

## A morning with Louis Pasteur: a short history of the “clean hands”

Uma manhã com Louis Pasteur: uma breve história das “mãos limpas”

Una mañana con Louis Pasteur: una pequeña historia sobre las “manos limpias”

Cláudio Tadeu Daniel-Ribeiro <sup>1,2</sup>  
Marli Maria Lima <sup>3</sup>

doi: 10.1590/0102-311X00068619

### Abstract

*This article examines the story of Louis Pasteur from the point of view of a classic movie presented at the Weekly Seminars of the “Oswaldo Cruz Institute”, at the end of the 2017 activities. Although very old, the movie The Story of Louis Pasteur (Warner Bros., 1936) inspired spectators and gave rise to an energetic debate that led the authors to decide for publishing the comments of the Seminar Coordinator, the guest commentator and the audience. The movie communicates to the public the legacy of one of the greatest precursors of the public health history using also fictional characters. The article presents the reliable passages in Pasteur’s biography and the fictional ones, without disrespecting the production of the creators of cinematographic work. The major merit of the movie, one of the first steps towards the policy of scientific diffusion, is to disclose the importance of vaccines and hand hygiene to prevent infectious diseases. The authors argue that the film-maker impeccably captured the scientist’s tenacity in the relentless search for discoveries and Pasteur’s idea that only persistent work can lead to rewarding results, remembering that the context created by previous researchers enabled Pasteur to establish new paradigms. Finally, the authors cite movie passages illustrating realities that are still in force: (i) the inertial resistance of science to new paradigms, illustrated by the medical-scientific community opposing to simple practices proposition, such as washing hands and boiling instruments, and (ii) the excessive confidence, and even arrogance, of some specialists, instead of serenity and humility that arise from committed study and accumulated knowledge.*

*Biography; Scientific Communication and Diffusion; Anthrax; Rabies; Vaccines*

### Correspondence

C. T. Daniel-Ribeiro  
Laboratório de Pesquisa em Malária, Instituto Oswaldo Cruz,  
Fundação Oswaldo Cruz.  
Av. Brasil 4365, Pavilhão Leônidas Deane, 5<sup>a</sup> andar,  
Rio de Janeiro, RJ 21090-360, Brasil.  
malaria@fiocruz.br

<sup>1</sup> Laboratório de Pesquisa em Malária, Instituto Oswaldo Cruz,  
Fundação Oswaldo Cruz, Rio de Janeiro, Brasil.

<sup>2</sup> Centro de Pesquisa, Diagnóstico e Treinamento em Malária,  
Fundação Oswaldo Cruz, Rio de Janeiro, Brasil.

<sup>3</sup> Laboratório de Ecoepidemiologia em Doença de Chagas,  
Instituto Oswaldo Cruz, Fundação Oswaldo Cruz, Rio de  
Janeiro, Brasil.



“All reflections illuminate infinity” (Louis Pasteur).

If we consider that, after hand hygienization, vaccination is the isolated procedure with the highest effect on public health, which is one of Pasteur’s main contributions, he may correspond, associated with Ignaz Semmelweis and John Snow, as one of the most solid contributors to the knowledge that solidified the paradigms of collective health.

The movie *The Story of Louis Pasteur* (dir. William Dieterle; Warner Bros., 1936) was presented at the end of the annual activities of the Weekly Seminars of the “*Instituto Oswaldo Cruz*” on December 16, 2017. The spectators’ enthusiasm led us to consider opportune to make accessible the comments of the movie, made by the Seminars Coordinator (M.M.L.) and the guest commentator (C.T.D.R.), as well as the session audience, to a larger number of colleagues than those present at the Emmanuel Dias amphitheatre of the Pavilion Arthur Neiva (Oswaldo Cruz Institute, Oswaldo Cruz Foundation – IOC/Fiocruz) that morning. Before initiating, considering the relevant historical aspects of the movie by William Dieterle, we need to explicit the reasons that led the Seminars Coordinator to choose a 1936 movie, even knowing that some good-quality documentaries on the subject exist, which are more recent and more connected with the actual story. Due to the broad scope and profile of the Seminars (Science, History and Art), the choice was based more in function of the fact that the character of Pasteur, a referential precursor of public health, would be shown in a classical movie – awarded with three Oscars – than as result of a concern with the historical precision of the biographical recite that could be pointed, discussed and even updated after the movie presentation and/or in this paper.

