

Chapter 5

Phage–Ethics: A Lacanian Reading of Sinclair Lewis’s *Arrowsmith*

5.1 Introduction

Arrowsmith (published in 1925) is an intriguing novel for various reasons, but first of all because this 500–page romance is often regarded as the first real *science novel*, devoted to experimental laboratory research as a practice, a profession, an ideology, a worldview, a “prominent strand in modern culture” (Schorer 1961, p. 414), a way of life.¹ Named after its key protagonist Martin Arrowsmith, it records an important event in the history of biomedicine: the discovery of the “bacterium–eating” virus: the bacteriophage. But it also addresses a moral ambivalence that runs through biomedicine as a research field, namely the tension between the exacting demands of “pure” research on the one hand and its various (more or less benevolent) applications in medical practice on the other. The novel stages a series of dramatic moral conflicts between the duties of Martin Arrowsmith as a physician (working for the benefit of his patients) and as a researcher (working for the benefit of future generations, of “humankind”), thereby practicing not one but *two* “impossible professions”. Lewis’s lively descriptions of science communication, priority conflicts, funding strategies, research ethics and laboratory rivalries are still relevant today. First and foremost, however, the novel allows us to discern how, beneath biomedicine’s manifest aspiration to promote human well–being, there is a “deeper” impulse, a disconcerting obsession at work that may prove highly disruptive, not only for test animals, research subjects and patients, but also for scientists themselves. Biomedicine’s fuelling desire, its *cupido sciendi* (its will to know) is not predominantly to safe, but rather to *control* life, and the aim of my Lacanian rereading is to bring this subliminal dimension to the surface. Lacan’s quadruped will guide our reading:

¹“*Arrowsmith*, the first major American novel to concern itself with the culture of science” (Doctorow 2008, p. 455/6).

S_2 (biomedical expertise)	a (the bacterium-eating factor X)
S_1 (compulsion to control life)	\S (the impossible profession)

Sinclair Lewis (who was awarded the Nobel Prize for literature in 1930) wrote what is perhaps his best novel in collaboration with science writer Paul de Kruif,² a graduate from the University of Michigan who had worked as a bacteriologist (“microbe hunter”) at the *Rockefeller Institute for Medical Research* in New York³ and was well underway to become a prominent author himself.⁴ He would publish his (still famous) best-selling book *The Microbe Hunters* in 1926. Whereas Lewis (son of a general practitioner) was responsible for the descriptions of marital, domestic, professional and civic life in the United States a century ago, De Kruif added the scientific ingredients: the biomedical jargon and the intricate details of laboratory research. But he also portrayed one of the most intriguing characters of the book, namely Max Gottlieb: a “blend” (De Kruif 1962, p. 93, p. 102), “melange” (p. 109) or “amalgam” (Markel 2001, p. 372), – a *Mischperson* as Freud calls it (1900/1942, p. 299) –, of Frederick G. Novy (De Kruif’s Professor of bacteriology at the University of Michigan) and Jacques Loeb, the famous biologist of German–Jewish descent (1859–1924) who joined the Rockefeller Institute in 1910 (Pauly 1981; Fangerau 2006). Lewis and De Kruif toured the Caribbean together on a “literary safari” (De Kruif 1962), combining furious writing with heavy drinking, collecting ample materials for their masterpiece along the way.⁵ And while De Kruif offered Lewis a crash course in bacteriology, Lewis provided De Kruif with an apprenticeship in non-academic writing.

Arrowsmith portrays the relentless (and potentially disruptive) will to power that drives life science research. Whereas on the ‘manifest’ level biomedicine aspires to do good, there is a “mysterious and unreasoning compulsion” (p. 146) at work that cannot be reduced to purely altruistic motives. This is underlined by a disconcerting

²“To Dr. Paul de Kruif I am indebted not only for most of the bacteriological and medical material in this tale but equally for his help in the planning of the fable itself – for his realisation of the characters as living people, for his philosophy as a scientist” (Lewis 1925/2002, p. 2).

³The Rockefeller Institute, with its “sumptuously plush research facilities”, is depicted by De Kruif as a “scientific emporium” (1962, p. 14).

⁴Although his “dissociation experiments” (comparing virulent and attenuated streptococci) resulted in publications in the *Journal of Experimental Medicine*, he was fired by the Institute’s director Simon Flexner (Dr A. DeWitt Tubbs in the novel) for publishing *Our Medicine Men*: a critical journalistic review of contemporary medical practice in the U.S. (“A montage of what I’d seen, heard, read, felt, and experienced”, 1962, p. 35), written at night while experimenting during daytime. Flexner notably objected to De Kruif’s view that relentless *competition* rather than disinterested *collaboration* lies at the heart of scientific research.

⁵Their collaboration was drenched in “epic” alcohol bouts and subsequent hang-overs. In his memoirs, De Kruif explains that during these “drunken combats” his assignment was “to keep our genius [Lewis] on this side of delirium tremens ... on this side of going off a deep end – though there were times, mornings, when his shaky hands poured some of his Scotch onto the table and some into the glass.” (1962, p. 94).

quote from Paul de Kruif (who transferred his own research ethos on Martin Arrowsmith) about the “nihilism” of scientific inquiry:

Why had I stopped the study of medicine and switched to bacteriology? ... [What did] my years of cool butchery of thousands of rabbits and guinea pigs show but a lack of reverence for life? I was destructive. I was a nihilist, period. For me, the world was too full of people and animals. And having no spark of reverence for all life, I had no ethics (1962, p. 39)

To bring this “deeper” impulse to the fore, I will read the novel from a Lacanian angle, to come to terms with this disconcerting normative “flaw”, this *death drive* fuelling what is purported to be the “science of life”. But before explaining the design of this chapter more fully, let me first provide an outline of the plot.

