

# MOSQUITOES, MALARIA & MAN:

A History of the Hostilities Since 1880



GORDON HARRISON

# Mosquitoes, Malaria and Man:

*A History of the Hostilities  
Since 1880*

Gordon Harrison

JOHN MURRAY/LONDON

Line drawings by Wynne Brown  
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First Edition

there is always some  
little thing that is too  
big for us

—archy

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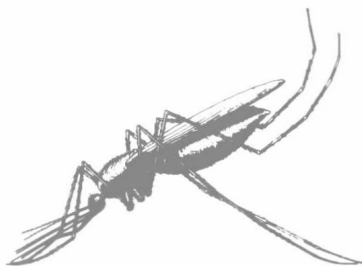
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# 1 / Caliban's Curse



Malaria, described by Hippocrates in the fourth century B.C., is almost certainly one of the most ancient diseases of man.<sup>1\*</sup> Indeed, it is reasonable to suppose that it is older than we, that our primate ancestors were recognizably malarious before they were recognizably human, that the parasite which causes the fever and the mosquito which transfers it from one person to another have accompanied us throughout the Darwinian descent. But it is less than a hundred years since the causes first became known and only since the beginning of this century that people have begun systematically to attack it and its insect propagators.

From small and scattered raids prior to World War I the fight against malaria and malaria mosquitoes grew into a global campaign after World War II. Fifteen years ago victory in all continents except Africa seemed in sight. Today the armies of people everywhere are in retreat. Malaria is resurgent, most tragically in Asia where the battle had seemed almost won. In India, malaria cases, which were reduced to 50,000 in 1961, soared in 1977 to 30 million or more.<sup>†</sup> Classically one of the greatest if least spectacular of the killers, malaria may become that once more. What happened and why are the subject of this history, which begins with the discoveries that precipitated hostilities and traces the ups and downs of the battles that followed.

I have been a military and a political historian and an environmentalist.

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\* Notes on sources are to be found at the back of the book.

† See below page 254.

That odd combination of tastes and experience drew me to the study of this, mankind's first war against another species, and it is from that triple perspective that I have regarded it. Although the characters in the story are insects, parasites and doctors of public health, I think the narrative is essentially not a medical but a military and social history, and at the same time clearly an ecological one.

The early fighters referred modestly to their campaigns as efforts to control mosquitoes and disease. Yet for most "control" always meant defending people chiefly by killing mosquitoes. Most of the doctors in the field saw themselves at war; the language of battle came easily to their minds and pens.<sup>2</sup> From the outset, moreover, the defenders were intent on advance. Although at the turn of the century malaria was still endemic in North America and Europe, it was then as now predominantly an affliction of warm climates and particularly lethal to White agents of empire. The doctors who first fought malaria in the tropics went out explicitly to challenge the mosquito for possession of the rich lands that she and her supercargo of disease organisms dominated.

Any attempt to banish disease is by definition an attempt to alter evolved relationships among living things, in this case between disease organisms and their victims. To try to banish disease by killing its insect vectors\* carries the process of intervention in the natural order a step further. Finally to attack disease vectors, as in the war against mosquitoes, by making the world less fit for their habitation is to engage on a grand scale in the kind of environmental manipulation that has been characteristic of man's approach to his inexplicably flawed but perfectible world.

The science of the natural order is ecology—a late starter among the natural sciences arguably because it has never before seemed useful. From reductionist biology we have learned what we need to know about living things in order to use them effectively; ecology teaches us what they need in order to survive. Only recently have any considerable number of people begun to care about the survival of those living things because only through the environmental crunch have we come to see that their survival may be important to us.

The history of the seventy-five-year war against malaria mosquitoes, all

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\* "Vector," a useful word, is difficult to define precisely; its meaning turns on a point of view. In diseases caused by microorganisms that have alternative hosts—mosquito and man, tsetse fly and cattle—the vector (usually invertebrate) is that host (sometimes called "intermediate") which from the standpoint of the other host (always vertebrate) transmits the disease. The vertebrate host when thought of as a reservoir of infective agents is called the "carrier" which but for the point of view means the same thing.

of the genus *Anopheles*, is one small chapter in the mostly unwritten history of man's relationships with the rest of nature. It is a history of ecological entanglements, mostly unrecognized at the time, many of which by revealing the attitudes brought to the war on mosquitoes throw unexpected light on some of the more usual concerns of history.

