54. GRASSI G.B., *Studi di uno zoologo sulla malaria*, 1900, op. cit.
55. FANTINI B., SMARGIASSE A., *Le radici scientifiche e sociali della scuola malariologica romana*. In: *Aspetti storici e sociali delle infezioni malariche in Sicilia e in Italia*. Atti del II seminario di studi (Palermo, 27-29 novembre 1986), Palermo, CISO Sicilia, 1987, pp. 201-215.
56. FERMI C., *Regioni malariche. Decadenza, risanamento e spesa. Sardegna*. Roma, Tip. Edit., 1934, p. 533.
57. Ivi p. 534.
58. FERMI C., intervento al primo Congresso Internazionale della Malaria. Roma, 4-6 Ottobre 1925, Il Policlinico, Sez. Pratica, 1925; 32: 1497-1505.

La corrispondenza va inviata a B. Fantini, Case postale 1211 Genève 4.

MEDICINA NEI SECOLI ARTE E SCIENZA 6 (1994) 213-228
Journal of History of Medicine

Articoli/*Articles*

A SUCCESS FOR SCIENCE OR TECHNOLOGY? THE ROCKFELLER FOUNDATION'S ROLE IN MALARIA ERADICATION IN ITALY, 1924-1935*

DARWIN H. STAPLETON
Rockefeller Archive Center, New York

SUMMARY

The Rockefeller Foundation's malaria control work in Italy provides an important and instructive episode in the history of malariology. The pattern of the Rockefeller Foundation's early malaria control work, using its role in Italy in the 1920s and 1930s is an example of its strategy and methods. Although the history of malaria control usually is written with a focus on the scientific and laboratory achievements of scientists and physicians, the technology of malaria control also has been very important as in the case of Italy in the 1920s and 1930s.

The founding of the Rockefeller Foundation and its related organizations has been well-told and need not be repeated here, but a brief review how the Rockefeller philanthropies developed a strategy for malaria control will set the stage for later events. When the Rockefeller Foundation was established in 1913 two earlier philanthropies created by John D. Rockefeller already had been working in public health in the southern states of the United States. The General Education Board (GEB), founded in 1902, was charged with improving the educational level of both black and white Americans in the South. The GEB quickly found that widespread health problems in the South were a serious

Parole chiave/*key words*: Rockfeller Foundation - Malaria eradication - Italy

impediment to education and began to promote improvements in nutrition and cleanliness. The Rockefeller philanthropic network, which included the Rockefeller Institute for Medical Research (founded in 1901), became aware that hookworm (*Uncinaria*) infestation was possibly the South's most widespread health problem. In 1909 John D. Rockefeller created the Rockefeller Sanitary Commission (RSC) for the Eradication of Hookworm Disease, and the Commission demonstrated throughout the South how administering of a few doses of thymol could clear the body of hookworms. By offering to fund the creation of local public health offices, the Commission was able to ensure that its successful demonstrations were followed by the establishment of permanent anti-hookworm programs[1].

In 1914 the Sanitary Commission was dissolved but its techniques and much of its staff were transferred to the International Health Board (IHB), a body that in 1928 became the International Health Division (IHD) of the Rockefeller Foundation. During the next ten years the IHB developed a global strategy for the control of widespread epidemic and endemic diseases. First the IHB focused on diseases that had known etiologies and, if not known cures, then clear evidence of how they were transmitted. Secondly, the strategy called for establishing that there were existing or promising methods of disease control that were cheap and effective. Three diseases seem to fit these criteria - hookworm, yellow fever, and malaria - and the IHB spent millions of dollar fighting these diseases during the next forty years. Effective means of combating hookworm had been developed by the RSC, and among other organizations the American Panama Commission had demonstrated successful techniques of yellow fever control, but there was no equivalent American experience with malaria. The IHB therefore adopted an experimental approach based on the two known aspects of malaria control: the administration of quinine to affected persons - the strategy adopted in Italy - and the possibility of controlling mosquitoes, the malarial parasite vector.

Drawing on the RSC's southern hookworm strategy and imitating malaria control measures tried elsewhere the IHB cooperated with state health departments to create experimental malaria control districts in several states in the American South known to have malaria. IHB field workers tested quinine, drained or flooded swamps, deepened and straightened waterways, screened windows and doors, sprayed oil on standing water, and introduced a mosquito larva-eating fish from Florida, the *Gambusia*, and put it in wells, springs and ponds. The greatest reduction in malaria incidence occurred when mosquito larva-control techniques were used rather than quinine or adult mosquito control[2].