5.2 Plot Outline

Like Lewis himself (born in Sauk Centre, Minnesota, in 1885) Martin Arrowsmith grows up in the American Mid–West at the turn of the century, but as a young adult, his biography more closely resembles that of Paul de Kruif (1890–1971). Like him, he is a medical student at the University of Winnemac (\equiv Michigan) at Maholis (\equiv Ann Arbor), a “factory designed to produce physicians much like the Ford Motor Company produces cars” (Lewis 1925/2002, p. 8). In Lacanian terms: a factory to produce S_2 -type professionals. Here, however, Martin becomes infected with the spirit of pure science, personified by Max Gottlieb (\equiv Jacques Loeb), a *Fremdkörper* in professional medicine, because he is a professor of bacteriology rather than a physician, who puts his life in service of an obsession, a fatal addiction, namely “pure”, basic research. His goal is to synthesise antitoxins *in vitro* to free humanity from the scourge of infectious disease, but also to free laboratory researchers from the laborious use of test animals (as impure and unreliable models). Martin wants to follow in his footsteps and become a bacteriologist himself: a devotee, a believer in the “religion” of science.

But as he meets a female nurse (Leora) and becomes a married man, he has to choose between a career as a general practitioner (that will provide him with social respectability and an income) and the uncertainties of a life devoted to science–for–its–own–sake. Somewhat reluctantly, he opts for the former, thus betraying his true calling, his truth event (the lectures by and conversations with Gottlieb), suppressing his persistent feelings of discontent with heavy drinking. Martin gives in to the reality principle, as it were, allowing himself to become enwrapped in civic, marital and professional life. Yet, he keeps up his habit of spending long and lonely nights tinkering in his home–made laboratory. At a certain point he investigates a local outbreak of cattle disease, publishes his results in the *Journal of Infectious diseases* and sends a reprint to Gottlieb, who now works as a principal researcher at the McGurk Institute (\equiv the Rockefeller Institute) in New York. After reading this article, Gottlieb invites Martin to join him at McGurk and Martin eagerly accepts the invitation.

During his (initially quite unsuccessful) research there, he coincidentally discovers a strange invisible “something”, a mysterious “principle X” which destroys bacteria, and he decides to study it meticulously, in accordance with the rigorous methods of his mentor. Unfortunately, while Martin is still engrossed in his analyses, experiencing serious inhibitions when it comes to putting his findings to paper, Felix d’Herelle of the Pasteur Institute announces his discovery of what he refers to as the “bacterium–eating” virus, the bacteriophage. After recovering from this serious drawback (the loss of priority), Martin is urged by Gottlieb to continue his phage research, but to focus on practical applications instead, using these predators of bacteria as “allies” in the war against disease. When the fictitious Caribbean island of St. Hubert is struck with bubonic plague, and McGurk is called upon for help, Martin is sent there (accompanied by his wife Leora and a drinking companion, the public health specialist Sondelius) to conduct a field trial designed to determine whether “phage” can effectively be employed in fighting lethal pathogens. The result is a moral clash between the island’s administrators (who had expected a life–saving doctor) and Martin’s own objective as a scientist, intent on using the population as “material” for his trial. Thus, he finds himself confronted with an ethical dilemma: as a physician, it is his duty to vaccinate as many inhabitants as possible, but as a researcher, he is in need of an (untreated) control group to demonstrate the effectiveness of his vaccine. This means: dividing the coloured, illiterate population of a village into two equal halves: the saved and the doomed.

Initially, he remains loyal to the experimental rigour instilled in him by Gottlieb, but after the tragic death of both Sondelius and his wife the physician in him gains the upper hand and he contaminates the experiment that was supposed to bring him everlasting fame. He still manages to publish his results, but tampers with his sloppy data so as to make his story sufficiently convincing. He becomes married again, this time to an affluent socialite widow who kindly provides him with a lavishly equipped laboratory of his own. Yet, utter dislike of the social life of the New York elite, in combination with marital unease, presses him to leave both wife and child behind and to escape to the wilderness of Vermont, where, together with another disgruntled colleague, he lives out his mania for “pure” research, virtually undisturbed, in an isolated forest cabin.

In the following sections, key dimensions of the novel will be subjected to a Lacanian reading, treating Martin Arrowsmith as a case study (*Fallgeschichte*). Successively, I will focus on: (a) the organisational and occupational hazards of a biomedical career; (b) the *cupido sciendi* of pure science as a “divine madness”; (c) Martin’s grand moment of discovery (the bacteriophage as the intrusion of the “real”); (d) the core medical–ethical dilemma (the bacteriologist as a physician and as a researcher) and (e) cabin science: Martin’s escape to a reclusive, scientific Walden, the novel’s final act.