Although the movie story was inspired in the life of a real personage, many of the scenes were enhanced by the writer’s and director’s creativity and they do not correspond necessarily to facts. While they may not be successful in all trials, the authors try to indicate the passages that deserve to be identified as not realistic enough along the different sections of this article. One must also point out that some of the discussions and thoughts raised at the occasion have been published in French previously elsewhere <sup>1</sup>.

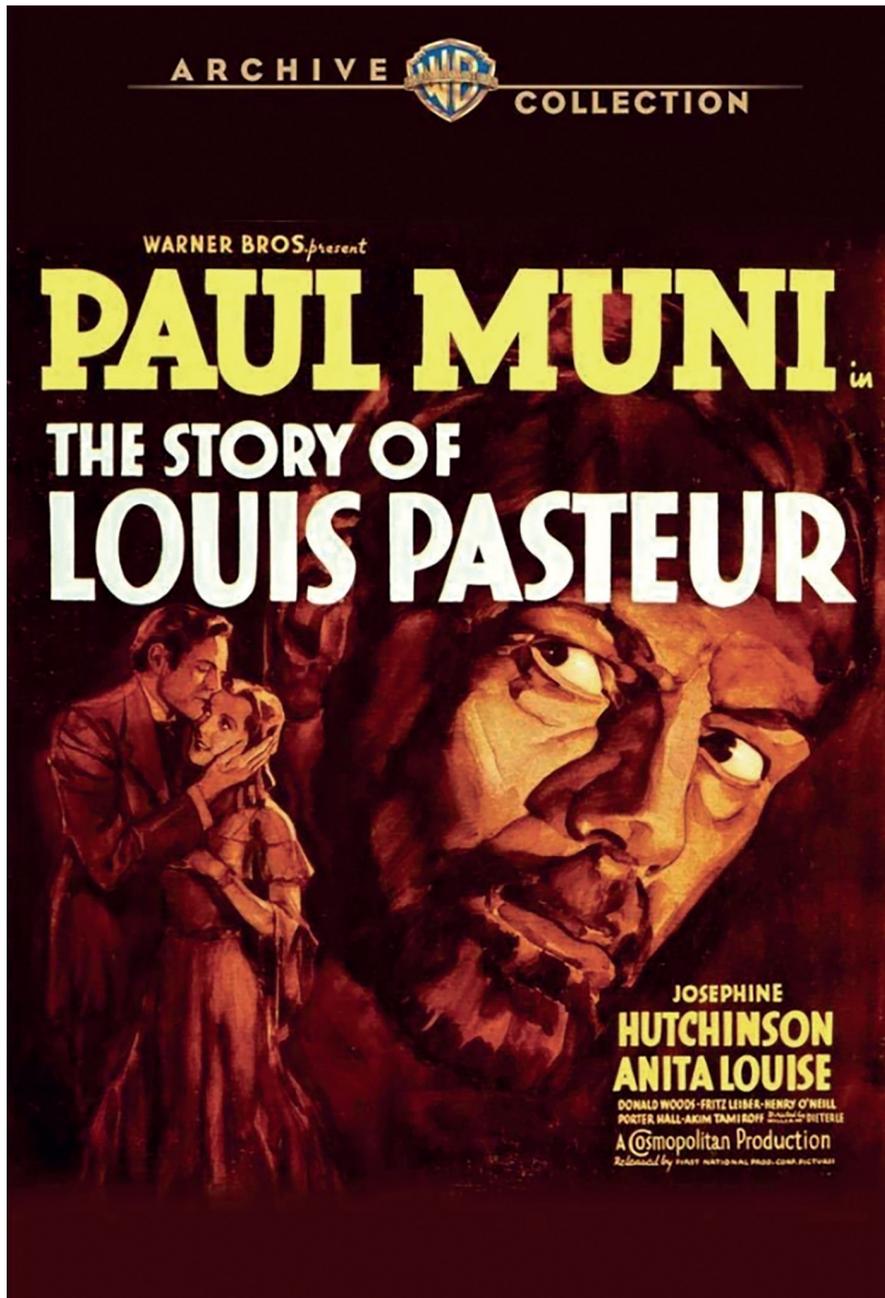
The 87-minute American movie *The Story of Louis Pasteur* (Figure 1) was produced by Henry Blanke (1901-1981) based on the story written by Pierre Collings (1900-1937), Sheridan (Raimes) Gibney (1903-1988), and Edward Chodorov (1904-1988, who did not receive the credits), and it was directed by William (born Wilhelm) Dieterle (1893-1972). The movie won three of the four Oscars it was nominated for: Original Story, Best Screenplay, and Best Written to Pierre Collings and Sheridan Gibney, but lost in the Best Picture category. Pierre Collings and Sheridan Gibney became the first two people to win two Academy Awards for the same movie. In 1930, Hollywood called the German actor Dieterle to direct and to act in German versions of American movies. He not only accepted, but also worked most of his professional life as an actor and director in Hollywood, becoming a U.S. citizen in 1937. He seemed to be charmed by Paris, or at least France, since three of his major movies were about French personalities: *The Story of Louis Pasteur* (1936), *The Life of Emile Zola* (1937, Academy Award for Best Film and his single nomination for Best Director), and *The Hunchback of Notre Dame* (1939). It is easily intuitive that, by migrating to the United States, the German Jewish actor Dieterle was, in reality, fleeing from the horror unfolded in the periods that preceded Nazism in Germany. But even more than that, as pointed out by Menchero <sup>2</sup>, together with the Ukrainian actor Paul Muni (1895-1967, who played the role of Louis Pasteur), also a Jewish with a left political orientation, and with the protection and support of Jack L. Warner (1892-1978), owner of the production company Warner Brothers, Dieterle used creative personalities of science, arts and politics (depicted in the biographical films on Pasteur, Zola and the Mexican politician Benito Juarez) to criticize the rise of fascism in Europe by using the rhetorical figures of allusion or simile.

