal correspondence be accepted, measurably increased friendly relations between English and American workers.

In May 1945, and on the advice of Dr. J. T. Wearn who had just returned from a mission to the Philippines, it was proposed to establish a liaison office for GMR in the Pacific. The primary purpose of the London office had been the exchange of scientific information garnered from laboratory research. The primary purpose of the Pacific office would have been to obtain accurate knowledge of problems encountered by troops in the field and to learn quickly and directly when old problems changed in importance or new problems appeared. Such knowledge would have allowed GMR to arrange for sending special research teams to the field when their despatch was indicated and to better guide the research program at home. Its acquisition would have demanded much closer cooperation with the Services than had previously existed but, in the Pacific areas, this cooperation seemed possible of attainment. It was the intention to establish this office at a proposed branch of the Office of Field Service, OSRD, in the Philippines. The War ended before the plans could be further crystallized or put into effect.

A counterpart of the London office was established in Washington after the visit of Sir Henry Dale to this country in January 1942 with Professor J. H. Burn as the first representative of the Medical Research Council. He was succeeded, in turn, by Drs. B. S. Platt, A. D. Macdonald and E. E. Pochin. In March 1944, Colonel Ewan Downie came to Washington to represent Australia as a medical liaison officer and

to represent South Africa. After October 1944 Dr. E. J. Rigwood represented Belgium at Washington in a similar capacity.

2. Missions to England and Beyond. Useful as the London office was it could not of course achieve the perfect liaison which is obtainable, and only obtainable, by direct personal contact between investigators. The desirability of sending individuals to England was therefore early envisaged by CMR and, either upon its initiative or that of British agencies, visits were arranged and carried on throughout the War. All American representatives were either OSRD consultants or were appointed such for the purposes of the visit. The missions served important functions. They established many cordial personal relationships and provided an understanding of the problems faced by the two countries. They frequently succeeded in coordinating research programs. They always resulted in a gain of information; and if, towards the end of the War, the British profited rather more than we by this exchange, the reverse was equally true at the War's beginning.

The first of these visits occurred in February 1942 when Dr. W. A. Miles, proceeded to England at invitation of the British Air Ministry to investigate problems of pilot fatigue. Dr. Miles remained there till May 1942 making extended field trips with R.A.F. bomber, fighter and coastal commands and examining the studies being conducted under the Flying and Personnel Research Committees.

Dr. (later Colonel) Willard Machle, director of the medical laboratory of the Armored Vehicle Unit at Fort Knox, Ky., visited England from 8 June to 12 July 1942 to study physiological and technical problems of tank warfare. He inspected operational establishments and laboratories and collected relevant data not contained in previous reports. The projected research programs of the two countries were discussed at length. Uniform methods of expressing results were agreed upon and work on subjects for which facilities were not immediately available in England was allocated to American investigators.

Upon invitation of the Medical Research Council Drs. W. A. Sawyer and

England in July and August of 1942 to give advice upon the health and welfare of factory workers. They advised that the number of medical factory inspectors be increased and that they be placed under control of the Ministry of Health rather than the Ministry of Labor and National Service. They made specific recommendations in regard to factory supervisors, factory medical services, ventilation and working hours.

Dr. M. G. Winternitz went to England in July 1942 at the request of the Ministry of Supply and with the purpose of establishing closer cooperation between American and English investigators in chemical warfare. He visited all the laboratories and the leading workers concerned with this subject. He was impressed with the advantage of the centralized research carried on by the British at Porton and recommended that their example be followed in this country. In consequence of this recommendation OSRD contracts at Universities throughout the country were gradually terminated and a much enlarged establishment was created at the Edgewood Arsenal in Maryland where the subject matter of the contracts was carried on under the Chemical Warfare Service. Agreement was reached with the British on a standardized symbol code and it was decided that American investigators would write and publish a manual which should collect all bibliographical material in the field and serve as a basis for military and civilian training.

Pursuant to a recommendation of Dr. Winternitz, Dr. E.M.K. Gelling spent six weeks in England during November and December 1942. He reviewed British investigations and consulted with investigators in the fields of aviation medicine, chemical warfare, anti-malarial drugs, penicillin and insect repellents. Dr. Turner being absent from the London office at this time, Dr. Gelling wrote several issues of the weekly news letter.