The war on mosquitoes began in the high noon of the White man's empire, at the end of the nineteenth century. At the time when Ronald Ross in colonial India discovered that mosquitoes transmit malaria, only one important nation remained independent in that part of the world—Siam, which buffered British Burma and British India from French Indochina. The British were in Singapore and the Federated Malay States; the Dutch, in Java and Sumatra; the Germans, in New Guinea. The Pacific was dotted with outposts of empire mostly French and British. So was the Caribbean. The scramble for Africa<sup>3</sup> in the last three decades of the century resulted in the partition of almost the whole continent among the British, French, Germans, Portuguese and Belgians. Even the Italians, entering the competition late with—as Bismarck put it—“such a large appetite and such poor teeth,” had taken a small bite out of East Africa. The United States, having at last filled in its continental slice between Canada and Mexico, fought a little war with Spain in 1898 to acquire Cuba and the Philippines and began actively to hanker after Panama. Between 1870 and 1900 Britain, France, Russia, Germany, Italy and Belgium added more than 10 million square miles and 120 million people to their dominions. The only lands thereafter left that had never been under European domination were Turkey, Arabia, Mongolia, Siam, Japan, a scattering of small islands and Antarctica.<sup>4</sup>

Success produced an ecstasy of self-congratulation. Few doubted that, as the European way was clearly the predestined one, White industrial man could take over the world and make it bloom as never before. Some minds popped with greed and jingoism and imagined their own countries growing ever bigger and richer. Others held to the earlier idealism, so fortunately coincident with self-interest, of empire as the beneficent spread of civilization to barbarians, and dreamed of the near approach of a world in which science, business and Victorian virtue would triumph. The historian Carlton Hayes, who had gone through high school before the end of the century, recalled during the agony of World War II the special excitement of those years of success. “I saw those last decades of the nineteenth century then—and for almost thirty years afterwards,” he wrote, “as a stage, indeed a glorious stage, in the progress of Europe and our Western civiliza-

tion toward ever greater liberty, democracy, social betterment, and scientific control of nature."<sup>5</sup>

The ultimate spread of Western civilization was seen at the turn of the century to hinge in large part on the "scientific control of nature." Equatorial Africa, the principal arena of nineteenth-century empire, had notoriously resisted White settlement. The West coast in particular was so disease-ridden that a military posting to such colonies as Sierra Leone, Lagos or the Gambia throughout the eighteenth and nineteenth centuries was considered tantamount to a sentence of death. Except for the highlands of East and Southern Africa no part of the continent was healthy. Tropical Asia and tropical Latin America were hardly more hospitable. Everywhere in the tropics the White man languished and died, wasted by the heat and ravaged by disease, above all by malaria.<sup>6</sup>

When Caliban in *The Tempest* thought to wound the foreign master who had enslaved him in his own land he called to his aid his native fevers. "All the infections that the sun sucks up / From bogs, fens, flats on Prosper fall and make him / By inch-meal a disease."<sup>7</sup> Seventeenth-century English audiences could be expected to recognize the fitness of that curse. Englishmen already familiar with the deadly fevers of tropical lands could easily believe them to be a spell laid by their hostile and savage possessors. By the end of the nineteenth century the new scientific understanding of disease seemed only to confirm its association with savagery.

In the brilliant light of the research of Pasteur and Koch and their successors, it began to appear in the last decades of the century that most, perhaps all, disease was caused by microscopic forms of life which invaded and parasitized the body. As doctors simultaneously found ways to resist some of these invasions, the conquest of disease seemed a near and even, to some, an inevitable prospect. With weapons in hand to destroy the lower forms of life that made men ill, Europeans could move into the tropical lands and supplant the lower forms of human life who were then in possession. The battle against disease and the battle for civilization were demonstrably one.