The movie takes place in the 1860 Paris, when the French scientist Louis Pasteur (Dole 1822/Paris 1895) was 38 years old. The central point of the narrative exposes the difficulties and hostility that the scientist suffers in Paris from both medical community and even the French Academy of Medicine, due to his defence and broadening in the concepts and foundations of the “*germ theory of disease*”. This opposition was heightened by the fact that he was a chemist, and not a physician (<https://www.sciencemuseum.org.uk/history-science/louis-pasteur>, accessed on 18/Mar/2020).

One may focus the important conflict suggested to exist between Pasteur and the Emperor Napoleon III, trying to bring precision to points now recognized as matter of speculations or exaggerated creativity along the movie. Napoleon III would have exerted pressure on Pasteur, constraining him

**Figure 1**

In the movie *The Life of Louis Pasteur* (<https://www.youtube.com/watch?v=Hq1P--o3V0w>, accessed on 18/Mar/2020), Paul Muni, who played the title character, won the Best Actor Award at the Venice Film Festival (1936) and the Oscar for Best Actor (1937), while Pierre Collings and Sheridan Gibney won the Oscar for Best Writing, Original Story and Best Writing Screenplay. The U.S. National Board of Review awarded the movie as one of the Top Ten Films of 1936. One interesting story on the Muni's performance as actor is reported at Trivia at the site of IMDB (<https://www.imdb.com/title/tt0028313>, accessed on 18/Mar/2020): "An electrician for Warner Bros. studio came up to Paul Muni after an advanced screening of the film and told him that his nine-year-old son asked him to buy him a microscope because of Muni's performance. Even though he went on to win the Oscar for his performance, Muni said later that this was the greatest compliment he had ever received and that all other accolades meant nothing compared to that one".



to silence and even forcing him to deny his theory and to move to Arbois, abandoning his work. This information does not correspond to reality, since Napoleon III was known as having a personality open to new technics and advances of science and both men, actually, had and maintained a close and solid relationship, including reciprocal respect and admiration <sup>3</sup>. The scene of Pasteur, constricted to obey the Emperor, leaving Paris to move to Arbois, is purely fictional. The screenplay writers probably based the scene on the fact that Arbois was the town where Pasteur (born in Dole) lived since the age of five, where his family house was located. Pasteur inherited this house after the death of his parents and sister, where he carried out the first studies on wine fermentation.