5.3 Medical Practice and Its Discontents

For young Martin Arrowsmith, becoming a doctor involves an extended process of socialisation into the medical profession. Although courses in bacteriology and immunology are indispensable ingredients of his training, they nonetheless represent something which, in essence, remains at odds with professional medicine, namely basic research: science for the sake of science (seeing human beings as research subjects rather than as patients). The pure scientist (Max Gottlieb) is an oddity on the campus, eager to recruit a small number of students (the “elect few”), – or even one single student, Martin –, luring him away from a normal professional career, converting him to the spirit of pure science.⁶ Due to Gottlieb, one could argue, *Arrowsmith* becomes a *science* novel, rather than a *medical* novel (i.e. a novel featuring a practicing physician).

Thus, *Arrowsmith* depicts a failed process of socialisation. Martin continues to waver between the world of medical professionals (from country doctors up to metropolitan hospital surgeons) on the one hand and the international subculture of “pure” scientists on the other: nomads really, contemptuous of “worldly success” (p. 11), speaking a strange, artificial language, migrating from one laboratory to the next, convening at international conferences and publishing dense quantitative analyses in esoteric journals. Sooner or later, Martin will have to choose between the “profane” world of medical practice and the “sacred” world of laboratory work, with McGurk, the “immaculate” laboratory, towering as the ultimate “sanctuary” of science (p. 310): a “Heavenly laboratory in which good scientists may spend eternity in happy and thoroughly impractical research” (p. 147).

Just a few years before *Arrowsmith* was published, Sigmund Freud (1921/1940) developed his views on socialisation in *Group psychology and the analysis of the ego* (“Massenpsychologie und Ich-analyse”). How can an organised group of people (an “organised crowd”) sustain itself in view of the fact that, for individuals, participation comes with a price: they must relinquish private interests and short-term rewards to pursue distant goals that can only be collectively achieved? How can self-centredness, individualism and discontent in modern mass societies be overcome? For Freud, the key to understanding the functioning of well-organised groups (as opposed to unorganised groups, i.e. *crowds* or *mobs*, who are intimidating, but prone to panic) is identification. Groups need leaders: paternal figures like Sebastian Bloch in the previous chapter, embodying the collective ideal and endowed with sufficient charisma and prestige for anonymous group members to identify themselves with them. And this is precisely the weakness of professional medicine as depicted in Lewis’s novel, – and the cause of Martin’s failure. The various father-figures (representatives of organised medicine) are relentlessly ridiculed, one after the other. Only Loeb escapes the pervasive atmosphere of satire.

⁶Like Jacques Loeb (1859–1924), Gottlieb was a contemporary of Freud, trained by the German physiological school, although Freud focused on neurology and language (aphasia) and Gottlieb on psychophysics, before turning to immunology.

In the early twentieth century, group behaviour had become an urgent topic. Societies were becoming mass societies; modern media were creating mass audiences; politics had become the domain of mass movements; and even science itself was expanding in scope and scale: new universities were established and new types of scientific institutions were founded (such as the Rockefeller Institute, founded in 1901). The question how to manage and organise large groups was not a purely academic one.

In *Arrowsmith* we see a chronic tension/collision between two types of groups (two types of callings), highly dependent on one another, and yet apparently mutually exclusive, namely (impure) medical practice and basic (pure) research. For Martin, there are many incentives for choosing a medical career: the income and respectability of the profession, the possibility of marriage and of upward social mobility, in combination with the public acknowledgement of its relevance. Yet, what is lacking, to a deplorable extent, are inspiring personalities. One by one the father–figures in Lewis’s novel (representing medicine and public health) are ridiculed as hypocrites, endorsing unsubstantiated claims and leading uninspiring lives. On top of that, Martin himself is not a good physician at all, lacking “bedside manners” and communicative skills, while his drinking habits are symptomatic of his ambivalence: his repressed yearning for pure inquiry.

Gottlieb, by contrast, seems to stand out as a beacon of integrity, a scientific prophet, a window into the future. Their first meetings give rise to “imprinting”, as it were. No matter how hard Martin tries to “repress” his admiration for his hero, his exposure to Gottlieb prevents him from developing a whole–hearted commitment to medical practice. Indeed, although he had “given up Gottlieb–worship and his yearning for the laboratory ... something of Gottlieb’s spirit remained” (p. 115).

Having mesmerised Martin during his lectures, and subsequently during the laboratory hours they spent together, Gottlieb continues to draw Martin towards him.⁷ Gottlieb considers “medical science” a contradiction in terms. He is a genuine scientist, devoting his life to intellectual aspirations, willing to work excessively hard and to accept the risk of failure. Martin is in awe of Gottlieb, the ideal “father figure” he is looking for (Parry 2008, p. vii), an ego–ideal or intellectual conscience, encouraging him to work harder. Indeed, Gottlieb “indoctrinates him into the religion of a scientist” (p. viii).