Europeans early observed that tropical diseases—malaria above all—so often deadly to White men seemed scarcely to affect Blacks. They took that fact as further evidence of the hierarchy of species and races in which they were first and would be master. An Italian doctor in 1870 speculated that the inferior races shared the immunity to malaria of the lower animals to whom they were more nearly kin. After mosquitoes were identified as carriers of the fever it seemed possible to some that Blacks were spared because of the "offensive odour from their persons" or because of their thick skins.<sup>8</sup>

The supposed racial difference in susceptibility to disease helped to define the mission of empire and the role of the doctor in it.\* Disease was seen as the ally of barbarism. Only disease permitted backward, slothful races of man to ride best what were obviously the richest lands on earth, so letting their riches go to waste. With the conquest of disease, General Gorgas, cleanser of Panama, wrote, the White man "most eager in his pursuit of wealth" could take over and "produce many times the amount of food now produced in the temperate regions."<sup>9</sup>

So the war against malaria was launched not primarily as a humanitarian crusade to save lives but as a campaign to wrest resources from the grasp of Caliban and exorcise his curse. In seventy-five years both the tactics and purposes have undergone many changes which it is the business of this history to detail. But much of the early militancy persisted throughout.

The dominant view of malaria and mosquitoes has been that they are unqualified and unnecessary evils; the dominant aim has been simply to get rid of them. Each time a new offensive weapon offered new hope, enthusiasts imagined that malaria would soon be wiped out. Only when the latest hope lay dashed did any considerable number of malariologists shift their thinking from an adversary to be conquered to an adversity to be tamed, mitigated and lived with.

Those who hold with the militant view will see this history as a record of a war lost despite important victories on some battlefields. Many of those who took part in the most recent battles do in fact now suffer a sense of defeat. In extenuation some of them point out that their failure is not unique, that in fact one can find very few grand victories in such grand undertakings. (The conquest of small pox may be one, but the final word on that is not in.) That is true. It may also be instructive. Failure so universal, so apparently ineluctable, must be trying to tell us something. The lesson could be of course that we have proved incompetent warriors. It could also be that we have misconstrued the problem.

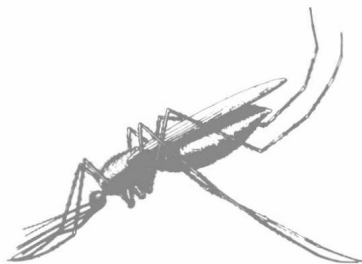
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\* Actually there is a racial difference. The Negro genetically is relatively resistant (compared to Whites) to one form of malaria. This has been strikingly demonstrated among Negro Americans. Besides that true racial immunity (or tolerance) there is an inherited immunity to another (the malignant) form of malaria that is indigenous to sub-Saharan Africa. This is produced by the sickling trait, an inherited abnormality of haemoglobin. Children with sickling genes from both parents (homozygotes) are likely to develop severe and often fatal anaemia. But those with genes from only one parent have a mixture of normal and abnormal haemoglobin that usually does not bother them and does give them resistance to the malignant malaria parasite. Geneticists have used sickling as a classic example of the survival of normally disadvantageous genes in an environment where they confer a special advantage.

The attempt to exterminate forms of life which compete too successfully with us may be as mistaken in principle as it has generally proved in practice. In the fight against malaria the most enduring gains have been made by gradual, complex social and economic as well as physical and medical changes that have together altered the terms of competition between man and disease organisms in man's favor. Those changes too are part of this history—the hopeful part. Dramatic failures in battle not only shed light on undramatic evolutionary progress but have often prepared and promoted it.

So the story may be read many ways—as probing relations between man and nature, as illuminating the motivation and consequences of colonialism, as documenting the problems of public health administration, as reaffirming the interrelations between disease and social and economic conditions, as well as recounting the struggles of some unusual and a few heroic people against what they rightly or wrongly identified as the enemy. In sum it offers, I think, no simple meanings. And that may be the most important point of all.