The larva-control strategy also had the advantage of being less expensive than quininization, which required both large quantities of the drug and teams of doctors and nurses to administer it. The chief of the IHB, Wickliffe Rose, had established a goal of finding a technique for malaria control *at costs which the average community could afford*, and the larva approach seemed to meet that goal[3].

The IHB's approach was not entirely focused on economy at the local level, however. It also supported the development of fundamental scientific knowledge through its funding of schools of public health, first at Johns Hopkins (1916) and Harvard (1921) universities, and then at twenty other sites around the world during the next 30 years[4]. At such schools and at IHB field stations many scientists, physicians and others were trained to recognize malaria infestations and to develop control strategies.

By the early 1920s the International Health Board had such success with malaria control in the United States that it decided to extend its program globally. In line with general Rockefeller Foundation strategy, the IHB decided that its malaria campaign would have the greatest effect if it worked with a Western European country that could provide a model for other advanced nations and the colonial empires that some of them administered. The Rockefeller Foundation's strategy of working with centers of excellence led it to funnel medical

research and education monies to Britain and France, to give grants for scientific research to Germany, and to establish an extensive malaria research and control program in Italy. The International Health Board spent $ 800,000 on malaria control in Italy between 1923 and 1955, nearly 1/6th of its total expenditure on malaria, and more than it spent in any country except the United States[5].

Italy had the greatest tradition of malaria research in Europe, led by G.B. Grassi, Angelo Celli, and others, and an extensive and well-established quininization program that had greatly reduced the malaria death rate since 1902. But it was also the most malarious country in Western Europe and had experienced a resurgence of malaria infection during World War I. Whatever the IHB could do in Italy would be highly visible to anyone seriously concerned with malaria control. Visibility to the scientific community and the interested public was certainly a major consideration throughout the early history of the public health activities of the Rockefeller philanthropies.

In 1924 with the assent of the Italian government the IHB sent to Italy Lewis W. Hackett, one of its officers formerly in charge of its yellow fever campaign in Brazil[6] (Fig. 1). Hackett immediately conducted a survey of the Italian anti-malaria program. He was well acquainted with the IHB's techniques developed in the American South, having examined them carefully just before he went to Italy, and he reported back to the IHB that the Italian program had serious flaws. According to Hackett *the (Italian) government has developed an elaborate machinery for taking care of the sick individual, but no provision is made for the study of the local causes of malaria (or) the control of* Anophelene *mosquitoes*. He claimed that local health officers took no interest in controlling malaria except for the distribution of quinine, and that Italy's outstanding water control engineers did not consider malaria work their responsibility. Whether this assessment was accurate or not, it became the basis for the IHB's involvement in Italy.

Fig. 1

Hackett followed his assessment with a proposal suggesting that the IHB initiate what may be recognised as a typically American malaria control program, one that he knew would appeal to the IHB reviewers. He suggested that:

1. the IHB pay the salaries of additional public health staff who would carry out an *organized study of the malaria problem* and would demonstrate the value of such trained staff to the government;
2. that controlled tests of anti-malaria measures be undertaken, and
3. that the tests should establish whether malaria control costs would bewithin the financial means of *the average community*[7].

Hackett's report went to the Italian government as well as the IHB office in New York, and he later reported that it was a *disappointment to the Government since it led directly away from the official program of twenty-two years' standing... Furthermore, (the government) considered that the situation called for financial rather than technical assistance (there being no lack of the latter in Italy)...*[8].

However, the city of Rome saw the report as an opportunity to respond to its malaria problem, and in 1925 offered the IHB the Palazzo Farnesina in Rome to house a research station[9]. This led to the establishment of the Stazione Sperimentale per la Lotta Antimalarica, which from 1926 through the 1930s was not only a leading center of malaria research in the world but also attracted researchers from other European countries.

Hackett was the IHB representative at the *Stazione* until 1935 and Alberto Missiroli, a leading Italian malariologist, was the director from the beginning. Together they planned a program of malarial control demonstrations. If Hackett's survey was accurate, *malaria constituted a serious problem in thirty-eight of (Italy's) sixty-nine provinces. About forty-one percent of the total population was exposed to infection.*[10] Hackett and Missiroli had a variety of environmental and cultural situations to choose for field sites.