Dr. Howard Naffziger was sent to England in June 1943 to inspect British neuro-surgical work. After studying the organization and clinical methods of hospitals in England and Scotland, he visited American and English installations in North Africa

attended a conference on penicillin at Tripoli and returned to this country in September. He was particularly impressed by the desirability of establishing special centers and special neurosurgical units for the treatment of cranial, spinal and peripheral nerve injuries and urged that our Army follow the British practice in this regard. He also advised the use of more complete record forms for cases of peripheral nerve injuries.

Dr. J. E. Moore, visited the British Isles between 17 July and 28 August 1943. He collected figures on the rising incidence of syphilis amongst British civilians and armed forces and observed the methods for control and treatment which were in effect. Dr. Moore made a survey of venereal disease conditions in the ETOUSA for the Surgeon General with the proviso that it could not be submitted to OMR or other civilian agency.

During July and August 1943, Dr. R. D. Coghill, consultant to OMR on penicillin, surveyed the British methods of penicillin production and advised them of our progress in that direction. Information was exchanged on the status of penicillin synthesis which was being pursued in both countries. In October 1944, Dr. Coghill returned to England to represent OMR at an international conference called to establish a standard for penicillin.

The effectiveness of penicillin therapy in the treatment of wounds and burns was examined by Dr. A. O. Whipple during a trip to England and North Africa in August and September 1943. He was particularly concerned with the local use of penicillin and visited all civilian and military hospitals where this procedure was being studied. He conferred with Drs. Florey and Colebrook, with Col. Churchill at NATCUSA and Major Lyons at Halloran General Hospital. He advocated the use of penicillin ointment in the treatment of wounds and compound fractures and, for a single application, in the case of burns.

Dr. W. Brock, visited American and British air force units in England and North Africa during late August 1943. He observed the operational use of American and British equipment and reported on activities in the field of aviation physiology.

At invitation of the Military Research Committee, GMR sent a Malaria Mission composed of Drs. R. F. Loeb, Jr., and J. A. Shannon to England in early April 1945. The purposes of the mission were to integrate the British and American programs so that the two would be more complementary and to obtain a more precise understanding of the status of British investigations. The British Malaria Committee called three special meetings at which Drs. Loeb and Shannon detailed the American program. Confidential information on the synthesis of new anti-malarial compounds was placed at the disposal of the British Confidential Panel on this subject who agreed to use it in guiding the work upon synthesis in England. Arrangements for further interchange of confidential information were perfected.

At the instance of the Division of Medicine, CMR, the Surgeon General of the Army requested the Office of Field Service, OSRD, to send a mission of civilian psychiatrists to the ETO to make a scientific study of "combat exhaustion" and related psychiatric casualties. Five men were selected and started, 16 April 1945, on a three months mission through Germany, France and Great Britain: Drs. L. H. Bartemeier, L. S. Kubie, Karl Menninger, John Romano and J. C. Whitehorn. The war was so nearly over and the fighting so scattered at the time of their arrival in Germany that the members had no opportunity of studying acute casualties at clearing stations as they had planned to do. They were, however, able to see less acute casualties and to talk with neuropsychiatrists at American and British installations. They made an 80-page report to the Surgeon General describing the clinical picture of combat exhaustion, outlining its treatment and making recommendations and suggestions for further study.

These missions to England and beyond were reciprocated by visits from British scientists and visitors from other countries. At the suggestion of CMR, the Director OSRD cabled Lord Hankey, Chairman of the Scientific Advisory Committee of the War Cabinet, in October 1941 inviting a visit by a "medical man of high distinction" to assist us in planning a program which should be integrated with that of the British. Lord Hankey accepted the invitation for Sir Henry Dale, President of the Royal Society and, traveling under the aegis of the British Medical Research Council, he reached the States in January 1942. In company with Professor E. D. Adrian, member of the Medical Research Council who was in this country upon invitation of the Rockefeller Foundation, Sir Henry came to Washington and met with the CMR and its Consultants on the 8th and 14th of that month. The visit was useful in acquainting both CMR and the British representatives with the organization and status of research in the two countries and, as an important incident of it, plans were perfected for permanent liaison in London and Washington.

The NRC established such close relations with the medical scientists of Canada by attendance at each others committee meetings and by interchange of minutes that their visits escape formal record. From more distant countries to visit GMR and inspect the progress of contract research throughout the country, came 63 scientists from England, 14 from Australia and New Zealand, 6 from Russia, 4 from India, 3 from France, 3 from China, 1 from Sweden and 12 from South America.