### The origin of diseases and the “germ theory”

One fundamental aspect to be considered when analyzing the origins of the “germ theory” historically is the availability and awareness of concepts generated by scientists that preceded Pasteur’s thoughts, or that progressed, concomitantly, in other disciplines, specialties, or even fields. The reader may find support for such reality by reading the speeches of some laureates on the website of the Nobel Prize (<https://www.nobelprize.org/prizes/uncategorized/all-nobel-laureates-in-physiology-or-medicine>, accessed on 18/Mar/2020) and verifying how much some of the winners have been inspired by ideas that had previously appeared in other fields, leading to a progressive and collective construction of a new paradigm.

Since the dawn of humanity, the quest for disease cure or control has been the core concern of many scholars. Hippocrates, considered the Medicine’s Father, who lived in Greece before the Christian era (460-377 BC), already attributed diseases to disorders in the vital fluids of the body. He emphasized the importance of boiling water for washing wounds, cleansing the physician hands and nails, and using medicated dressings around wounds. However, in the Dark Ages period, medicine suffered a tremendous kickback. About 400 AD, the developing Roman, and Greek medicines were replaced by mysticism and “...witches were boiled instead of water”. During the Middle Age, humanity was plagued with epidemic diseases. The Black Death (bubonic plague) caused, in 1348-1350, the death of one-quarter of the world’s population, killing 60 million people. Consequently, filth, pestilence, and plague came back again to stay until the 18th century <sup>4</sup>.

Indeed, for these reasons, physicians and scientists continued to seek ways to prevent infectious diseases. In the 16th century (1546), the Italian physician, mathematician and poet Girolamo Fracastoro (1478-1553) released and expanded the “germ theory” <sup>5</sup>. He stated that tiny particles (spores) were the cause of infectious diseases, and that these particles could transmit infections by direct or indirect contact, or even without contact over long distances. More than 200 years later (in 1792), the Austrian physician Marcus (Antonius) von Plenciz (1705-1786) expanded Fracastoro’s theory, defeating the prevailing paradigms of “spontaneous generation”. Von Plenciz also denied the idea that the causes of diseases, now described as infectious diseases caused by microbes, did not come from outside, but were born within the organism of the individuals themselves. Predictably, at that time, the medical and scientific community totally refuted von Plenciz ideas since the only acceptable influence from the outer environment was that contained in Galen’s theory of miasmas, i.e., diseases would come from the bad air (as malaria).

The precocity of von Plenciz contribution to the present knowledge on infectious diseases and pathogenic microbes was, however, titanic. Galen’s theory, fully accepted by scientists and physicians, predominated for centuries, until the 19th century, and it had still corresponded to the dominant paradigm when Pasteur’s works appeared, hindering the understanding of infectious diseases occurrence and progression. The anti-smallpox vaccination, which had existed since the 18th century, spread throughout Europe <sup>6</sup>, but still without a proper understanding of the vaccine principles and mechanisms of protective immunity induction.

Viruses would only be discovered in 1892, a few years before Pasteur’s death, with the works of Dimitri Ivanovsky. Notwithstanding, from 1850 onwards, with Pasteur’s works on rabies, anthrax, fowl cholera and, then, those of the German physician (Nobel Laureate, 1905) Robert Koch (1843-1910) mainly on tuberculosis, the “germ theory” gained force and acceptance, but not without a lot of resistance and criticism.

The movie narrates the development and consolidation of the “germ theory” when, by recommending thorough hygiene and sterilization of medical instruments, hospital infection rates would decrease considerably. However, the medical community and even the French Academy tried to silent him. Even considering the enormous opposition Pasteur suffered, it must be highlighted that he benefited from all the work done by his predecessors that paved the way to the consolidation of the “germ theory” as a new paradigm.