Although Hackett later claimed to have been *sent to Italy with only a fragmentary knowledge of malaria* he was one of the best that the American public health establishment had to offer[11]. Holding a medical degree and a doctorate in public health from Harvard University, Hackett began work with the IHB in 1914, first with the continuing hookworm campaign in the American South, then on yellow fever control in Brazil. He thoroughly absorbed the IHB approach to disease control and, because of his success in Brazil, his IHB superiors regarded him as an excellent collaborator with national and local public health officials[12].

In January 1925 Hackett and Missiroli began their demonstration program by selecting two field sites - Portotorres in Sar-

dinia and Bianconovo in Calabria. They adopted the IHB approach of attempting to discover what would be the most economical system of malaria control. They began by having their engineer, American Nelson H. Rector, map each town, especially noting sites of known mosquito breeding and attraction; he also determined the surface area of large bodies of water. Local physicians supplied information on the location and number of malaria cases, which were also mapped. This process required at least two weeks.

At Bianconovo and Portotorres and several other sites chosen later, a variety of control methods were then applied, beginning with quinine administration, but including the cleaning and deepening of watercourses and the filling of swamp areas to reduce the slow-water breeding places for *Anopheles* mosquitoes; the introduction of the *Gambusia* minnow; and the application of Paris Green, a larvicide, to all standing water. X-ray treatment of the distended spleens typical of malaria victims was probably the most exotic procedure utilised in the campaign[13]. Meanwhile Hackett and Missiroli taught the mysteries of larva and mosquito collection to teams of local residents, and laboratories at each field station kept records of the concentrations of mosquitoes, larva, and the incidence of the malaria parasite.

Within two years Hackett and Missiroli came to the conclusion that larva reduction techniques, especially the spraying of Paris Green, were the keys to dramatic reductions in malaria incidence. As they expanded the program to other sites in Italy, as many as twenty by 1930, they relied more and more on Paris Green to kill *Anopheles*[14].

In 1921 a United States Public Health Service officer had shown that Paris Green, a double salt of arsenic and copper ($3CuHAs\,O_3 + Cu\,[C_2H_3O_2]$), was effective as mosquito larvicide[15]. Hackett learned of Paris Green's initial success during his examination of IHB programs in the American South, and he promoted and developed its application in Italy. At Portotor-

res and Bianconovo Paris Green was mixed with pulverized dirt and sprayed on pools and slow-moving water by hand or with hand-powered blowers. Local residents were hired to spread Paris Green during the malaria season, focusing on the sites identified on the maps made by the engineers. The results were dramatic when Paris Green was used extensively in a radius of three kilometres from population centres: new malaria infections were virtually eliminated (Fig. 2). This procedure was adopted at the additional field stations and demonstration sites established by Hackett and Missiroli throughout Italy in the latter 1920s and early 1930s.

The officers of the Rockefeller Foundation who investigated the anti-malaria work in Italy a few years after it was begun were effusive in their praise of what had been accomplished. One visiting officer, Wickliffe Rose, observed that the Station was *a strategic center with work of high order now in progress and with unlimited possibilities lying at its door.* Officer Selksar M. Gunn stated that *the malaria work done by the IHD for the past few years (is) one of the finest pieces of scientific practical work done by the IHD in any part of the world* [16].

We may now consider whether the successful malaria control program developed by Rockefeller philanthropy in Italy should be viewed primarily as scientific or technological. The history of malaria control in the 20th century has been written largely by medical and scientific personnel, or from documents created by physicians and scientists, so it may be unsurprising that most histories of modern malaria control begin with the laboratory discovery of the malaria parasite and the mosquito vector of the disease, and continue the story as if it were largely controlled and directed out of laboratories[17]. However, research in the IHB/IHD records at the Rockefeller Archive Center that deal with Italy strongly suggest that the technological aspects of malaria control have been underestimated or ignored.