3. Missions to Other Theaters. The first mission sent out by GMR, in point of time, was that of Drs. P. H. Long and I. S. Navdin to Honolulu, 17-22 December 1941. They inspected the wound and burn casualties inflicted at Pearl Harbor and, at a later date, returned to Army and Navy Hospitals on the west coast to further study the same cases during convalescence. On the basis of these studies they made recommendations to the Surgeons General and to the committees on surgery and chemotherapy of the NRC. They were much impressed with the results of local sulfonamide therapy, more impressed, as it has turned out, than was entirely justified. Ed.

The British initiated a combined British-American-Canadian surgical mission to Russia which reached Moscow on 2 July 1943 and returned to England, their point of departure, 30 July 1943. Lieutenant Colonel Loyal Davis, USAMC, was appointed to represent GMR and NRC on this mission; Colonel E. G. Cutler and Dr. Wilder Penfield of Canada were other members. The meetings permitted an exchange of information concerning the medical and research organization of the two countries. The members visited front line and base hospitals and reported on the methods of evacuation and surgical techniques employed by the Russians.

A second mission to Russia, sponsored by GMR, was made by Dr. A. Baird Hastings, Member GMR, and Dr. Michael Shinkin, a Russian-speaking Surgeon of the United States Public Health Service, in response to a suggestion by the Soviet Government. Drs. Howard Florey and A. N. Sanders represented Great Britain on this mission. Manuscripts were prepared by American workers and delivered to the Russian authorities

by Dr. Hastings describing the status of investigations on B.A.L., penicillin, epidemic typhus vaccine, plasma protein fractionation, use of atabrine, insect control and the treatment of wounds and burns. These reports were discussed with leading Russian investigators at a series of conferences and the mission visited all the important teaching and research institutes in the Moscow area. It was felt that a very free and profitable interchange of information had occurred and it was hoped that the visit had established the basis for an enduring relationship. Attempts to have Russian scientists visit this country in a similar capacity and to send another mission to Russia unfortunately proved unsuccessful, though some contact has been maintained by an exchange of literature. ^{Ed.}

Drs. G. A. Carden, Jr., and J. A. Shannon went to Mexico, Guatemala, Costa Rica and Panama in August 1943 in search of a locale suitable for the field study of new anti-malarial drugs. It was decided that the immunity of the population was too high and the possibility of supervised treatment too small to make a successful study possible and a team of three CMR investigators which had been installed in Costa Rica was recalled. Two years later Dr. Carden, accompanied by Dr. R. B. Watson, was sent to Peru by CMR to inspect a field study in malaria suppression which was being carried out by the International Health Division of the Rockefeller Foundation. The new drug 761B, which had been developed by CMR investigators, was being used ^{then} in a controlled study. The results were promising and the study is to be resumed in 1946 on a larger scale.

The last four missions to be mentioned were sent to the Southwest Pacific, Pacific and Indian areas at request of the Commanding Generals of those theaters and of South East Asia Command (British). The requests were transmitted by the Office of Field Service, GSEAC, and the personnel was selected by CMR.

A malaria mission composed of Dr. F. C. Bishop and Dr. R. B. Watson went to the Southwest Pacific Theater in July-August 1944. They traveled through Australia

and New Guinea visiting American and Australian installations. Recommendations were made to theater headquarters on the organization of malaria survey and control units, on procedures for the control of malaria and scrub typhus and on research projects which could be carried out in the field.

Dr. J. G. Hopkins followed the malaria mission to the Southwest Pacific in September 1944. He spent six months investigating the skin diseases which constituted such a serious problem in that region, visiting the Philippines as well as Australia and New Guinea. He advised the despatch of several mycologists to the theater to conduct research on specific problems and made recommendations for the prevention and treatment of dermatophytosis and other conditions and for further study of lichen planus and eczematoid dermatitis.

Dr. Sidney Robinson was sent from the University of Indiana, where he had been conducting valuable studies on clothing, to India, Burma and Ceylon in June 1945. He made observations on the effects of clothing, climate and food on the performance of ground troops in these areas and returned to the States in August 1945.

The last mission, in point of time, was that undertaken by Dr. C. K. Carpenter who went to the Philippines in September 1945 to make a study of chancroid with special reference to improved methods for its diagnosis.

