

Arrowsmith (1931) or Research in Microbiology

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Summary

This film is an adaptation of the novel by Sinclair Lewis, directed by John Ford. Despite the number of years passed since its debut (December 7, 1931), the movie continues to awaken interest. It shows an approximation of what was once the practice of medicine, microbiology and research in the first third of the 20th Century in the United States of America. In addition, it presents many aspects of what is research and who are the researchers; in respect to this, the film has clear educational values.

Keywords: Research, Medical practices, Bacteriologists, Blackleg disease, Plague, Serum, John Ford.

Technical details

Original Title: *Arrowsmith*

Country: USA

Year: 1931

Director: John Ford

Music: Alfred Newman

Screenwriter: adaptation by Sidney Howard based on the Sinclair Lewis novel

Cast: Ronald Colman, Helen Hayes, Richard Bennett, A.E. Anson, Clarence Brooks, Claude King, Bert Roach, Myrna Loy, Russell Hopton, David Landau, Lumsden Hare and John Qualen.

Color: black and white

Runtime: 108 minutes original and 99 minutes re-release

Genre: drama

Production Companies: Howard Productions & Samuel Goldwyn Company

Synopsis: Martin Arrowsmith is a doctor with a calling for research. For that reason, he abandons his practice as a rural doctor and goes to work with his mentor in New York at the McGurk Institute. In the West Indies, he tests the effectiveness of an anti-plague serum he developed and while there, his wife

dies. The death of his wife and the mental deterioration of his mentor convince him to abandon the institute and research independently.

Arrowsmith (1931) is the first sound film by John Ford in which the protagonist is a doctor. In the director's ample career, doctors have played a regular part, however usually in supporting roles. In addition to Martin Arrowsmith, other doctors in the category of lead in Ford's works are George Bull (*Doctor Bull*, 1933), Samuel Mudd (*The Prisoner of Shark Island*, 1936) and the D.R. Cartwright (*7 Women*, 1966). Cartwright was the first main character female doctor of Ford's career and the movie was the last of his cinematographic career. Two other doctors had rolls as co-protagonists, Doctor John 'Doc' Holliday, who really was a dentist, (*My Darling Clementine*, 1946) and the Major Henry Kendall (regimental surgeon) (*The Horse Soldiers*, 1959). It would be unfair to forget Doctor Boone, the memorable drunkard in *Stagecoach* (1939), despite his having a secondary role in the film.

It's a fortunate turn of events that *Arrowsmith* includes the first stages of the medical profession, the formation of medical schools and the first professional performance. It would also be the first Ford film

with a doctor as the protagonist, a merit not owed to the Irishman, but to the plot of the novel on which the movie is based.

Ford's *Arrowsmith*, is the cinematographic adaptation of the novel by Sinclair Lewis. In 1926, the author won the Pulitzer Prize for this work, though he turned it down. He would not, however, do the same when the Swedish Academy granted him the Nobel Prize in Literature, making him the first United States citizen to receive the honor. For its scientific content, the author was advised by Paul De Kruif, a bacteriologist and author of *Microbe Hunters* (1926), a classic in microbiological literature, to whom Lewis dedicated his novel¹.

The literary work has been analyzed various times in professional medical journals for its health-related content¹⁻³; however, this is not the case for the film, which nonetheless has been included as content in some books about science or doctors⁴⁻⁶. The objective of this current work is to analyze the movie, not the novel. Indubitably, the film includes many, but not all, aspects of the literary work; our analysis is of only those reflected in the film.

The Movie

It is one of the first sound films directed by John Ford, who at that time had a contract exclusively with Fox. For this reason, the producer, Samuel Goldwyn, asked the company for its permission to have him direct the film. Since the Irishman had entered into the select group of the great drinkers of Hollywood, the producer demanded he sign a contract promising not to imbibe during filming; a promise which he did not honor and for which he was fired prior to completion of the film⁵. Ford was then a prestigious director who had directed numerous silent films. Nonetheless, he was far from being creatively mature and without a doubt, restricted by the script and the producer, a situation very unlike what would ultimately become John Ford's films. On the other hand, the movie includes clear Fordian elements. The backlighting and scenes in various parts are similar to the initial and final scenes from *The Searchers* (1956). We see this when the protagonist builds his practice, when we witness the voodoo scenes or when his wife dies, abandoned by her servants. The positive assessment of the medical profession is a characteristic of

this director, as are such things like the child's molar being pulled, the repetition of some elements (cigarettes, flasks and microscope) and much more.