Thus, one of the most exciting stories related to the movie is that of puerperal fever. In the 1840s, the American physician Wendel Holmes had already observed that the hands of doctors and midwives transmitted “something” to the parturient women, which could kill them. Few years before, in 1847, the Hungarian physician Ignác Fülöp Semmelweis (1818-1865), marginally cited (with a wrong name) in the movie, became famous for his findings on sepsis and fever of childbearing women. His most crucial medical contribution was calling attention to the contagiousness of puerperal fever (1847). He recommended hand-washing and prophylactic cleanliness to avoid or to reduce cross-contamination to the (still unknown) microbes. Another noteworthy aspect of the Semmelweis work was his daring in honouring the scientific conviction. John Snow (1813-1858), considered the father of modern epidemiology, finally made seminal observations on microbes’ causality of diseases by studying the cholera outbreak that affected the Soho, London, killing hundreds of people in 1854. By using a geographical grid to chart deaths and investigating each case to determine access to the pump water, Snow proved that the cholera outbreak came from a source of water contaminated by sewage faeces. To compare, Snow investigated people who did not have cholera, tracking down whether they drank pump water. With that, he helped to put down the theory of miasmas, until then in force in the scientific environment <sup>7</sup>.

### The resistance to Pasteur’s ideas

The movie highlights Pasteur’s recommendations for hands hygiene among physicians before performing obstetric procedures. We were, then, at 1860, 20 years after the Semmelweis original propositions and few years after Snow’s contributions, but Pasteur had, at that time, the merit of identifying the origin of contagiousness as pathogenic microbes that could affect parturient women. It is quite impressive to observe the opposition, and even the hostility that the medical community triggered, within a two-decade period, by the proposition of a simple practice with no harmfulness potential.

In this part, the movie refers to an order from the Emperor Napoleon III, requesting Pasteur to ignore his “germ theory” and even to deny his recommendations (the movie suggests that Pasteur prepared a pamphlet that circulated in the streets of Paris) asking doctors and surgeons to “*wash their hands and boil instruments in order to destroy microbes that could kill the patients during the childbirth*”.

The passage is also fictional since, as aforementioned, the emperor was an open-minded Regent who nourished with Pasteur a strong and respectful relationship. However, such episode might reveal the same kind of ignorance manifested in nowadays beliefs of a “flatland”, vaccines causing autism, and natural products with body “detoxifying” or “cleansing” properties as well as the astonishing recrudescence of creationism followers, and of non-scientific based alternative therapies users, in the full XXI century.

One may also be tempted to express our emotion by observing the English surgeon and researcher Joseph Lister (1827-1912) entering the scene and approving Pasteur’s theory and work, even considering his severe scientific criticisms. However, it seems that this meeting between Pasteur and Lister occurred around a decade later, at the Sorbonne University, during Pasteur’s jubilee <sup>8</sup>. Lister had stated that wound infection should be caused by some unknown elements present in the blood, constituting a form of putrefaction of the surgical incisions. Therefore, he opposed the then current theory of miasmas and the belief that living organisms could be generated spontaneously. Lister would find confirmation of his theses in Pasteur’s studies on the relationships between microorganisms and fermentation processes. The appearance of Richard Pfeiffer (1858-1945) reveals not only an exacerbated exercise of creativity from the screenplay writer and the director, but also an enormous epoch mistake, since at 1860, when the episodes shown in the movie supposedly occurred, Pfeiffer would be a two-year toddler.

## The “vaccinating” procedures to immunize organisms

At Arbois, Pasteur started to immunize sheep against anthrax with dead bacteria, and soon the village became known as “immune to anthrax” (as Radisse – a fictional character – explains to the President of the French Academy of Sciences), and the journals announce “*no anthrax in Arbois, the Government will appropriate a huge area for grazing. Radisse urges farmers to take their cattle to Arbois at the government expenses*”. It seems again quite astonishing and even unbelievable that the medical and scientific community preferred to attribute “special” properties to the village than to recognize that the sheep could have been turned into immune animals by Pasteur’s procedures. An experiment was finally designed and planned to confirm Pasteur experiments by vaccinating some sheep, but not a group of control animals, before exposing them all to an infective challenge. Rossignol, also a fictional character, proposed the trial at the Academy of Medicine. The director or screenplay writer exercise of using invented personages as expedient is widely employed in movies and novels referring to historical characters. One may similarly quote the example of Pasteur’s daughter, Annette, who marries Jean Martel in the movie. Pasteur did not have any daughter by the name of Annette, but Marie Louise, who married René Vallery-Radot, who became Pasteur’s biographer later.

When designing the experiments, Rossignol suggests Pasteur to inject the “venomous” blood (theoretically contaminated by the anthrax germ) into the sheep but emphasizing that he did not believe in microbes.