4. Liaison with the Services. ¹⁸⁸⁸⁸ The single reason for the existence of GMR was to be of use to the Services. In order to be ^{of} use it was essential that GMR be informed of the needs of the Services, the lacunae of knowledge that could be filled by civilian investigative work. It was equally essential that the knowledge gained as a result of civilian work be promptly imparted to the Services. The formal organization to establish this liaison appeared adequate. Sitting as members of the GMR, and therefore acquainted with its intentions and findings, were the Chief of Preventive Medical Section, Office of the Surgeon General of the Army, and the Chief of the Research Division, Bureau of Medicine and Surgery of the Navy. Sitting with the NRC

committees and subcommittees, and therefore in a position to express approval or disapproval of investigative projects as they were taking form, were official representatives of both Surgeons General and a number of liaison officers in special subjects. This organization worked well in some fields and but indifferently in others.

It is emphatically worth pointing out that something more than the formal net of organization was present in the fields in which most effective cooperation was obtained. In the case of aviation medicine for example, Dr. DuBois, Chairman of the NRC Committee on that subject, accepted a commission in the Navy but commonly attended the committee meetings thereafter. Dr. Bronk, Chairman of the Division on Aviation Medicine in OMR, worked part time in the office of the Air Surgeon, Army Ground Forces. Both men had therefore close professional association with the Services. There was always a large attendance of military personnel at the committee meetings and there was a constant exchange of visits to each other's laboratories by civilian and military investigators. In consequence, useful apparatus and procedures developed in civilian research were adopted by the Services with reasonable dispatch. In the case of chemical warfare Dr. Winternitz, Chairman of the NRC Committee on Gas Casualties and Chief of the OMR Division of Chemistry, established very close relations between his investigators and the Chemical Warfare Service at the Edgewood Arsenal. He was a distinct influence in the enlargement of the Edgewood laboratories and in the profitable connection they established with the Johns Hopkins Hospital for the treatment of chemical injuries. On the Board for the Coordination of Malarial Studies the Army and Navy were represented by investigators of experience. This representation made possible the prompt field trial of new anti-malarial drugs and the use of volunteers amongst Army prisoners in the clinical testing program. Relations with the Quartermaster General of the Army, for whom investigations on clothing, food and fatigue were undertaken, were consistently frank and cordial. In a letter congratulating OMR on the results of these investigations in January 1943, he formally requested that a representative of OMR be attached to his office. In

response to this request Dr. Wearn, familiarized himself with the interests of the Quartermaster General and undertook to coordinate the GMR research in this field.

The converse of these examples is equally true. In fields where such special relations were not established the formal net of liaison was often insufficient. Certain of the GMR staff and of the NRC committees, particularly in the field of surgery, felt that they were not fully apprized of conditions in the field or sufficiently familiar with the needs of the Army to design research projects accurately. Insofar as this defective liaison existed at the level of the NRC committees it is not difficult to understand. No single representative of the Services could conceivably be familiar with military requirements in the many fields of research any more than he could be familiar with the technical aspects of such research. Such familiarity as he had with the requirements was gained second hand through the medium of confidential reports, which he often felt unable to disclose, rather than by direct contact with the field. His rank did not permit him to advocate changes in policy very strongly.

Granting this defect to have existed, granting that GMR and the NRC committees did not have an accurate and adequate view of the military problems in certain cases, there are two methods by which it could have been filled: by civilian missions to the field or by more intimate contact between GMR and the Surgeon General's Office in Washington.

A majority of the missions dispatched by GMR were designed to survey research programs in other countries. This was the province of GMR. This was all it could do of its own initiative. Occasionally missions went beyond this province. Drs. Whipple and Naffziger were allowed to go beyond England and to establish contact with troops in Africa. The mission of psychiatrists reached Europe. Four missions which were invited to the Pacific area by the Commanding General of that theater acquired an excellent picture of field conditions. GMR felt that these missions were very profitable and that they exerted an important influence in directing the research program

... too, were consultations with Medical Officers who, returning from the field for other reasons, appeared before CMR and NRC committee meetings. Desirable as such contact with the field appeared to CMR, it did not appear in that light to the Surgeon General of the Army. In favor of his point of view it must be admitted that the presence of civilians in a military theater imposes certain difficulties and responsibilities on the military. It was presumably on this account that in August 1944 he expressed complete disapproval of such missions and denied a request of CMR that four consultants be sent to the ETO. It required repeated suggestions over a period of nine months before his Office arranged for the visit of psychiatrists to the ETO in April 1945.