Surely, Lewis receiving the Nobel Prize the year before was a determining factor for Sidney Howard adapting the novel to film. This author had won the Pulitzer Prize in Theatre in 1925 for *They Knew What They Wanted* and later, in 1939, the Oscar for best script for *Gone with the Wind* by Victor Fleming.

It is no masterpiece of film, but enjoyed grand success with both the critics and the public. In 1932, it received four Oscar nominations: Best Picture, Best-Adapted Script, Best Cinematography and Best Art Direction.

The narrative rhythm is very fast, clumsy, and in just a few scenes, many years of Arrowsmith's life pass. There are frequent scene changes, sometimes fading in over one another and they tell so many things in such little time.

The film profiles very well the country in which the action occurs; for example the nature of the flood of its population. The birthing with which Martin helps is that of an Italian immigrant whose family does not include even a single English speaker. The owners of the cows affected by blackleg disease are Swedish, one of whom, the father of the girl who died of diphtheria, does not know how to correctly pronounce the word veterinarian. Ford includes this not to ridicule, but to reinforce the character's origin.

It shows clear demonstrations of racism, born of the adaptation. In the epidemic of the bubonic plague, central to the action, the anti-plague serum is received by people of color who were involuntarily offered as guinea pigs, unlike those of the white population. To top it all off, the man who proposes the administration of the serum is a black medic, a native of the islands. Ford, by cinematographic means, marks the separation of the two races by the color of arms as he presents the owner of the white arm, she who could be the second love of the protagonist (figure 1).

In the part of the movie which occurs in the West Indies and in the last encounter of the protagonist with his mentor, one can see the influence of

Germany expressionism, particularly of Murnau, over the director. Examples of this influence are voodoo, fires, the burials, the chants, the faces, the cigarette smoke or the dark ambiance of some scenes, similar to that of a horror film. In its debut, the film was 108 minutes long, which is reduced to 99 in its re-release, the only available version. It is believed this shortening is owed to the critics and censures established in the United States in 1934⁴. The sad and oppressive ambiance in some of the movie and the possibility of adultery by Arrowsmith presented in the original version could explain this change.



Figure 1: Cinematographic and racism resource

In the first sequences, the presence of Ronald Colman is left out, but when he appears, there is the sensation the actor is much too old for the part. A doctor who has just finished his studies; the Brit was 40 when he starred in the film. His English accent is also very far from that of an American. Nonetheless, his interpretation is outstanding, as well as those of Helen Hayes, who that year received the Oscar for Best Actress in *The Sin of Madelon Claudet* by Edgar Selwyn, and Richard Bennett.

The Plot

The film captures five moments in the life of Arrowsmith (Ronald Colman), the last four occurring chronologically. The first, or prologue, is very short and offers the minimum facts to get to know the character. After the credits appear, a legend attempting to summarize the plot says: “The story of a man who dedicated his life to serve others and dedicated his heart to the love of a woman.” The first sequence is a caravan similar to those that appear in Westerns. In one of those wagons, a woman decides to go West

instead of to Cincinnati. The scene quickly changes and someone familiar appears - Arrowsmith’s father? He speaks to the young Arrowsmith saying that woman was his grandmother. The spectator discovers the past sequence was just a flashback used to fix the origin and character of the protagonist. Saving time, it is told the boy is a student who wants to be a doctor. In his hands, he holds *Gray’s Anatomy of the Human Body* and the speaker comments that the library of a doctor should include this book, the Bible and Shakespeare; it is also recommended that he push himself. Once again, there is a jump in time and Martin appears now studying medicine at Winnemac College. This scene manifests his inclination toward research. Entering the office of Doctor Gottlieb (A.E. Anson), Arrowsmith asks permission to study bacteriology that year (figure 2). With the idealism of a student, he tells Gottlieb he does not want to be a doctor like everyone else, but wants to discover a cure for cancer. With the eye of a good professor who sees in him the qualities of a good researcher, Gottlieb explains a scientist is born, not made, and he should at least finish his studies and then come see him.