The critical technical expertise in the IHB's Italian campaign was supplied by engineer Nelson H. Rector, who joined Hackett

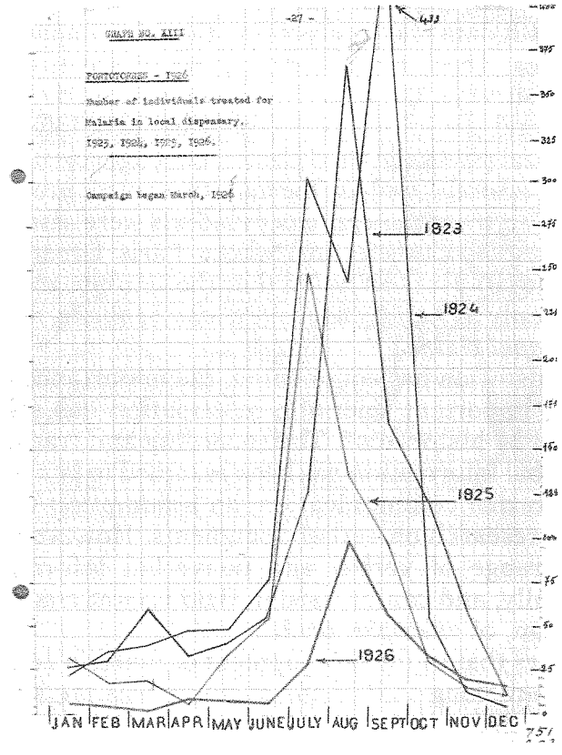

Fig. 2

in Italy at the beginning of 1925 and stayed until the spring of 1927. Rector had a civil engineering degree from Johns Hopkins University. He was hired by the IHB after graduation and given special training in sanitary engineering and malaria control. He was assigned to the Alabama Board of Public Health for two years, primarily in malaria control, and was then sent to Italy[18].

Rector's crucial contribution to the work of the field experiment stations in Italy was the collection of topographical and public health data and interpreting them by mapping the field station sites. These maps codified the information from the engineer's surveys, the scientific data collected by Hackett and Missiroli, and the information about malaria infestation provided by local physicians and government agencies. These maps became an essential tool for the malaria control program, showing where larva and mosquito populations were sampled, where malaria cases occurred, and where Paris Green should be sprayed (Fig. 3). Hackett noted that the IHB program could be expanded only as *rapidly as surveys can be made, maps drawn, and personnel trained* [19].

As one historian has commented, the importance of maps in conveying important scientific information has seldom been recognised by historians[20]. The recording and transmission of purely verbal information has been assumed to be the dominant mode of formal communication, an assumption that focuses historical research on verbal documents. However, maps can codify a range of verbal and nonverbal information very economically, and can be used in field operations much more readily than, of example, books.

It appears that in the development of malaria control in Italy the map making skill of the engineer was the key to giving everyone in the malaria control program - scientists, physicians, insecticide sprayers, and local officials - access to the latest information, and served as a guide to the program of larva control. The engineer had the critical role of mediating between these different constituencies of the program, and his map was the most vital tool of mediation. Hackett praised Rector for surveying, mapping and reporting on more than fifteen different sites during his 26 months in Italy[21].

Engineer Rector also played two other roles that were important to the malaria-control work. First, he worked with local officials and sometimes Italian engineers to plan and execute water-control projects at the field sites - draining swamps,