Already during the very first lecture he attends, a *rapport* is established, and Martin identifies himself with his life–long mentor. The novel describes how, at the beginning of the lecture, Professor Max Gottlieb is about to assassinate a guinea pig with anthrax germs, displaying his masterful technical dexterity, claiming that “technique is the beginning of all science” (p. 36). As Lewis phrases it, the class was “a mob” (p. 35), “shuddering” (p. 36) in response to the idea that even a small sample of anthrax bacilli could easily produce a lethal infection. But Martin is simply enthralled by Gottlieb. Indeed: “Martin Arrowsmith already saw himself doing the same experiment and, as he remembered Gottlieb’s unerring fingers, his hands curved in imitation ... He had begun, perhaps in youthful imitation of Gottlieb, to

⁷Lewis originally intended to call his novel *In the shadow of Max Gottlieb* (Fangerau 2006).

work by himself in the laboratory at night” (p. 38/9). He mimics and copies Gottlieb’s words and gestures. And via Gottlieb, who studied with Helmholtz and idolises Koch, Martin extends his identification to his master’s masters.

This fascination for scientific truth hampers his professional career, causing a chronic sense of ambivalence: “Martin remained doubtful, he admired the insistence on the physician’s immediate service to mankind, but he could not forget the cool ascetic hours in the laboratory” (p. 119). As a symptom of this ambivalence, he insists on having a makeshift laboratory of his own where he continues his habit of conducting experiments, usually at night, although this is barely tolerated by his social environment, first of all his wife. This dynamics is captured by Lacan’s quadruped:

S_2 (medical professionalism)	a (unknown disruptive lethal factors)
S_1 (the imperatives of pure science: Gottlieb as super-ego)	$\$$ (divided loyalties: the worldly versus the “religious” calling)

His research position at McGurk (where he joins his ego–ideal again), his dramatic expedition to the Caribbean and, finally, his retreat into the woods are all instances of a return of the repressed. Having been exposed to the quest for pure science, he cannot really become socialised into normal civil society any more. Indeed, in *Arrowsmith*, bacteriology is presented as an infectious affliction, spreading from the laboratories of Pasteur and Koch into the United States, with researchers such as Gottlieb as carriers or vectors.⁸ As Freud argues in *Group psychology and the analysis of the ego*, there is a strong desire in infected individuals to confer their infection to others, for why should they alone be excluded from the benefits of social life and condemned to an ascetic existence of toil and hardship (p. 134)? But what exactly makes laboratory research so ‘infectious’ (for individuals ‘susceptible’ to it), so alluring?

5.4 *Cupido sciendi*: Pure Science as a Divine, Infectious Madness

Arrowsmith contains numerous descriptions of biomedical research settings, with racks of test–tubes, Bunsen burners, constant temperature baths, centrifuges, autoclaves, notebooks and so on, but this in itself does not explain the fatal attraction

⁸Immunology and psychoanalysis seem comparable. There is a famous anecdote, told by Lacan (1966), who allegedly had it from Jung, that (as their ocean liner entered New York harbour) Freud gloomily told the latter that they were ‘bringing the plague’ to America. Psychoanalysis has often been depicted as an ‘infection’, disrupting academic life and therapeutic practice (or even society at large), for instance by De Kruif, who claimed that Pavlov “immunised me against the peril of what I came to call the ‘analism’ promulgated by Sigmund Freud, just then beginning to taint American psychiatry and even psychology” (1962, p. 122).

these *loci of discovery* exert on individuals such as Martin. Rather, what attracts him in science is the aura of a quasi-religious calling. This is underlined by an improvised sermon by Gottlieb, with Martin (who has just entered McGurk) “at his feet” (Doctorow 2008, p. 453), explaining that science, extremely demanding and error-prone, is essentially a religion:

I make many mistakes. But one thing I keep always pure: the religion of a scientist. To be a scientist [is] like mysticism ... it makes its victims all different from the good normal man... The scientist is intensely religious – he is so religious that he will not accept quarter-truths, because they are an insult to his faith... he is a man that all nice good-natured people should naturally hate! ... [The authentic scientist is] the only real revolutionary... He lives in a cold, clear light... Not all the men who work at science are scientists. So few! ... To be a scientist [there are] two things you must do: work twice as hard as you can, and keep people from using you. I will try to protect you from success ... May Koch bless you! (292/293)

Science means perseverance, loneliness. Research had not yet evolved into the large-scale pre-programmed phenomenon it became today. Discoveries were made by solitary individuals at their benches, preferably after hours, during the night.⁹ McGurk encourages individuals to pursue their goals in splendid isolation. Research is pure, researcher-driven, and intolerant towards the “quarter-truths” abounding in the real world outside the lab.

As a general practitioner struggling in the fuzzy, dreary outside world, Martin tried to forget about Gottlieb and his imperatives (S_1 in the lower-left position), but his super-ego continues to haunt him like a phantom. As a doctor, Martin is deprived of something, – and of someone. The repressed attachment continues to cast a shadow¹⁰ and his ego is split into two halves: on the one hand the married, heavy drinking professional, on the other hand the would-be researcher, tormented by his intellectual conscience (his ego–ideal), failing to live up to his true vocation ($\$$ in the lower-right position). His entering McGurk as a research associate entails a moment of euphoria and triumph, of reconciliation and atonement: a spiritual “inflammation”. He and Gottlieb (the “demon” of pure science) are finally on speaking terms again, while Martin can overcome his paralysing dividedness ($\$ \rightarrow S_2$), can restore his *integrity* (literally: his *wholeness*), can wholeheartedly identify himself with his role as researcher and constitute himself convincingly as a moral subject.