Pasteur thus argues to Rossignol: “*If you do not believe in microbes, or in anthrax being caused by germs, why to inject anything? Let’s let anthrax being generated inside the sheep bodies...*”.

Rossignol thus answered: “*Let’s follow the protocol rules, or do you want to give up and to admit that you lose?*”.

One aspect that could be interesting to discuss in the light of the knowledge accumulated so far in immunology was shown in the movie when the scientists went to the corral to check whether the sheep vaccinated against anthrax were alive, and found them asleep. It is easy to conceive that the scientists firstly concluded that the sheep had died for not being immunized (as the movie may want to induce us initially to think). They could, indeed, had died if the immunizations had occurred on the days before the infecting challenge, instead of weeks before as we now know that is the recommended protocol for an immunization procedure. In fact, it is not clear in the movie when the immunization occurred, but we use this opportunity to remember that a vaccine needs some weeks, and most frequently, one or two booster doses, before immunization is achieved in a vertebrate organism.

Later on, the scene in which Charbonnet (likewise imaginary) injects the rabies virus into his own arm is also fully fictional (we are aware that Pasteur thought of self-inflicting with the rabies virus, to confirm whether what he saw in rabbits would be repeated in humans, however, he did not do so).

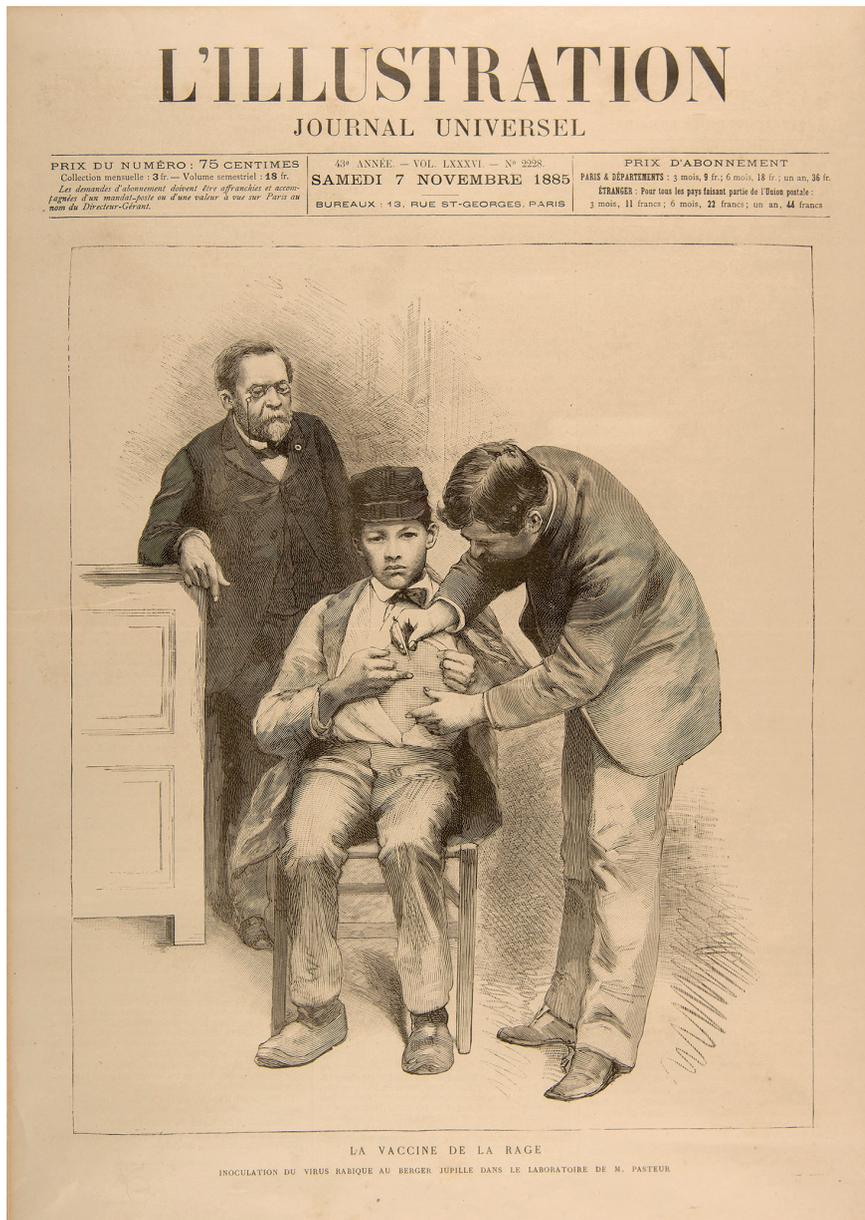
Nevertheless, one may call upon the impression that what this movie passage provides us is not different from that exhibited by many scientists nowadays: overconfidence often translated into arrogance, whereas committed study and accumulated knowledge usually manifest in scientist in the form of wisdom, serenity, modesty and, even, delicacy. As examples, we could use Pasteur’s quote: “*The benefits of science are not for scientists, they are for humanity*”. Also, the generous, although exact, quotation by the Brazilian scientist Carlos Chagas on Pasteur’s work: “*The great achievement of Pasteur was the emergence of a luminous phase for practical medicine: it marks the beginning of a new era of triumphs, and it was the dawn of a splendid day in the history of the Hippocrates’ science*”<sup>9</sup> (p. 5).