Figure 2: Arrowsmith’s first encounter with Professor Gottlieb

In the second part, the protagonist’s life is that of a rural doctor. A sudden change in scene and Arrowsmith is now a physician, performing his first birthing. We also discover Martin is an aide to Professor Gottlieb, as he tells this to Leora Tozer (Helen Hayes), who would later become his wife. He also mentions he will look for a dangerous microbe strain. Oh how easily young professionals are affected by girls! Martin met Leora, a nurse, who was cleaning the floors, when he entered the hospital. She was being punished for smoking, a bad “vice” of Lee’s, a diminutive that Arrowsmith uses (figure 3). That

same night, they dine at the Acropolis and he declares his love, a genuine “love at first sight”.

Once again, there is a change of scene; Doctor Gottlieb tells Arrowsmith he is going to work at the McGurk Institute in New York, the most famous scientific institute in the world, and that he has acquired an aide’s position so that Martin may join him. Arrowsmith turns down the offer for economic reasons derived from his recent domestic change and will practice medicine. In the next scene, a \$2 marriage license is obtained in a frustrating administrative act for the young-enamored couple. After the wedding, Lee suggests they establish themselves in the country, in Wheatsylvanic, South Dakota, and that is what they do. There, with the help of his in-laws, he opens his practice and Lee stops working, to become a housewife. Not forgetting the protagonist’s calling as a researcher, the image of a microscope appears among the equipment. His first case is a total disaster. He diagnoses a girl with diphtheria and treats her with an antitoxin, but she dies because he does not dare perform a tracheotomy (figure 4). Two superimposed images, that of a microscope and the announcement for a conference, mark Arrowsmith’s re-encounter with the world of research. He travels to Minneapolis for a conference about “Heroes of Health” given by Doctor Gustav Sondelius (Richard Bennett). In his very characteristic dialect, this eminent scientist from the Swedish Academy traveled around many countries and cities dedicated himself to divulging the successes of microbiologists and microbiology, both huge in those years (figure 5). After a few drinks, the men realize they have a common acquaintance, the very same Gottlieb whom Sondelius admires. Meanwhile, the



Figure 3: Martin meets his future wife



Figure 4: Arrowsmith’s first case as a rural doctor, a girl with diphtheria



Figure 5: Martin shares drinks with Sondelius after the conference in the east

director slows the plot with the entrance and exit of a drunk. After this encounter, Arrowsmith feels good.

The next day he remembers how the last two years as a rural doctor had gone, things had come to a standstill, but he does not think they will remain as such. Lee’s lack of appetite announces she is pregnant. A funny and compassionate sequence follows, reinforcing the ambiance of optimism. Five children have passed at the window of his practice when a five-year-old boy has a toothache. Arrowsmith pulls the tooth, using a whimsical method. As if that were not enough, a blackleg epidemic (produced by *Clostridium chauvoei*) in the livestock permits him to obtain a serum capable of treating the disease. This angers the state veterinarian. (figure 6). Ironically, Arrowsmith proves his serum’s worth on the livestock of the father of the child who died of diphtheria. In his absence, caused by the blackleg research, Lee miscarries, leaving her sterile, a circumstance the couple uses as an excuse to leave town. A telegram from New York puts an end to his work as a rural doctor, marked by the image of the General Store where he had received the message.



Figure 6: A serum for blackleg disease, the protagonist's first success as a researcher

The third period covers Arrowsmith working as a researcher in a laboratory at the McGurk Institute. In this way, he reaches his professional goal. The entrance to Grand Central Station slowly substitutes the image of the General Store announcing his arrival to New York accompanied by his wife. In this grand metropolis housed on the 25th floor of a skyscraper, sits the impressive McGurk Institute. Gottlieb receives him with open arms, reminding Martin he had returned as predicted, but on his own merits, referring to his recent success. Arrowsmith is introduced to Doctor Tubbs (Claude King), the director, as well as a chemist at the institution, Terry Wickett (Russell Hopton), a character of certain importance hereafter (figure 7). Gottlieb compares Arrowsmith's arrival with that of the return of a prodigal son and takes him to Martin's laboratory, upon which appears his name. He begins a time of intense research, leaving Leora alone, not rendering a single result. Snowfall marks the passing of time, two years. In the laboratory, Wickett tells him to store some cloudy flasks for bacterial growth in the incubator. He does so, and then goes home. Martin dines absentmindedly with his wife, ready to throw in the towel, before being fired. At this time, the image of one of the flasks clearing appears for a moment. Worried and depressed, even though it is late and under snowfall, Martin returns to the laboratory. His wife accompanies him, but he does not realize this until he arrives at the Institute and sees her reflection in the glass front door. When he opens the incubator something catches his attention: the center flask is clear, unlike those on either side (Figure 8). He perceives this as an important discovery and works frantically to ensure that the bacteria were destroyed. The next day he tells the news to his mentor. Once again, a relaxingly comic