It is more difficult to understand why liaison with the Surgeon General's Office in Washington should not have been more adequate and personal. Surely there should have been some way of familiarizing the few civilians responsible for effectuating the research program with all facts at the disposal of the Surgeon General's Office. When all is said and done, this program produced all, or practically all, the important advances in military medicine which were made during the War. There were consultants in the several branches of medicine at the Surgeon General's Office whose fields corresponded with those of the NRC committees and of the Divisions of CMR and who would have been an appropriate channel for this liaison. That more effective liaison did not occur is not the single responsibility of either party. A more aggressive attitude on the part of CMR might have established such a relationship. Certainly it is true that after the spring of 1944, when the Division Chiefs of CMR became specifically responsible for precise fields of research, they were able to obtain a more accurate view of the situation by establishing informal personal relationships with their "opposite numbers" at the Surgeon General's Office. But it is equally true that the Surgeon General did not invite the members of CMR to his Office or offer them access to the Essential Technical Medical Data Reports until January 1945. Only after this date was access to similar reports offered to the CMR liaison officer in London.

It has been with deliberate intention that the specific defects in liaison have been stressed. In more general terms it is obvious that the research program could not have been as ^{effective} successful as it was, had not the military successfully and accurately indicated the subjects on which they desired information. The permission for civilian investigators to use troops for the study of fatigue and water deprivation has already been mentioned. The permission to use facilities of Army General Hospitals provided models of successful cooperation between military and civilian groups and yielded useful information; notably in tuberculosis and psychiatric investigations at Fitzsimons, in the penicillin study at Bushnell and Halloran, in the study of convalescence at Gardiner. These collaborations were arranged at the instance of GMR. One of the GMR contractors, the laboratories of the Department of Agriculture at Orlando, Florida, performed a distinctly useful function for the Army by conducting four-day courses on the subject of insect control at which some 750 Army Officers received instructions between 1943 and 1945.

One concludes that successful liaison is a function of close personal relationships between individuals of equal good will and nearly equal understandings. Lacking these personal relationships no system of formal liaison would have been successful.

The difficulty of getting information from the field to investigators in the States has been under discussion. The corresponding difficulty in getting information from the States into the field was the universal subject of comment by returning Medical Officers and GMR missions from all theaters. Even in the life of portable surgical hospitals there are lulls in activity when the progress of medical research is of interest and value. It is always of interest in more stable installations. GMR should have started to publish its weekly news bulletin at an earlier date and, publishing it, have essayed to distribute it much more widely. To do this would have required the cooperation of the Services. This should not have been impossible to obtain. Of its own initiative the Navy asked for and received permission to republish extracts from the GMR bulletin in its admirable *Bumer News Letter*.

Relations with Commercial Firms. 27 contracts were entered into between OSRD and commercial firms. Thus an appreciable portion of the research program was carried on by investigators in industrial laboratories. Nor was this their only contribution. They supplied without cost large amounts of sulfadiazine and culture media to the projects concerned with wounds and burns, they gave gelatine and cortical extracts to GMR investigators concerned with those substances. They contributed about half (? G.C.) of the 14,000 compounds which were tested as anti-malarials, and all of the 7,000 examined as insect repellents, the series investigated as rodenticides. Although many of the drugs thus submitted for assay were "shelf compounds", many others had to be synthesized at considerable expenditures of time and moneys. Each firm was informed of results obtained in the assay of their products and such information as they contributed in connection with structure and synthesis ^{was} were kept confidential by GMR and only released with the consent of the supplier. The major contributions made by commercial firms in the production, and towards the synthesis, of penicillin have already been related. In all its contacts with industry GMR was scrupulous to protect their commercial rights insofar as these rights did not conflict with the national interests. This effort was genuine and was accepted as being genuine by the industries.

The close association of commercial firms with each other and the spirit of cooperation which they exhibited as a group towards GMR has measurably improved personal relationships in the entire field of research and constitutes a definite human accomplishment of the program.

6. Relations with War Production Board. Although the GMR program had relatively slight impact on industry in comparison with that of the armament program, the construction of plants and the equipment of both plants and laboratories were occasionally essential for its prosecution. On these occasions the cooperation of the WPB and its predecessor, the Office of Production Management, were freely given and vigorously executed. A high priority was routinely given for material required by OSRD contractors. Without such priorities it would have been impossible, for example,

to construct the decompression chambers needed in aviation medicine or the centrifuges required by the blood substitutes program. When OMR convinced WPB of the importance of penicillin, their cooperation in the erection of plants resulted in an increase of penicillin production from 425 million units in June 1943 to 646,818 million units in June 1945. Similarly, when the value of DDT was recognized, the WPB granted priorities which permitted its annual production to increase from 153,000 pounds in 1943 to a rate of 36,000,000 pounds in August 1945. Such results may have been common place in the War effort. They seemed very striking to OMR.