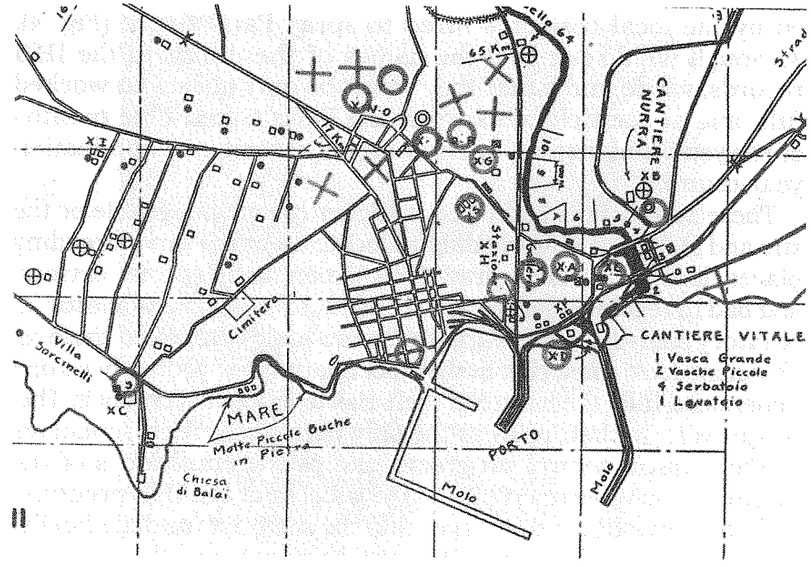

Fig. 3

deepening watercourses to improve water flow, and sometimes filling in pits and pools[22]. Such *systematiz(ing of) the water areas*, as Hackett described it, was crucial to the mosquito control program because it reduced the number of areas to be treated with Paris Green. Second, Rector trained at least one Italian engineer in the survey and map making procedures associated with malaria control, particularly engineers working in the districts where field stations were established. Rector also instructed foreign engineers who visited Italy to see the IHB program in action. Hackett held Rector's accomplishments in high regard, complimenting his *technical accuracy, untiring energy, and... conscientiousness*, and noting that Rector's work was *invaluable to this station*[23].

The other technical role in the IHB program in Italy was filled by the local residents hired to spray Paris Green (Fig. 4). Although we do not find the names of these men in the IHB records, we do know that they were the only ones who worked full-time at the field sites, spraying Paris Green nine months of the year, and inspecting the area for new sites of application year-round.

These technicians had to be sufficiently knowledgeable of the site and skilled at map-reading to locate all of the larva-breeding places; had to mix and spray Paris Green using special devices; and had to regularly sample larva and mosquito populations for laboratory analysis. Since Paris Green is a toxic compound these technicians took some risk in their occupation but probably no one understood fully the nature of their risk and how to control it. These sprayers, in their roles as the only permanent representatives of the malaria control programs, and as the eradicators of the mosquito larve, were crucial to the success of the IHB program.

Finally, we should not forget that the scientists and medically-trained personnel, such as Hackett, Missiroli and the others at the Stazione Sperimentale per la Lotta Antimalarica and the field stations, carried out their research with the aid of numerous laboratory devices, some highly specialized for malaria and mosquito observations[24]. In his definitive work *Malaria in Europe*, Hackett stated that a modern malariologist must have *a research laboratory equipped to carry out every kind of field study*[25].

It is arguable, then, that both the personnel and the process of malaria control were weighted toward technological approaches, rather than toward medical or scientific approaches. Perhaps this is not surprising, since the IHB's style originated within the culture of the United States, then the most industrialized nation in the world. But we should understand also that the IHB's goal of creating an economical method that a community could maintain through its own resources favoured the adoption of technologies could be utilised easily by an agrarian population. For example, Hackett noted that the hand blowers

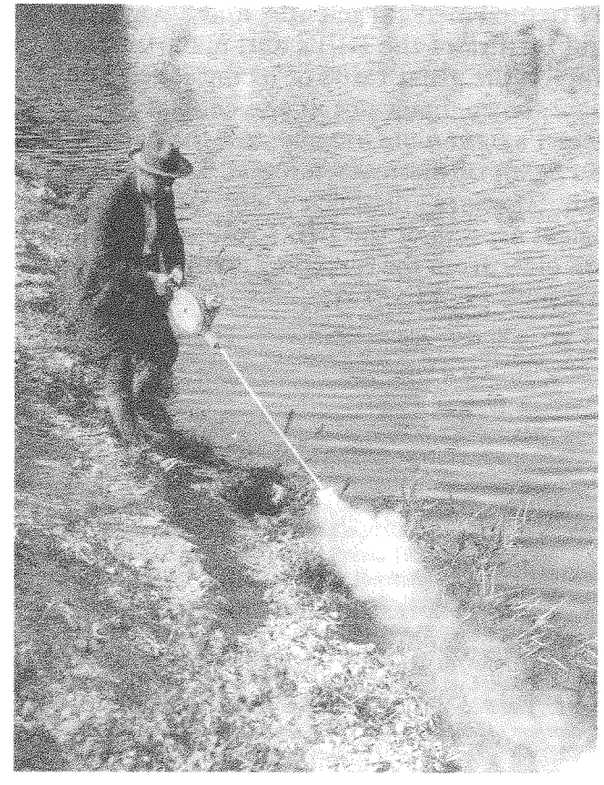

Fig. 4

used for the distribution of Paris Green in Italy were similar to the devices used to fumigate Italian vineyards with sulphur, and that the local men hired at the demonstration sites quickly became efficient anti-larva sprayers[26].