But in his new position, new challenges, new threats to his integrity await him, precisely *because of* the exclusiveness of the scientific calling. In *Arrowsmith* the ethos of science is described as a divine madness, $\theta\epsilon\acute{\iota}\alpha\ \mu\alpha\upsilon\acute{\nu}\iota\alpha$, as Plato phrased it (*Phaedrus*, 244–256). Inside their laboratory, similar to Plato’s philosophers, scientists behold a realm of truth which is invisible for untrained senses, a transcendent region only discernible for the initiated mind, although there are many who, after

⁹Cf. “In Betreff der intellektuellen Leistung bleibt bestehen, dass die großen Entscheidungen der Denkarbeit, die folgenschweren Entdeckungen und Problemlösungen nur dem Einzelnen, der in der Einsamkeit arbeitet, möglich sind” (Freud 1921/1940, p. 89).

¹⁰“Der Schatten des Objekts [i.e. Gottlieb] ist auf das Ich gefallen” (Freud 1921/1940, p. 120).

much toil and hardship, leave the field without gaining even a glimpse of this higher reality (248B). Because of their desire for truth, true scientists cannot sleep at night. They must distance themselves from the common “herd” of mankind; ignore their neighbours, who rebuke them for apparently having gone mad. In *Arrowsmith* this madness, rather than providing access to a “higher” realm (of ideas), as in Plato, allows Martin to open up a “deeper” realm of microbial life, only accessible via microscopes. The topology has changed: rather than striving upwards, the modern scientist aims to dive deeper, but a similar amount of persistence is required. Only those who, like Martin, persevere in their tedious, repetitive activities will experience the “joy” (p. 43), the “rapt quietude” (p. 125), the “beautiful precision and dullness” (p. 40) of laboratory work. They will “sink blissfully into the laboratory” (p. 270), “beyond sounding in their experimentation” (p. 305), so that their lab temporarily becomes a “perfect world” (p. 295).

On the verge of the discovery of his “principle X”, Martin becomes completely absorbed in his work. He forgets about night and day, becomes unconscious of the world, and completely exhausts himself, until he goes literally mad: “He was completely fagged, perhaps a little insane” (p. 326). Indeed, he works himself into a state of “neurasthenia” (§ in the lower-right position):

Martin watched himself, in the madness of overwork, drift toward neurasthenia...From irritability he passed into a sick nervousness in which he missed things for which he reached, dropped test-tubes, gasped at sudden footsteps behind him. ... Then he was obsessed by the desire to spell backward all the words which snatched at him from signs... At last Fear closed in on him. [It began] with terror of the darkness. Footsteps in the hall were a creeping cutthroat.... When in the street below he did actually see a man standing still, he was cold with panic. Every sky glow was a fire...He knew absolutely that his fears were absurd, and that knowledge did not at all keep them from dominating him. Till the safe dawn brought back a dependable world (p. 332/3)

All this is captured by the Lacanian quadruped:

S_2 (pure laboratory research: the dexterous experimenter)	a (the unknown, allusive factor X)
S_1 (driven by a will to power, to control)	§ (various symptoms due to exhaustion, self-exploitation, workaholism, etc.)

As a consequence of his fatigue, he suffers from a wide range of symptoms, the by-product (in Lacanian terms) of his devotion: insomnia, agoraphobia, claustrophobia, siderodromophobia (i.e. the fear of railway journeys) and, most of all, anthropophobia (the fear of meeting other humans), and yet he realises that, sooner or later, his crazy experiment will turn “from overwhelming glory into sane ... routine” again (p. 335), so that S_2 (the balanced, impassive agent of university discourse) will be restored. What is it that, during this episode of self-imposed mental suffering, reveals itself to him? What is this “gold” which he seems about to find (p. 336)?

5.5 The Bacteriophage as the Intrusion of the Real

Arrowsmith makes it sufficiently clear that experimental laboratory work is often-times quite tiresome and repetitive. Researchers redo their experiments over and over again, under various conditions, in order to confirm and verify their results. As World War I is gliding into its final, most sinister Act, Martin quietly attends the beautiful, grapelike microbes named staphylococci which he cultivates in vitro, representing the S₂ agent of university discourse.¹¹ All of a sudden, something completely unexpected happens, thwarting his expectations rather dramatically. What went wrong?

The purpose of laboratories is to keep the unexpected and disturbing at bay, allowing researchers to achieve maximal control over nature. The experimental setting is designed to immunise experiments against disturbances and intrusions (noise). The real world (out there, beyond the confines of the lab) is kept at a safe distance. Research facilities are purified, streamlined versions of reality, devoid of debris, processing tiny, artificial samples of nature that can be meticulously studied, such as strains of bacteria in test-tubes, carefully cultivated, protected, isolated, and also controllable and predictable to a considerable extent, with the help of measurements, technical equipment and mathematical equations.

