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THE GLORY OF THE UNITED EFFORT IN A GREAT CRUSADE

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In the story of man's triumphs over his own infirmities no chapter stands out more brilliantly than that of yellow fever. Not only has this conquest been great enough to alter much of the world's history and its economic patterns, but the results have been so brilliant as to light paths for the solution of many other problems. This history of yellow fever is a success story and in it may be found much to aid us in our attempts to solve our current problems.

Others at these ceremonies have eulogized individuals and indicated the steps toward ultimate success which resulted from their deeds. This is fitting, and I am delighted that my predecessors on this program have recounted the keen observations and bold thinking of Finlay, the brave and meticulous efforts of the Reed group and the astonishingly successful vector control measures of Gorgas and his associates. Furthermore, men of the Rockefeller Foundation who took an active part in the unfolding of the yellow fever story have mentioned the countless contributions of their group to an understanding of the virology, epidemiology, ecology and immunology of this disease.

I wish to speak first about certain of the factors that aided these investigators in accomplishing their individual tasks and later mention other factors which contributed to the united effort. The popular notion is that any problem can be solved, given means, manpower and opportunity. Like most generalities there is some basis of truth in this notion. Certainly these necessary elements are to be found in the record of the conquest of yellow fever, but the important question is, how were they attained? Who provided the means, who enlisted the men with the required interest and ability and who created the opportunities or capitalized on the intangible ingredient which might be labeled "good fortune"? Let us see if we can find answers to some of these questions.

In the present age we often regard public demand as being of importance in initiating and sustaining interest of investigators in a given disease. Mere mention of poliomyelitis, cancer, heart disease and cerebral palsy will acquaint
you with the kind of public clamor, stimulated or natural, that I have in mind. Such public demand would seem to have been of little importance in the conquest of yellow fever.

During the summer of 1853, which was the year Carlos Finlay enrolled at the Jefferson Medical College, there were 128 deaths from yellow fever in Philadelphia and almost 8,000 in New Orleans. Except where yellow fever invaded new territory, or returned after a long absence in severe epidemic form, it was usually accepted as an act of God by the lay population, that is, it was regarded in much the same fashion that we now tolerate the shameful number of casualties which result each year from motor-car accidents or the high incidence of tuberculosis in some sections of the country.

If not public demand, then what did provide the drive for the continuing intensive study of yellow fever for the three-quarters of a century since the dawn of the microbial era? I believe it was provided in large part by the deep humanitarian and scientific interests of a relatively small number of men. Carlos Finlay, who stood alone for so many years, was one of these. George M. Sternberg was another; he was a friend of Finlay, a member of the Havana Yellow Fever Commission in 1879, an investigator of yellow fever for almost two decades; he was the first prominent bacteriologist in North America and was Surgeon General of the United States Army from 1893 to 1902.

Sternberg's sustained interest in, and vigorous support of, work on yellow fever made possible the successes of Reed in Cuba. Subsequently, General William C. Gorgas and General Frederick F. Russell provided the leadership and continuity for the attack on this disease. Thus, interest, support and continuity of leadership, all essential ingredients in any protracted campaign, were maintained for almost three decades by the Army. Thereafter, these three essential ingredients were provided by the Rockefeller Foundation, first in 1916 with the appointment of Surgeon General Gorgas as Director of the Rockefeller Foundation Yellow Fever Commission and later by General Russell who assumed the directorship of the International Health Division of the Foundation. Following General Russell, Dr. Wilbur S. Sawyer and Dr. George K. Strode served as Directors of the International Health Division. Hence, in the period of a little more than half a century, command of the major forces aligned against yellow fever passed through the hands of five outstanding scientists, each of whom had been prepared for the great task by many years of work in the field and in the laboratory on yellow fever.

Each of these leaders had the prestige to attract the right men to their organizations and the capacity to stimulate them to perform great deeds. Each knew the value of basic science and throughout this long period none hesitated to devote an appreciable portion of the available facilities to the establishment of a fundamental point of fact, when such was crucial to further progress toward the control of yellow fever. These men were excellent ad-
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administrators. I suspect that their greatest contributions to medicine and health were probably made during their more mature years when they devoted themselves to leading the general attack.