## 2 / Laveran's Germ



It was not inevitable but it was fitting that the two men who made the basic discoveries that unlocked the secrets of malaria were both military men, both sons of military men. Doctors Alphonse Laveran and Ronald Ross served their respective countries' armies in posts of empire—Ross in India, Laveran in Algeria. Ross's father fought in the great Indian Mutiny of 1857 and became eventually a general in the British Army. Laveran's was a doctor who also served in Algeria. Ross, a complicated and chronically maladjusted man, was nevertheless the true son of his father and of his time and circumstance, one who viewed life as a struggle and himself as a soldier perpetually in battle with people and forces that sought, from stupidity or maliciousness, to frustrate him and hold back the course of human progress. Laveran appears to have been a gentler man, more purely a scientist by temperament, taste and long profession. Yet the devotees of science were not indifferent to the struggle for progress. On the contrary, they were among its generals. Laveran like Ross was egotistical, ambitious and endowed with the seemingly limitless energy, patience and optimism that are indispensable traits of discoverers.

Charles Louis Alphonse Laveran was pitched into the study of malaria when he was sent to Algeria in 1878.<sup>1</sup> He was then thirty-three. Besides his medical preparation, he had a degree in public health (from L'École du Service de Santé of Strasbourg) and had spent four years as agrégé professor of epidemic medicine at the Army's medical school in Paris, Val de Grâce, occupying the chair that had been established for his father. He

does not appear to have had special interest in malaria himself or clinical experience with it. But there were at Val de Grâce four doctors who had worked extensively on the disease: F. C. Maillot who in years of practice in North Africa had developed successful quinine therapy, Léon Colin who made careful studies of the epidemiology, and Achille Kelsch and P. J. Keiner, who investigated the pathology. Laveran of course knew them and their work and had in fact carefully studied Colin's principal text in preparation for his examinations for the *aggrégé* degree.<sup>2</sup>

The work of Kelsch was a direct forerunner of Laveran's, even though Laveran never mentions it in any of his books or papers. Kelsch's attention as a pathologist had been drawn to one of the remarkable peculiarities of malaria: In the blood vessels of people who died of the disease were innumerable tiny black particles, often so numerous in certain organs (especially the spleen and liver, sometimes the brain) as to color the whole organ an abnormal slate grey.

By the 1870s when Kelsch began work the phenomenon of the malarial black pigment was well known though not at all understood.<sup>3</sup> Heinrich Meckel, a German pathologist, is generally credited with having been, in 1847, the first to describe the pigment. Another German pathologist, T. Frerichs, in 1858 demonstrated that the black particles consisted of degraded haemoglobin from the red blood cells. He thought the degradation might occur through a slowing or stoppage of circulation in the capillaries. It would thus be a product of pathological changes brought about by the disease. One doctor theorized that malaria fever destroyed the haemoglobin, another believed circulation of the degraded haemoglobin caused the fever. The critical mystery was why whatever happened happened only in malaria.

At least three doctors probably had the mystery under their microscopes but did not realize what they were looking at. Meckel himself described the pigment as sometimes contained in round, ovoid or spindle-shaped bodies. Rudolf Virchow, one of the great German pioneers in pathology, saw much the same thing a year later. So did Professor Kelsch, who was working in Algeria at the time Laveran was teaching in Paris, and seems to have just missed anticipating Laveran's discovery by some six years.

Kelsch, like Meckel and Frerichs, observed the black pigment almost always contained in white blood cells, or, as he put it, "in cellular elements that more or less conform to the white corpuscles of the blood." But occasionally he found it free and occasionally "enclosed in a hyaline body [clear protoplasm]" which he differentiated from leucocytes but did not otherwise describe.<sup>4</sup> Without much doubt these were the parasites that cause the disease *and* the black pigment.





From *Chanteclair*, 1909

Charles Louis Alphonse Laveran

*The Wellcome Institute for the History of Medicine*