It is true that Hackett stated over and over that the larvicidal approach to malaria control was a temporary measure - presumably because he thought in the long run that some kind of inoculation, or some other triumph of medical science, would

permanently eradicate malaria[27]. Hackett was trained as a research-oriented medical scientist and always saw science as the central feature of the IHB's anti-malarial work. Although he understood the great value of technology and those skilled in it he saw the engineer not as the central figure, but as the malariologist's *right-hand man*; he saw the Paris Green sprayer only as an agent of the malariologist. In the longer view that more than 50 years' distance gives us we can assess the technological aspects of the IHB's Italian campaign differently: it seems clear from the foregoing analysis that Hackett's and Missiroli's success in the 1920s and 1930s was primarily technological.

NOTES AND BIBLIOGRAPHY

1. ETTLING J., *The Germ of Laziness: Rockefeller Philanthropy and Public Health in the New South.* Cambridge, Mass., Harvard University Press, 1981.
2. MEAD A. P., *The Rockefeller Foundation Operations and Research in the Control and Eradication of Malaria.* New York, Rockefeller Foundation, 1955, mimeographed, pp. 1-2.
3. FOSDICK R. B., *The Story of the Rockefeller Foundation.* New ed. New Brunswick, NJ, Transaction Publishers, 1989, p. 48.
4. IBID; SHAPLEN R., *Toward the Well-Being of Mankind: Fifty Years of the Rockefeller Foundation.* Garden City, NY, Doubleday, 1964, p. 53.
5. MEAD A. P., *Malaria*, p.x.
6. Lutrario to Rose, 30 December 1922, and Hackett to Rose, 26 July 1922, Hackett files, box 13, RG 9, Rockefeller Foundation Archives, Rockefeller Archive Center (RAC), North Tarrytown, NY, USA. Hackett began an intensive study of Italian as soon as he learned of his new assignment. See also WILLIAMS S., *Nationalism and Public Health: The Convergence of Rockefeller Foundation Technique and Brazilian Federal Authority during the Time of Yellow Fever, 1925-30,* presented at a conference on *Science, Philanthropy, and Latin America: Cross-Cultural Encounters in the Twentieth Century.* RAC, North Tarrytown, NY, USA, 15 November 1991.

7. HACKETT L. W., *Annual Report of the Work of the International Health Board in Italy During 1925.* Box 247, Series 3, RG 5, Rockefeller Foundation Archives, RAC. (The reports in this box will be cited as *Malaria Reports*).
8. IBID.
9. *The Rockefeller Foundation Annual Report, 1925.* New York, Rockefeller Foundation, 1926, p. 193.
10. Scientific Directors' minutes, 16 December 1949, International Health Division, Rockefeller Foundation Archives, RAC.
11. HARRISON G., *Mosquitoes, Malaria and Man: A History of the Hostilities Since 1880.* New York, NY, E. P. Dutton, 1978, p. 82.
12. Interviews with Eugene Seeger, 2 August 1922, and Luis Coudert, 25 July 1922, Hackett files, RAC.
13. *Malaria Reports*, 1926.
14. HACKETT L.W., *Malaria Reports*, 1925, 1926; IDEM, *Malarial Control Through Anti-Mosquito Measures in Italy.* Trans., Royal Society of Tropical Medicine and Hygiene 1929; 22:482; Scientific Directors' minutes, *Control and Investigations of Specific Diseases: Malaria, Italy.* Folder 72, box 6, Series 751I RG 1.1, Rockefeller Foundation Archives, RAC.
15. *The Rockefeller Foundation Annual Report, 1925.* New York, Rockefeller Foundation, 1926, p. 23; HARRISON G., *Mosquitoes, Malaria and Man*, pp. 186-87.
16. W. Rose to F.F. Russell, 2 May 1930, and Selksar M. Gunn diary excerpt, 5 February 1930, L.W. Hackett files, RAC.
17. For example: HARRISON G., *Mosquitoes, Malaria, and Man*; DeKRUIF P., *Microbe Hunters.* New York, Harcourt Brace & Co., 1926; RUSSEL P. F., *Man's Mastery of Malaria.* London, Oxford University Press, 1955.
18. Nelson Hamilton Rector files, box 24, RG 9, Rockefeller Foundation Archives, RAC; photocopies of letters in Nelson H. Rector admission file, Hamburger Archives, Johns Hopkins University, Baltimore, MD, courtesy of James Stimpert, archivist. Rector, like Hackett, studied Italian in the months between accepting his assignment to Italy and his arrival there.
19. HACKETT L. W., *Recent Developments in the Control of Malaria in Italy.* Southern Medical Journal 1931; 24: 8.
20. RUDWICK M.J.S., *The Emergence of a Visual Language for Geological Science, 1760-1840.* History of Science 1976; 14: 149-152.
21. Hackett to Rector, 1 March 1927, N.H. Rector files, RAC.
22. HACKETT W., *Organization and Method of the Experimental Station for Malaria Control....* 1927, folder 79, box 6, Series 751I, RG 1.1, RAC.
23. L.W. Hackett to N.H. Rector, 1 March 1927, N.H. Rector files, RAC.
24. HACKETT L.W., *Malaria in Europe.* London: Oxford University Press, 1937, p. 269.
25. Field equipment for 1927 is listed in *Organization and Method of the Experiment Station for Malarial Control....* Folder 79, box 6, Series 751I, RG 1.1, Rockefeller Foundation Archives, RAC.
26. HACKETT L.W., *The Importance and Uses of Paris Green (Copper Aceto Arsenite) as an 'Anopheles' Larvacide.* Proc., First International Congress on Malaria (reprint in RAC library), pp. 4, 11.
27. IDEM, *Malarial Control Through Anti-Mosquito Measures in Italy*, p. 498.