scene appears; to replenish strength, Terry takes out a bottle from a footlocker in the laboratory and gives Arrowsmith a drink. Martin retires. Later, while eating breakfast he encounters the byline "Scientist at McGurk Finds Cure for All Diseases". Doctor Tubbs, to the great disgust of Arrowsmith, did not wait for confirmation of the uses of the find, nor its originality, spreading the news with great fanfare. Gottlieb arrives, while Martin rightly protests to the director, showing him an article of a Frenchman, D'Herelle, of the Pasteur Institute of Paris, who had previously made a similar discovery. Arrowsmith remains at the institute without a raise in pay and does not become head of the department.



Figure 7: Doctor Gottlieb presents Arrowsmith to the director and a chemist at the McGurk Institute



Figure 8: Arrowsmith discovers the results of the bacteriophages

The fourth part of the movie captures Arrowsmith's work as a researcher in the field fighting a plague in the Caribbean. A year has passed since his incident. From the cinematographic and scientific points of view, this change in the scene could not be better: it opens with images of a port, rats and ships (figure 9). Sondelius, traveling in a Swedish ship, diag-

noses the death of two stowaways as a result of the bubonic plague. Gustav arrives in New York and informs the McGurk Institute there is plague in the West Indies. Gottlieb tells Arrowsmith this epidemic may be his opportunity. Martin responds that he does not know anything about plague. Sondelius replies that he knows everything about plague ...and it is true about epidemiology of this infectious disease. Later, Arrowsmith creates an effective serum and the institute sends him to test its efficiency. The procedure proposed is a study at random, the same used with the cows in the blackleg epidemia, which he finds immoral when applied to humans. In the end, he accepts, pressured by Gottlieb who appears very aged and ill.

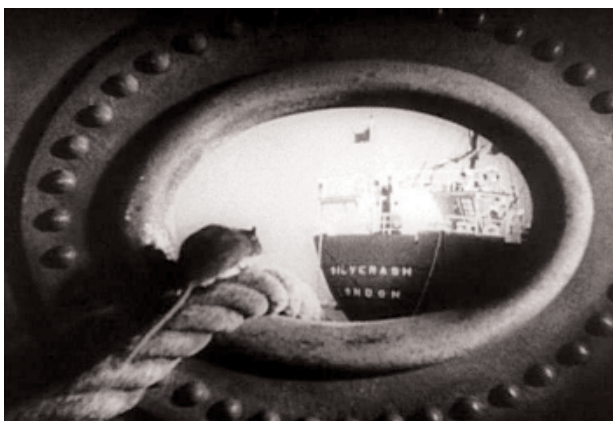


Figure 9: Ports, ships and rats

Martin travels to the tropics accompanied by Sondelius and Lee, who joins the group against his wishes just before setting sail. When they arrive in Blackwater he presents his study to the white population. The British governor refuses to participate, for moral reasons, not wanting his people converted into guinea pigs; it is better to die like men. Just when he feels this failure brings him to hopelessness, Doctor Marchand (Clarence Brooks), a doctor of color, tells Martin he would not have a problem carrying-out the experiment if he decided to do it with people of his race (figure 10). Accepting the offer, Arrowsmith travels to another island in the Caribbean. Before he leaves, Martin demands Lee stay in Blackwater and puts her in charge of destroying some bacillus plague cultures in boiling water. While Lee watches the burial of those killed by the plague, one of the tubes, tipped, drips on a cigarette (figure 11).

