On 11 December 1943, Winston Churchill flew from Cairo in Egypt to the north African city of Tunis to spend a few days with Dwight D. Eisenhower at his “White House,” near the ruins of Carthage. The British Prime Minister had already completed a complex series of meetings, conferring with the Chinese general Chiang Kai-shek in Cairo and with Franklin Roosevelt and the Soviet leader Joseph Stalin in Teheran. Their agenda was an evolving plan for the D-Day landings to regain France from the Germans.

Overweight, and a heavy smoker and drinker, Churchill was also overworked and exhausted. His flight to Tunis was delayed, and by the time he reached Eisenhower’s villa, he had a sore throat and was feeling unwell. In the coming days, his temperature rose rapidly, his condition deteriorated, and a portable X-ray machine confirmed that he had contracted pneumonia. When Churchill suffered two bouts of atrial fibrillation, his physician decided to give him not only digitalis for the heart problem, but also a new drug to combat the pneumonia. It was one of the sulfonamides, called M&B 693 named after the British drug company, May & Baker, which had developed it.

The treatment was successful, and two weeks after becoming ill the British premier was able to fly to Marrakesh and then home to London, where he continued to refine the D-Day plans. While he had been delighted to be allowed a shot of brandy with the M&B 693, there’s little doubt that the novel sulfa drug defeated the pneumonia and probably saved his life.

Given the eminence of the patient, and the dramatic nature of this and many other, earlier cures, it seems remarkable that there is now so little awareness of the impact made by sulfa drugs on the conquest of infectious maladies. Everyone knows about Louis Pasteur, the first scientist to devise specific vaccines against pathogens, and about Alexander Fleming’s work on penicillin. But who recalls the name of Gerhard Domagk, the German biochemist responsible for the inception of the sulfa drugs during the 1930s? Even today’s physicians can be hazy about this crucial episode between the historic studies of Pasteur, Robert Koch and Paul Ehrlich, and those of the Oxford researchers who turned Fleming’s laboratory observations into the revolutionary advance of penicillin therapy.

It was in an effort to make good this deficiency that Thomas Hager decided to write *The Demon Under the Microscope*, published recently by Harmony Books (New York). He has succeeded extraordinarily well. Do not be deceived by the hyperbole and raciness of the cover (“The Nazis discovered it. The Allies won the war with it...This incredible discovery was sulfa”). Hager’s book is a well-researched chronicle which goes a long way to justify his claim that the key event in the history of the treatment of bacterial disease was not the emergence of penicillin in the early 1940s but the discovery of sulfonamides a decade earlier. If we accept his plea that all antimicrobials should be described as antibiotics, and not just those made by living organisms, then “sulfa” was the first truly revolutionary antibiotic.

Not least of Hager’s skills is that, alongside some admirable science writing, he illuminates the social context of the research. Especially vivid is his portrayal of the appalling conditions which Gerhard Domagk encountered as a youthful medical assistant on the Eastern Front
in World War 1, and which inspired him to pursue his medical studies in the hope of developing effective therapies for conditions such as gas gangrene. “He witnessed more operations in two years than many surgeons see in a lifetime,” Hager writes, “helped set compounds fractures, the bones bristling through the skin; used magnets to search for pieces of shrapnel; watched surgeons run their fingers down the insides of intestines, probing for holes; assisted with countless amputations, threw the severed arms and legs onto a growing pile in a side room.”

Young Domagk’s key observations were on the dreadful consequences when even the most heroic and apparently successful surgery allowed Clostridium perfringens to invade the incision site and foster foul-smelling, potentially fatal wound infections. Gas gangrene was furiously contagious, capable of killing half of the patients in a postoperative ward within a few weeks. And there were other bacterial enemies too, all contributing to the massive fatality rate even among soldiers who survived the traumas and stresses of battle. A quarter of a century later, Domagk was to write in his diary: “The real birth of chemotherapy as far as I am concerned took place in the Great War of 1914–18 when I swore an allegiance with my fallen comrades. Those were my first principles and they still are today. They stand over me like a shining star.”

Though he worked briefly as a pathologist at the universities of Greifswald and Munster, Domagk discovered the sulfa drugs during a long career at IG. Farbenindustrie, formed from a merger between Bayer and BASF in 1924. The key discovery, that the sulfonamide-containing Prontosil Red could control streptococcal infections in mice, came in 1932. However, difficulties in replication delayed its publication by about three years.

Once the work did become public, and other laboratories and other countries joined the search, a string of different sulfa drugs appeared, and the range of curable infections increased apace. By 1940, one sulfonamide or another had become standard therapy for pneumococcal pneumonia, childbed fever, erysipelas, streptococcal infections, and the commonest forms of meningitis. Soon urinary tract infections, trachoma, chancroid, mastoiditis, otitis media, and gonorrhea joined the list. With all combatants carrying or having rapid access to the new wonder drugs, death rates from meningococcal meningitis plummeted in World War 2 as compared with World War 1.

Two grim ironies may, in different ways, explain why this otherwise momentous work, which spawned enormous benefits for mankind, did not receive greater public acclaim. Firstly, the Nazis would not allow Domagk to accept the Nobel prize he was awarded in 1939 (though he did receive just the medal in 1947). Secondly, IG Farben became the major manufacturer of the Zyklon B poison gas that was used to kill Jews at Auschwitz.

No doubt the advent of penicillin, its potency and associated publicity, is the principal reason why the story of Gerhard Domagk and the sulfonamides has been painted out of popular histories of the conquest of pathogenic bacteria. Yet as Thomas Hager shows, the earlier chapter had at least as great an impact on human history—in a variety of different ways.

“Just as important as its role in curing any disease, sulfa cured the medical nihilism of the 1920s, dissipating the prevailing attitude that chemicals would never be able to cure most diseases,” he writes. “Sulfa proved that magic bullets were possible, encouraged their discovery, established the research methods needed to find them, framed the legal structure under which they would be sold, and created the business model for their development.”

Thomas Hager has written a fine book. He has performed an invaluable role not only in resurrecting from obscurity a crucial episode in our battles against communicable disease but also in emphasizing its wider social and industrial significance. What a pity that he mars all of this by misidentifying the three scientists who are famed throughout the world for the discovery and development of penicillin. He tells us that Alexander Fleming (a Scot) was Australian, and that Howard Florey (an Australian) and Ernst Chain (a German Jew) were British. Oh dear.