But now, in the midst of this tedious, repetitive, quantitative work, something highly unusual occurs, something which cannot be ignored. “I have hit something” (p. 323), Martin aptly exclaims, something “at the mysterious source of life” (p. 321), something which is not mentioned in the manuals or journals of normal science. A violent, disruptive, completely unknown dimension of nature suddenly opens up to him. A peaceful strain of staphylococcus bacteria, which should be flourishing and multiplying in their flask, is suddenly missing. Instead of a colony of bugs, he discerns a “clearing” (p. 325). The microbes have all disappeared: a most uncanny situation. Under his microscope, he sees “nothing but shadows of what had been bacteria: thin outlines, the form still there but the substance gone; minute skeletons on an infinitesimal battlefield” (p. 323). While World War I is raging, Martin hovers over a perennial battlefield (existing since time immemorial) on the microbial level, spotting the ghostly remainders of his perished troops (with test-tubes turned into trenches). Something has dissolved them, wiped them out. It looks as if they committed “suicide” on the spot (p. 323). Something is relentlessly preying on these peaceful herds; something violent has entered the lab, reminiscent of Heraclites’s maxim that warfare (πόλεμος) is the essence of being. What is this intruding “something”?

Jacques Lacan would have called it the Real: something which cannot be discerned directly, but intrudes and flouts our expectations, something alien, amorphous, unknown and uncanny; something we were *not* looking for. All of a sudden, something is missing which should be there (something is *Fort* which should be

¹¹“He was so absorbed in staphylococci that he did not realise the world was about to be made safe for democracy. He was a little dazed when America entered the war.” (p. 315).

Da): a researcher is suddenly deprived of his microbes. They are reduced to phantoms: ghostly, emptied organisms, bodies without organelles. Nothing survives the intruder's attack. The Real is that which is discovered by coincidence, which resists the normal functioning of scientific practice (Lacan 2007, p. 29) but cannot be ignored any longer; something profoundly alien and "other".¹² It can only be tamed if embedded in the symbolical order, by identifying, naming, counting and analysing it: the basic objective of university discourse, of laboratory research.¹³

Martin's discovery of the bacteriophage is also a turning point in the movie version (Ford 1931). In mid-winter,¹⁴ with Manhattan covered in snow, Martin places three flasks in a refrigerator, thick with bugs. Returning to his laboratory later that evening, unable to detach himself from his work, he discovers that in one of them, the bugs have completely vanished. Instead of being turbid, the fluid is clear. Under his microscope, which he handles with professional ease, he discovers the remnants of what had been a thriving colony of bugs. Nothing like this ever happened. Is it good or bad? Bad, because it ruins his experiment, but he quickly considers the option that it might be something "good", something "better". Bugs don't commit suicide: what slaughtered them? It must be *something*. In fact, it turns out to be the greatest *thing* that ever happened to him. "I have found *something*", he triumphantly exclaims, "but don't ask me what it *is*". After days of prolonged labour, Gottlieb glances through his notes and says: "Martin, you have a big *thing* here, a great *thing* ... You must find out what it *is* ... You will begin working in earnest".

Techno-scientific artefacts create a man-made, controllable reality, but the disconcerting real is never completely annihilated. It persists in the folds and margins of the laboratory world,¹⁵ offering resistance to complete "assimilation" (Lacan 1973, p. 65), revealing itself as a gap, a crevice, a rupture, something totally unexpected (Lacan 1991/2001, p. 58), unacknowledged, unnamed, unmeasured, unvisualised. The real is basically an intrusion, a disruption: that which resists our expectations. It is the "inexorable" (Lacan 2013, p. 565). As Heraclites phrased it, many centuries ago: real nature is wont to hide herself, but sudden revelations may prove quite disconcerting (Lacan 2004, p. 85 *ff.*). The real is that which, from the point of view of normal science, seems utterly "impossible" (Lacan 2011, p. 141).

Martin is confronted, not with an "object", but rather with a gap, something which causes his bugs to be *missing*. A first important step towards "symbolisation"

¹²The Real is not 'reality'. The latter term refers to the world of normal experience: that which functions, the world as we know it, worked-over, restructured, reorganised and transformed into something which is sufficiently accessible and predictable: objective reality, a product of human culture, of science and technology most of all. A world, a techno-social 'habitat': to a considerable extent man-made. We have been working hard to transform the terrifying Real into an environment we may safely inhabit, in which we function. Fire, for instance, has been domesticated with the help of pyro-technology, but the looming threat is still there (cf. the *Tower Inferno* archetype).

¹³During his days as a country doctor, an infectious disease flared up among farm animals, and the situation quickly got out of hand. Martin managed to tame the threat with the help of his makeshift laboratory.

¹⁴In the novel, the discovery is made during a "fine, wide August morning" (p. 326).

¹⁵"Le réel est à la limite de notre expérience" (Lacan 1956–1957/1994, p. 31).

or domestication is the act of naming. Martin uses a provisional, empty signifier for his strange entity: “principle X”.¹⁶ It becomes his “object a” (in the upper-right position), alluring and disconcerting, uncanny *par excellence*, midway between being and non-being, living and non-living, a condensed fragment of (or window into) the real. In the struggle over priority which unfolds, d’Herelle emerges victoriously, not only because he is the first to publish his results, but also because he gives the new entity a convincing name, a signifier that sticks: the virus that preys on bugs, the *bacteriophage*. By coining this signifier, which aptly conveys (in shorthand) what the mysterious entity actually *does*, he definitely makes a name for himself, and turns the mysterious principle into an (albeit fairly intractable) object. We see science at work: with scientists achieving immortality by successfully adding a new signifier to the network of names, concepts and symbols which Lacan refers to as the symbolical order. By providing the weird non-object with a name, the bacteriophage, or “phage”, as Americans soon prefer to call it (Cairns et al. 1966), becomes something that can be analysed and normalised, something scientists can relate and refer to: equations can now be drafted; the anomaly becomes embedded in university discourse.¹⁷