In emphasizing the importance of the five directors I would not neglect the impersonal organizations of which they were members. The Army Medical Service and the Rockefeller Foundation have great and unique potentialities for providing means, manpower and opportunity for medical research. These potentialities were exploited to the utmost in the battle against yellow fever. The accomplishments of the Army stand to its everlasting credit while the sustained effort of the Rockefeller Foundation ranks as the greatest monument in philanthropy.

While we are speaking of the elements of success in the war against yellow fever and the role of organizations in attaining these, I wish to digress for a moment and consider the future. The Rockefeller Foundation, after leading the battle for over a quarter century has indicated its intention of withdrawing from the field. The means for controlling yellow fever are at hand, but the wishful thinking of four decades ago that this disease could be eradicated from the Americas has proved unfounded. We and the generations to come are faced with a continuing guerilla action against the jungle cycle of yellow fever virus. We cannot hope to win decisively by eliminating the virus. However, by applying what we have learned we can maintain supremacy by confining the virus to its wilderness reservoirs. Let us hope that we and those who follow have the wisdom and vigilance to keep the virus at bay in the jungle and to keep our cities and trade routes free of the urban vector.

If the Rockefeller Foundation will no longer lead us, then who will assume this responsibility and provide the Americas with the intelligent and resolute leadership required for the continual surveillance, the police actions, and the occasional beachhead landings, against yellow fever? The problem of maintaining control over this disease is an inter-American one since it affects, or threatens, each nation in the hemisphere. The Pan American Sanitary Bureau has already stepped into the breach. Yesterday you heard Dr. Soper and others recount the results of the most recent skirmishes in the continuing war on yellow fever. What group could be better suited to guide us in the future in our joint efforts than the Pan American Sanitary Bureau?

To return to certain of the ingredients of success in the conquest of yellow fever, one of these was the close integration of field work and highly technical laboratory investigations which could be performed only in a base installation. The principle of rapid and effective interchange of information and personnel in the field and laboratory was begun with the Reed Board. The Army Medical School, on whose staff Reed served as the Professor of Bacteriology, provided the base laboratory for the Cuban work. Experiments were performed at the School which led up to the investigations in the field.
Furthermore, members of the Board returned to the School to complete their work. During the many years that the Rockefeller Foundation led the battle against yellow fever, its International Health Division Laboratory in New York served the field units in a manner similar to that by which the School had served the Reed Board. In the laboratory in New York was done the fundamental work on developing serologic diagnostic procedures, methods for immunization against the disease and basic work on the nature of the virus of yellow fever. Each of these studies on yellow fever uncovered new principles and provided background knowledge which has been of importance in the general field of virology. The base laboratory also provided an important cohesive force for the development and maintenance of esprit de corps in a far-flung operation which continued over many years. It provided the opportunity for sound scientific training of recruits and permitted the field worker to return to a well-equipped workbench to test the hypotheses which he had developed in the jungle. Finally, it enabled the group to develop and use complicated technical procedures which could not be employed in the ordinary virus laboratory or in the field laboratory. Perhaps I have spent too much time in discussing the role of the base laboratory in the ultimate success; however, in my opinion this is one of the important lessons which we should have learned. In my own work I repeatedly see the value of free interchange between the field and the supporting laboratory. Without this, the former rapidly degenerates into the unimaginative practice of therapeutic or preventive medicine and the latter devotes itself to an ivory tower type of research too far removed from the ills of mankind.

A unique and important ingredient in the early studies on yellow fever was the development of the concept of the use of lay volunteers in medical research dealing with problems in which crucial information could be obtained by no other means. The famous physicians of history who experimented on themselves and by so doing had made significant scientific contributions do not belong in the category of lay volunteers. Finlay employed over a hundred Spanish soldiers and Jesuit priests in his attempts to immunize against yellow fever by permitting mosquitoes, presumably infected with a mild strain of the agent, to feed on the men. These were bold experiments and demanded bravery in the volunteers. However, the volunteers were persons who were faced with the likelihood of contracting yellow fever in the normal course of existence in Cuba. Hence, the possibility of acquiring a mild attack, which would immunize against the natural disease, provided some personal incentive to these volunteers.