On the island, they burn the villages to kill the rats and insects. The rodents flee, scared, and are illu-



Figure 10: The meeting of Arrowsmith and Marchand

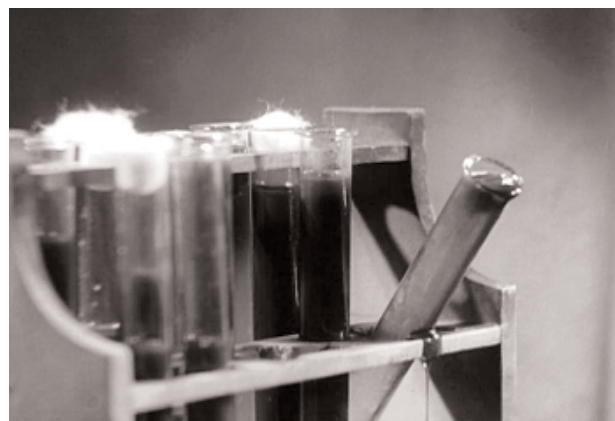


Figure 11: Open tubes drip a culture of bacillus plague

minated by the flames, creating a ghostly image. The natives devote themselves to voodoo. The application of the serum begins, with dearly preventive aims, some patients receive it and other do not. (figure 12). Sondelius feels ill and has a fever. Three white people, the owner of a plantation, his daughter and a beautiful woman, Joyce Lanyon (Myrna Loy), get in line and receive the serum. Sondelius, who does not receive it, dies and Martin begins to worry about his wife. Meanwhile, Lee, in horror watching the burials, takes the unknowingly contaminated cigarette, sits in a rocking chair, lights and smokes it. The director plays with the rocking chair's wicker back and the smoke from the cigarette (figure 13). While Sondelius dies and, remembering the snowy mornings of Stockholm after that last drink, breathes out, but not before having asked Arrowsmith to forget science and the experiments, pleading him to treat and save them all. Outside, it pours and Martin classifies Sondelius as a Hero of Medicine, placing him at the same level as those he dedicated his life to speak of at his conferences. Marchand has to return to Blackwater because the doctor on the island fell ill and Arrowsmith asks



Figure 12: Random distribution to receive the anti-plague serum



Figure 13: Smoking the deadly cigarette

him to look in on his wife. Martin spends the night in a room adjacent to Joyce Lanyon. She is interested in him and her shadow slips through the crack of the door connecting the two rooms. Desire hangs in the air. The next morning, Martin receives a call from Marchand that is suddenly interrupted. Worried, he asks the owner of the plantation for a boat to visit his wife, who meanwhile dies, abandoned by her servants. When he arrives at the island, Martin finds her body on the floor. Clutching her body, he professes his love to her. Later, with a broken heart and drunk, he gives the serum to the entire population undoing Gottlieb’s experiment.

Following the success of the mass distribution of the serum, which Arrowsmith considered a scientific botch-up, he returned by ship to New York. This sequence begins the fifth part, or epilogue. Martin receives multitudes of honors. Doctor Tubbs is a specialist in marketing and knows how to give resonance to the successes of the Institute and how to appear in the media. Martin asks Terry for Gottlieb and is given a gesture indicating he has mental prob-

lems. Upon arrival at the Institute, Arrowsmith encounters a reception which has been organized for his arrival. He goes directly to see his mentor. In the office, he confesses he did not contribute to science, but rather acted humanitarially. Gottlieb does not criticize him, but only weakly says, “Help me, Martin”, and then apparently suffers a stroke. Behind him, there is commotion. Terry suggests they take Gottlieb where he can be cared for and that they leave the institute, going where they can research freely.

Martin is tempted with two propositions - Tubbs offering him department head and \$15,000 as well as Joyce Lanyon offering herself to him. To Joyce, he says he will lovingly remember the offer; to Tubbs, that he keep his institute, if a scientist does not have the ability to work in any given laboratory, he will not accomplish anything for all the technical advancements at his disposal. He grabs his notes and microscope and runs through those congregated, leaving after his friend, shouting, “Hey Terry, Lee and I are coming with you” (figure 14).