PATENT POLICY.

Some provision had to be made for the new and patentable discoveries which might be made in the research program. Two different patent clauses were used in the contracts. In the case of academic institutions or of commercial firms which were undertaking new work supported by OSRD funds, the clause provided that OSRD was to have the sole right to determine whether patent applications should be filed and, in the event this was done, to decide disposition of the title. In the case of commercial firms which had already performed work in the field covered by the contract or which were not receiving material financial support, the agreement was somewhat more complicated as a matter of justice. If the invention had been developed and reduced to practice prior to the contract, the contractor agreed to give the Government an option to purchase, for a "reasonable" price, a license to make the product for military, naval and national defense purposes subject to the payment of royalties. If the invention were developed or reduced to practice during work covered by the contract, the contractor agreed to give the Government a royalty-free license to make the product for military, naval or national defense purposes.

This latter form of contract had to be modified in the research on penicillin synthesis which was carried on by commercial firms under contract but at their own expense, because the findings of each group were conveyed to the others throughout the

investigation. In this instance it was agreed that the Government rights would be protected and that the Director OSRD would be the sole arbiter of the interests of commercial firms in any discovery that their combined efforts might produce. Bright though the prospects of synthesis seemed at the time the agreement was made, it has not yet been achieved and the agreement, consequently, has not been invoked.

Two patents, on Antu and glycol disinfectant aerosols, have been granted under these patent clauses and about 125 others have either been applied for or are in process of registration.

PUBLICATION POLICY:

The general policy of CMR was stated by its Chairman, with concurrence of the Secretaries of War and Navy, as follows: "It is not the intent to withhold publication of advances in medical knowledge which would be of widespread advantage in the treatment of war injuries or the control and treatment of disease. Only in instances in which publication would result in military advantage to the enemy is the withholding of scientific papers from publication advisable". In accordance with this liberal policy, investigators under OSRD-CMR contracts were encouraged to prepare papers for publication with the proviso that they be submitted for prior approval to a member of CMR or, after its reorganization in May 1944, to the Chief of Records Section, CMR.

The only difficulty in applying this policy lay in deciding which matters would provide "military advantage to the enemy". In June of 1940 ~~(2-1940)~~ the National Academy of Sciences and the NRC had appointed a joint committee of which Prof. L. P. Eisenhart was chairman, to advise editors of scientific and medical journals on the propriety of publishing the results of investigations. After the formation of CMR, it provided Dr. Eisenhart with the names of ten medical referees to whom editors might send manuscripts suspected of containing information of military importance. The first formal list of proscribed subjects was prepared by CMR in

June 1942 with approval of the Secretaries of War and Navy. It contained topics in the fields of aviation medicine, chemical warfare, chemistry and tropical diseases. The need for making deletions and additions to this list became increasingly apparent as security restrictions were changed and since this could best be done by a continuing separate body, a Subcommittee on Publication Policy was created in February 1944 with Dr. Richards as Chairman and the three Service representatives of GMR as members. The Chief of the Records Section, GMR, Dr. K.B. Turner, served as secretary to the Subcommittee. At monthly or bimonthly intervals thereafter the Subcommittee revised the list of topics to be withheld from publication for the guidance of Dr. Eisenhart's referees. In July 1944, when the list was officially approved by the Army and Navy, it was issued by the Joint Security Council acting for the Joint Chiefs of Staff and was circulated as a nationwide publication policy on medical subjects to Army, Navy, Public Health Service, Office of Censorship and Office of War Information.

The coordination of our publication policy with that of Great Britain and Canada was highly desirable. In June 1943, with approval of the Secretary of War, a tentative agreement upon proscribed subjects was reached with the British Medical Research Council. In the summer of 1944 committees were designated by the Canadian and British Research Councils to exercise functions corresponding to that of our Subcommittee and thereafter satisfactory coordination of policies was achieved and maintained.

SUMMARY.

Leave blank for present.

RG 227, OSRD, CMR, General Records, 1940-1946