In contrast, the volunteers of the Reed Board had the promise of a severe and perhaps lethal disease and any immunity which might result from the experience was of little importance to most of them. Thus, these individuals exemplify for the first time the layman with such selfless devotion to mankind that he voluntarily jeopardizes his life in the hope of preventing or diminishing the ailments of other human beings. While by no means the
prerogative of the Americas the role of human volunteers has been greater in American medicine than in that of other areas. I have often wondered why. Is the urge to volunteer part of the generosity and community participation that characterizes the pioneers of young nations? Is it some peculiar interpretation we apply to our religious doctrines in this age which corresponds with that which motivated the crusades? Or is it as one of my friends said recently merely part of our national neurosis for health? Whatever the motivation that impels such volunteers to risk their lives without hope of personal gain, I wish to pay it homage. When we speak of the glory of the effort in yellow fever we speak in part of these men. I cannot leave this subject without commenting on the attitude of so many of my European colleagues on the participation of volunteers in medical research. Some, with justifiable revulsion against the Nazi crimes, oppose the use of volunteers under any circumstances. Others have difficulty in believing that the volunteers are fully informed and truly participate of their own desire and volition. The solicitation of volunteers for medical research is to be undertaken now with as much caution and reverence as displayed by Reed. Indeed the principles used by the Reed Board for employment of volunteers in the work on yellow fever have been incorporated into the accepted conventions of American medicine for accepting volunteers for participation in medical research. (Reference: J.A.M.A., 1946, 132, 1090.)

The Walter Reed Board and its success formed the spiritual pattern for the Army Commissions of both world wars, and for the present system of Commissions and their field teams responsible to the central Armed Forces Epidemiological Board. Unfortunately, even the medical public is not too familiar with this system of combined civilian and military enterprise, nor is it entirely familiar with the complexity of the medical research program supported by the Armed Forces. In the field of infectious diseases alone, one may point to achievements of the Armed Forces Commissions in the past 15 years in influenza, encephalitis, dengue, typhoid fever, the rickettsial diseases, plague, hemorrhagic fever, hepatitis, leptospirosis, streptococcal diseases, the dysenteries, and many others.

A number of ingredients which contributed to success have been mentioned. These were: means, men and opportunity provided by two great organizations; a succession of far-sighted scientific directors who made yellow fever their life's work; the close integration of practical field studies with basic scientific research in the laboratory; the employment of volunteers and the use of the commission system. But what of the most important ingredient of all — the men who actually did the work in the field and in the laboratory. These men did not merely contribute to success — they made success. They have been of no particular race or nationality or religious belief. Some have been loud, some shy, some brilliant, some stupid. But once involved in the study of this disease they amalgamated to form an ardent brotherhood of purpose. In almost all instances they have been highly trained men, attracted by
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the vastness of the ignorance. They were adventurers in technical and intellec-
tual skills. One almost senses that these people were born for high adventure.

It is the popular practice to single out certain individuals for credit in any success story. Frequently these individuals are made the objects of homage and adulation. But the story of yellow fever is one of many men. Who can deny the importance to the end result of the men who volunteered their lives, of the technical corps whose work was indispensable, of nurses who cared for the sick, or even of the men who cleaned the floors? This was indeed an in-
spired brotherhood, each individual a vital part of progress. In most instances the individuals had that feeling of pride which goes with being a part of a great spiritual enterprise. The relationships were so close and the rivalry so slight that it is almost impossible to trace the origin of many developments.

Reed, Gorgas, Lazear, Carroll, Agramonte, Mahaffy, Stokes, Bauer, Theiler, Soper. What names these are! They typify the modern odyssey. Carlos Finlay has full seniority amongst the officers and a place of immortal affection in the minds and hearts of all members of the crew, for he it was who furnished the one indispensable ingredient of success. He had the prime idea.