Figure 14: The grand triumph of Arrowsmith, abandoning the McGurk Institute

Research and medicine

Arrowsmith is a movie in which research specifically that of microbiology plays a large role. This can be seen from the credits which appear over images of the laboratory, an image of a boiling flask that alternates with another, showing various scientific utensils. If that were not enough, in three sequences appears a microscope in a glass case - when Martin opens his practice in Wheatsylanic, just before Sondelius’ conference and when he leaves his wife in Blackwater to go to the island with Doctor Marchand.

When he leaves the McGurk Institute, he does so with microscope in hand.

In three moments, Arrowsmith's research is seen - the first when, as a rural doctor, there is a outbreak of blackleg in the livestock. He has a great idea and in an unexplained process, obtains a viable serum in his kitchen. A serum obtained without using animals? The design is wrong, one does not only look to demonstrate the efficiency, administrating it to some animals and not to others, but also to determine the ideal dosage. As a result, Martin's success does not sit well with the veterinarian and not for his intrusion but from envy. It happens!

The second, when desperate for not having obtained a single result, Martin observes that one of the three cultures has cleared. He presumes something has killed the bacteria. Here he implements the scientific process, the observation of a phenomenon and the search for an answer. The accidental finding is a part of research; a good scientist does not just realize what he has done, but looks for its justification. What happened to Martin in the world of fiction would some years later actually occur to Alexander Fleming when he observed *Penicilium* destroyed colonies of staphylococcus. Arrowsmith would not come to explain the cause; however, the publication of Felix D'Herelle, which was presented to him by Doctor Gottlieb, deduced the phenomenon was owed to the action of the bacteriophages, or bacterial virus. The Institute, which immediately reported it to the press, and Martin both realize its possible usefulness for the treatment of bacterial infections. The possibilities of phagotherapy are still being researched⁷.

A convenient commentary for this narrative segment is that responsibility of the investigation is obtained with the report (what he sent to Washington regarding the blackleg epidemic), publication (that of D'Herelle) and all about the patent, surely for which the McGurk Institute longed. An appropriate tidbit comes from the fact that D'Herelle was not the first to discover the bacteriophages either, but rather Twort (1915) two years earlier⁷. Ford projects the discovery of the bacteriophages as that of Martin. He puts the flasks in the incubator for Terry, and when he leaves the laboratory, he checks them before going home. During dinner with his wife, the image of the flasks appears and shows the middle one is clearing up.

When he discovers the phenomenon, he appears looking at them in a take filmed from the inside of the incubator.

The third, when ruined he is sent to the West Indies to test the efficiency of his anti-plague serum. Although the clinical trials come out later, it is a random study without placebo to evaluate the efficiency of the preventative serum. It is an immoral experiment to let some people be exposed to an acutely mortal disease while others are given a supposedly effective serum. Although it is fiction, this was realized in a time well before the establishment of the bioethical norms derived from the Tuskegee experiment, another absolutely immoral study put to film⁸.

Taking advantage of the character, the film manifests some of the problems of research: that sometimes the results do not appear (a guaranteed successful study does not exist; there does exist good planning, but no sure results) and on occasion they appear too late (Arrowsmith's just after D'Herelle's).

After taking possession of his laboratory in New York, the protagonist, in a form of oration, recites some of the principles to be followed. A researcher should be an observer, never rushed, never presumptuous, one who looks for his mistakes, compares his results and confident in himself.

A false topic is brought up, the incompatibility of research with married life, for which Arrowsmith abandons his wife and later renounces a new love at the end of the movie.

The film shows various forms of research, what is done in the laboratory, to that done in the field, the latter being the favorite of Sondelius, who criticizes the former and those who practice it: "...in scientific institutions the scientists only look through the microscope and see nothing". Within laboratory research, there is a difference between discoveries found in institutes or independently. Arrowsmith practices independently in his rural experiments as well as at the end of the film. Clearly, the movie favors the latter, without avoiding showing the attractiveness of institutional research with its economic means. The McGurk Institute is impressive, as far as its Art Nouveau decoration, the magnitude of its laboratories, as well as the multidiscipline personnel it employs.

The equipment is noted in general terms but also in subtle details shown, such as the sinks controlled by pedal or the doors of the laboratories upon which appear the names of the scientists who occupy them. On the contrary, they demand a high performance - there is only compensation if there is success, and it is hoped the findings reach the doors of the press.