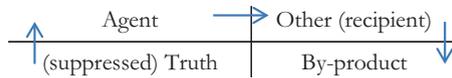
Why didn’t Martin publish his findings earlier? Because the scientific method, personified by Gottlieb (his epistemological conscience), prevented him from doing so. No preliminary results, however intriguing, even if they bring you everlasting fame: that is Gottlieb’s ethos. More research is always needed. As a super-ego (*Über-Ich*), Gottlieb proves too demanding. He refuses Martin to *enjoy* the fruits of his sacrifices, his late-night hours. Martin never seems to have laboured enough. With Gottlieb peering over his shoulder, he feels paralysed when it comes to putting his findings on paper. As Freud (1921/1940) phrased it, the leader of the organised group (the collective conscience or ego-ideal) is reluctant to grant his co-workers their personal triumphs, as this would set them apart from others and reward their striving for independence. Gottlieb already said it in his sermon: “I will try to protect you from success”. Whereas Director Tubbs (his formal superior at McGurk) urges Martin to hasten and publish his results, Gottlieb keeps discouraging him from doing so. And when the latter walks into Martin’s lab to tell him the bad news about d’Herelle’s publication (according to Gottlieb’s rigid standards a premature,

¹⁶Martin starts taking notes: “I have observed a principle which I shall temporarily call the X Principle” (p. 328). Indeed, “after years of stumbling he ... had visions of his name in journals and text books; of scientific meetings cheering him. He had been an unknown among the experts of the Institute, but now he pitied all of them. But when he was back at his bench the grandiose aspirations faded and he was ... the impersonal worker. Before him, supreme joy of the investigator, new mountain-passes of work opened” (p. 329).

¹⁷The discovery of the bacteriophage as an intrusion of the ‘Real’ is different from the famous Eureka–experience (of Archimedes and others) when pieces of a puzzle suddenly fit together and the missing link is found. The intrusion of the Real is something unpleasant, something we try to ignore or to explain away: that which does *not* fit our theories, enforcing itself upon us, until we ‘give in’, forced to acknowledge that we have ‘hit’ something. This is also underscored by d’Herelle (1917) who explains how he isolated the ‘invisible microbe’ from the faeces of a patient recovering from dysentery: the unexpected finding emerges in that which is rejected, abhorred: the (infectious) waste.

sloppy publication), he is ambivalent about it. Although he deplores the fact that Martin (and, by implication, the Institute) has lost the race over priority, the sublime ethic of pure science nonetheless stood its ground, rather than compromising itself by hastily running into print, merely to attain worldly fame (a questionable research practice). Martin, the researcher in the trenches as it were, is sacrificed to these lofty ideals. And rather than regretting his reluctance, Martin himself experiences relief for not having published a “premature” paper (p. 345). He doesn’t revolt against Gottlieb’s sinister regime: not yet, but is willing to produce more knowledge, work harder, even risk his life, by travelling to plague-ridden St. Hubert, where his devotion to the lofty ideals of science will be put to the test even more relentlessly. Or should we rather see it as an escape from the laboratory, where the split between obligation and desire (\$) had become untenable?

As was already outlined above, we may summarise these analyses with the help of Lacan’s dialectical scheme of “university discourse”, by inserting Lacan’s four symbols (S_1 , S_2 , $\$$ and a), Lacan’s στοιχεῖα, as “variables” (in a fixed sequence) in the four positions in a rotating, revolving quadruped:



University discourse puts the qualified expert (S_2) in the position of the agent.



The scientist (as agent: S_2 in the upper-left position) is a committed, self-composed, ascetic researcher focussing on an exacting object (a in the upper-right position). Initially, this object seems a normalised, standardised, domesticated object: his carefully cultivated staphylococci, but due to the disconcerting intrusion of the real, the focus of attention shifts to something completely different (initially referred to as his principle X), a taxing, toxic and addictive object, claiming his full attention, while remaining intractable and inexorable (a in the upper-right position). Initially, the position of the researcher seems completely neutral and impassive, but the confrontation with this “object a ” proves a taxing experience and reveals that *something else* (besides objectivity, precision, etc.) is at work in science as well, addressing scientists from beneath the bar. On certain occasions, during his “sermon” for instance, Gottlieb initiates him into a basic truth, namely that science is actually a *religion*, so that the true scientist is an ascetic devotee, an adept, something of a stylite, addressed by a secret calling, a will to power (S_1 in the lower-left position). And although research initially may seem repetitive and boring, this combination (the exposure to the intractable object, which reveals the hidden imperative) results in a destabilising by-product, an unexpected moment of intellectual jouissance, of $\theta\epsilon\acute{\iota}\alpha\ \mu\alpha\upsilon\acute{\nu}\iota\alpha$, of divine madness ($\$$ in the lower-right position), so that the normal relationship between an impassive subject and a domesticated object

gives way to the matheme of desire: $\$ \diamond a$. And indeed, this is what forces Martin to flee the Rockefeller Institute and seek shelter in the Caribbean: the tension between impassivity and desire (between super-ego and object a , between Gottlieb and X) has become untenable, resulting in an experience of dividedness or *Spaltung* ($\$$ in the lower-right position). His competitor (d’Herelle) faced a similar tension, but apparently decided to publish his findings prematurely, without sufficient evidence (controls, replications, etc.), a questionable way-out (from a normative perspective). This compromised his methodological integrity, but brought him everlasting fame. For someone like Gottlieb, however, such an eagerness to publish is a most questionable research practice.