Darwin H. Stapleton

*The author acknowledges the assistance of Camilla Harris and Melissa Smith in the preparation of this paper, and thanks Roy M. Acheson and Thomas Rosenbaum for their comments on earlier versions.

Correspondence should be addressed to: D.H. Stapleton, Rockefeller Archive Center, Pocantico Hills 15 Dayton Avenue, North Therrytown, New York 10591 - 1598, U.S.A.

MEDICINA NEI SECOLI ARTE E SCIENZA 6 (1994) 229-253
Journal of History of Medicine

Recensioni/*Essay Reviews*

CABRAS L., CAMPANINI E., LIPPI D., *Uno Psichiatra prima della psichiatria: Vincenzo Chiarugi ed il trattato "Della pazzia in genere, e in specie" (1793-1794).* Scientific Press, Firenze 1993, pp. 115.

AA.VV., *L'ospedale dei pazzi di Roma dai papi al '900.* Edizioni Dedalo, Bari, 1994, 2 vol., pp. 440.

La storiografia medica si è imbattuta spesso, e riguardo a varie epoche, nelle affezioni della mente. Dalla descrizione in diretta delle psicosi di Elio Aristide negli *Ieroi logoi* sino alle opere che documentano i ricoveri per i pazzi, il materiale raccolto è ormai così vasto da rendere non sempre facile un'analisi critica se vogliamo un'analisi *logica* della storia delle malattie mentali, che si deve allargare all'analisi delle strutture sanitarie, della concezione della follia nelle varie culture, delle risposte politiche alla realtà degli individui malati e delle loro famiglie, nella civiltà rurale o in quella industriale od urbana.

Un interessante spaccato, che ripercorre le vicende delle istituzioni per i pazzi, dal XVI al XX secolo, è offerto dai due volumi promossi dall'Amministrazione provinciale di Roma sul S. Maria della Pietà, una istituzione che ha raccolto nei secoli *poveri e dementi*, rimarca il sottotitolo, secondo una omologazione che si protrae nel tempo fino ai nostri giorni. Sino al XVI secolo *la concezione della mente è monolitica, come una luce che si accende o spegne*, nota nel suo contributo F.M. Ferro: è con *la bolla del 1561 e gli statuti ospitalieri del 1572 che la malattia mentale acquisisce una sua dimensione, con la destinazione ai malati di mente di specifici edifici di ricovero, perchè la follia non è una dimensione misteriosa, in bilico tra la verità assoluta e l'incomprensibile, ma una malattia.* I diversi articoli trattano del S. Maria della Pietà come struttura, ma anche con le sue regole ed in relazione a ciò che si pensa della follia (o meglio della *sragione*) ed a come essa viene affrontata mediante