The movie includes two diseases of great weight: diphtheria and plague. In both cases, their characterizations, especially plague, are superficial. In the case of diphtheria, the parents know their daughter has trouble breathing and tell Arrowsmith they think she has croup. Martin suspects the etiology when they tell him over the phone that her throat hurts. At that time, diphtheria was a frequent cause of tonsillitis. The final diagnosis is established after exploration of the pharynx (pseudomembranes). The treatment administered is an anti-diphtheria serum. The plague, apart from being an epidemic, is only shown in Sondelius and Lee, who only exhibit unspecific constitutional infectious symptoms. The film captures how many birthings were assisted in the homes of the patient. It is possible to see Arrowsmith's powers of observation when he tells a child, after pulling his molar, that he should have brushed his teeth after eating coconut cake for dinner the night before. He also relates the consumption of sweets to the appearance of cavities.

Doctors and researchers

Five researchers take part in the plot - Martin Arrowsmith, Max Gottlieb, Gustav Sondelius, Tubbs and Terry Wickett, all apparently doctors, except Terry, who is a chemist. The first two are bacteriologists and immunologists. Three more doctors participate or are cited in the plot - Doctor Oliver Marchand, Doctor Hessliken, who attended to Lee when she miscarried, and the doctor who became ill in Blackwater, whose name is not mentioned. Therefore, there is a saturation of medical professionals with different attitudes in Ford's film, four of them are sufficiently profiled in the film as to commentate here.

What is Arrowsmith like? Just like his father, he is a pioneer and stubborn; according to his wife, he is obstinate and egocentric; a bad doctor and good researcher to Gottlieb; and compassionate and in love, if you ask him. He is young, handsome and kind. In

the film, he is presented as well gifted in medicine (birthing, diphtheria, dental extraction), although a little insecure and in research, an observer, intuitive, hard worker and enthusiast. He is not a star researcher; therefore, he avoids the press and fame. He is an idealist. At the end of the movie, he leaves the security of the Institute to research freely, renouncing a good salary and the opportunity to be department head. Martin had already demonstrated this self-sacrificing attitude when he renounced a research position to marry, as well as when he gave in to the pressures of Gottlieb for randomly testing of the anti-plague serum. Ford projected this quality in other doctors in his films, reaching its climax with Doctor Cartwright, who gave her life to save those of her comrades. What is Arrowsmith's attitude toward his sacrificial wife? He is ambivalent. It is clear he loves her, as he gives up his first opportunity to work with Doctor Gottlieb to marry Lee. He shows declarations of his love for her, but not passion; he tries to protect her from the dangers of his research of the plague, although this attitude would have deadly consequences. Nonetheless, he is not very understanding and sometimes distant, as seen in his comments about the type of food they eat while he is developing the anti-blackleg serum. When he is researching, he forgets about her and when she has her miscarriage, she is alone. In New York, when he has problems due to a lack of results and goes to the Institute in a snowstorm, he does not realize she has accompanied him until he sees her reflection in the door of the building. He sees he is a brute, not dedicating enough time to her. At least in the second version of the film, Martin is faithful to her. He does not fall into the web of the enchanting Joyce Lanyon, although who knows what went through Martin's mind the night when only a partition wall and door separated them. The clearest showing of his love for Lee is when she dies. It is certain she remains in his heart, as the film nearly ends saying "Terry, wait, Lee -who is in my heart- and I am coming with you". Certainly the tobacco, which helped them to meet, separated them in the end. Tobacco kills, there is no doubt, and this film indubitably shows just that. Non-medical specialists have a much less positive vision of the protagonist⁵; one must be within the profession to know he cannot always do as he wishes and that both doctor and researcher help the patient.