5.6 The Medical–Ethical Dilemma (The Bacteriologist as a Researcher and as a Physician)

The history of the discovery of the bacteriophage is closely connected with World War I. Bacterial viruses were discovered in 1915 by the English microbiologist F.W. Twort, who had to discontinue his research because of the war effort. Two years later, in 1917, the phage was discovered for the second time¹⁸ by French–Canadian Felix d’Herelle at the Pasteur Institute. In d’Herelle’s original publication, he calls the bacteriophage a potential panacea, a “microbe of immunity”. Therapeutic trials proved unsuccessful, however, and phage therapy (the use of phage as a bacterium–killer, as a soldier in the war against infectious diseases) eventually gave way to more effective means: penicillin and other antibiotics (Dublanchet and Bourne 2007).¹⁹

Thus, the bacteriophage moved from medicine to pure science and became essentially a lab organism: a tool for basic research in molecular biology. As such, it achieved world-renown through the work of Max Delbrück at Caltech (Pasadena) who employed it as the “hydrogen atom of biology”, as a “minimal organism”, albeit too minimal for the word “organism” to apply. His Phage summer course at Cold Spring Harbor²⁰ put young James Watson on the road to success (Watson 1966). In Lewis’s novel, phage research is still in its earliest, applicatory stage. With De Kruif providing the necessary scientific details, *Arrowsmith* follows history quite closely, as if d’Herelle and Arrowsmith really were contemporaries, stumbling

¹⁸“Perhaps independently, perhaps not” (Stent 1966, p. 3). The *originality* of d’Herelle’s discovery is sometimes questioned.

¹⁹“By the middle of the 1930s ... the widely propagandized control of bacterial diseases by means of bacteriophages had failed to materialize” (Stent 1966, p. 5). This may change, however, as new ways of using anti-microbial viruses are currently under development: a revival of d’Herelle’s approach (Keen 2012). Dublanchet and Bourne (2007) likewise argue that, in view of increased antibiotic resistance, phage therapy may become topical again.

²⁰Pasadena (Los Angeles) and Cold Spring Harbor: the “Mecca and Medina” of phage–research (Cairns et al. 1966, p. ix).

over bacterial viruses at different locations (Paris and New York) more or less at the same time.

Seeing the struggle for priority lost,²¹ Gottlieb urges Martin to reorient his agenda towards applied research. An outbreak of bubonic plague in the Lesser Antilles provides him with a perfect opportunity to test his phage *in vivo*. His motives are scientific rather than medical, however, and he sets off on an expedition which is not meant to save lives, but rather to produce a landmark publication. He wants to *use* humans instrumentally, in order to understand the phage. For him, human beings (coloured, illiterate inhabitants of a Caribbean island) are living test-tubes as it were. So far, the bacteriophage had been a laboratory artefact. Time had come to test his principle X in an outdoor setting, exposing it to the reality principle as it were. Bacterial viruses were still untried in the real world outside the lab. Will the vaccine work in the messy and complex environment called reality? The inhabitants of St. Hubert are seen as research subjects rather than suffering patients. The population of a remote village (providing optimal conditions for a field trial) is divided into two samples: the experimental condition (receiving the phage vaccine) and the control group (denied the life-saving serum and treated with traditional methods) – a strategy which Pasteur and his followers had successfully adopted in their experiments with cattle (Zwart 2008a, p 175 ff.).²² Indeed, the experiment (purportedly conducted for the benefit of mankind, but primarily designed for the prestige of McGurk) is performed by Americans at the expense of coloured, native human “bodies” (Lynch 2000). But as the phage vaccine begins to show results, it becomes increasingly difficult to uphold the experimental design in practice. This again reflects the dynamics of university discourse:

S ₂ (experimentalism: extrapolation)	a (phage therapy: will phages kill lethal bugs?)
S ₁ (methodological imperatives: epistemic super-ego)	§ (normative collision between medicine and research)

Initially, Martin is bent on extrapolating his phage research to the outside environment, conducting high-quality research which is sufficiently robust (methodologically speaking) to render (friendly but powerless) doctors obsolete for good. In the end, however, he acknowledges that he is “too human to be a satisfactory experimenter”. The panic-stricken controls (the anonymous indigenous masses) secretly begin to move over to the experimental sample, and finally, due to the death of Martin’s two most significant others (Western individuals with a name and a face,

²¹While the conflict over priority between Twort and d’Herelle is still a matter of dispute among historians, the Arrowsmith–d’Herelle conflict resurged in the struggle over priority that unfolded in the 1980s between Robert Gallo (of the National Cancer Institute in Bethesda, Maryland, who also did research on viral pathogens in the Caribbean) and Luc Montagnier (of the Pasteur Institute) over the discovery of HIV.

²²“There may have been in the shadowy heart of Max Gottlieb a diabolic insensitivity to ... suffering mankind. He who had lived to study the methods of immunising mankind against disease had little interest in actually using those methods” (p. 365).