Gottlieb defines himself as honest. According to Sondelius, he is "the best, the spirit of

science". He is the prototypical mentor, his figure adorned by numerous human, orderly and scientific qualities. He is wise, counseling Arrowsmith to first become a doctor and then later return to see him. No more than having finished his studies, Martin begins to work with Gottlieb. His intuition leads him to discover Arrowsmith has what it takes to be a researcher and in the end, thinks of him as his successor. He is patient when his pupil turns down New York for his imminent marriage. He knows Martin will end up working with him and tells him he will always have a spot at his side. When the results do not appear, he does not get worked up and continues providing him with resources; he believes in him. Doctor Gottlieb is loving, he receives Martin with open arms; he is happy for his success and does not take joy in Arrowsmith's failure. He considers Arrowsmith a son - more than just a son. He is an instigator of research "...in the Institute, he will do his own work and have to answer only to himself". He knows the material and the equipment. He does not convert a man into a scientist; the gear is in the brain. He is honest and not ego-centric, he does not gain from the results of his pupil and avoids the press. He has a good training and is a good scientist. Gottlieb finds D'Herelle's publication and tells Doctor Tubbs and Arrowsmith the research is not original. Only he can find fault with the request and pressure he exerts over Martin to randomly test the anti-plague serum - a great dilemma to invoke the future interest of humanity to realize immoral research.

To Martin, Sondelius is a hero of medicine, a field, not laboratory, researcher. He is of good heart and a drinker. Sondelius is a scientist with experience and knowledge of epidemiology who, reaching his sixties, devoted himself to untiringly spread the achievements of microbiology and microbiologists in an attempt to get doctors to dedicate themselves to the fight against disease. He gives so many conferences, he forgets the city he is in. His kindness is clearly shown when, after the meeting with the governor and British colonists, he asks Arrowsmith if he is really going to deny them the serum and begs him to save them all.

Marchand is a colored doctor who is proud to say he has studied at Howard University (racism implied). In his attitude, is there explicit racism toward his own people or a wish to help them?

Tubbs, the director of the institute, believes fame is the only thing that matters to himself and to the institute he directs. He controls well the media in which he loves to appear. There is a great difference in the movie between the true researchers and the star. When Arrowsmith discovered the effect of the bacteriophages, Tubbs did not have the prudence to wait and look for the originality of the find or its impact on the clinic, instead rapidly spreading word to the media, exaggerating the find to capture the attention of the public. He is cold-hearted, reminding Martin he must still make a name for himself. After the plague epidemic in the Caribbean, Tubbs calls the press once more and organizes a reception for all the bigwigs in the Institute.

Microbiology

The image this movie shows of microbiology is far from the present. In its first decades, microbiological worry was centered in traditional infections; in the grand epidemics (plague for example); the epidemiological links (Sondelius remembers in his conferences, among other things, the successes in research about yellow fever, malaria, which, at that time, was attacking Italy, and the great microbiologists who made those advances possible); or in the development of the serums (the veterinarian who confronts Arrowsmith says that the serums are great).

Undoubtedly the roll of advisor, which Paul De Kruif had in the novel, is noticeable in the movie.

There are aspects of microbiological laboratory work which are shocking actually, such as the scenes in which Arrowsmith smokes and drinks inside the laboratory.

From the point of view of microbiological procedures, there are many superficial approaches. For example, how can Arrowsmith know his serum is better than the veterinarian's is with just a look under the microscope? How can he obtain the serum without animals? When he discovers the destruction of the bacteria, all of his microbiological work is incorrect. He asks his wife to ignite a lighter, however he does not use it, he does not flame the handle! Working with the flask away from the halo of sterility, which the lighter creates, he does not heat the mouth of the flask and adds a colorant to the liquid before fixing it. It is shocking the few precautions he takes with the bacillus plague cultures, as to have some of the tubes

uncapped and as a result, one tips and drips onto a cigarette. Also, the procedure of boiling is so rudimentary in destroying them, it can produce aerosols. There are terminology errors when the bacillus plague is referred to as the virus of the plague. In the black-leg epidemic, Martin speaks of a serum, while one of the farmers calls it a vaccine. On the other hand, his interpretation as doctor facing a case of diphtheria reflects very well the clinical and therapeutic reality of this disease at the time.

The film includes traditional means utilized to control great epidemics, such as quarantine and the burning of dangerous materials. Here they burn the villages to kill the rats and fleas. These means (quarantines and fires) have been frequently used in films with plagues. An example of movies where this occurs is *The Spiral Road* (1962) by Robert Mulligan.

“Things are proven through research,” says Arrowsmith to Henry (John Qualen), the father of the girl who died of diphtheria and owner of some of the cows he saved with his serum. This commentary could be the synthesis of a character in the movie who, as a doctor, dedicated body and soul to research and chose the liberty of his practice over the commercialism and economic security of an institute.

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