Other scene, depicted in the movie, that deserves to be commented, is the own Louis Pasteur vaccinating the young boy Joseph Meister, even though he was not allowed to do so (Pasteur was not a Medicine Doctor). At this moment of the story, his wife enters the room and draws Pasteur’s attention to the ethical and even criminal risk of such procedure. This scene does not represent the reality, and it is now clear that the vaccination has never been done by Pasteur himself, but by Dr. (Jacques-Joseph) Grancher (1843-1907), a French pediatrician ([https://fr.wikipedia.org/wiki/Joseph\\_Meister#cite\\_note-3](https://fr.wikipedia.org/wiki/Joseph_Meister#cite_note-3), accessed on 18/Mar/2020) (Figure 2).

In his Pasteur’s biographic *oeuvre*, Patrice Debré<sup>10</sup> has described a topic that must be approached as an unpublished aspect of the anti-rabies vaccine history. The author describes data on the first vaccination, obtained from Pasteur’s own *Laboratory Books*, object, for a long time, of a prohibition by his own will. The records indicate that the young J. Meister, presented as the first human “vaccinated

**Figure 2**

According to the website of the Institut Pasteur “...as Louis Pasteur was not a doctor, he entrusted Dr. Grancher with the task of inoculating the child with the treatment. In 10 days, Joseph Meister receives a total of 13 injections of rabies marrow less and less attenuated” (<https://www.pasteur.fr/fr/institut-pasteur/notre-histoire/troisieme-epoque-1877-1887>, accessed on 18/Mar/2020). This contradicts what is shown in the film, and, indeed, one of us (C.T.D.R.) has on the wall of his office the original front page of the newspaper *L'illustration* (from Saturday, November 7th, 1885) announcing the vaccination of Joseph Meister with the drawing of Louis Pasteur watching his collaborator Jacques-Joseph Grancher vaccinating the boy. The front-page drawing is also in accordance with what can be read at *Le Blog de Mijo* (<http://www.mijo.demouron.fr/2008/01/21/il-etait-une-fois/>, accessed on 16/Jan/2020): “Le traitement commença le soir même du 6 juillet, car il ne fallait plus perdre de temps. Mr Pasteur n’étant pas médecin, il ne pouvait lui-même pratiquer le traitement ni faire les piqûres. Ce fut donc le docteur Grancher qui s’en chargea” [“The treatment started on the evening of July 6, because there was no time to lose. As Mr. Pasteur was not a doctor, he could not himself carry out the treatment or give injections. So it was Doctor Grancher who did it”].



in *post-exposure*” against rabies, would have been, in fact, the third one. The first, an old man, which probably survived because he undoubtedly did not contract rabies, and the second a young girl hospitalized and treated too late who would have died of rabies after receiving just one (or two) dose(s) of the vaccine.

A last relevant point concerning the vaccination of the young Meister is that he did not have hydrophobia when he received the vaccine. He had been severely attacked (14 bites) by a rabid dog and received prolonged post-exposure prophylaxis and not a “treatment” for the rabies. This is unmistakably stated at the Institut Pasteur website (<https://www.pasteur.fr/en/institut-pasteur/history>, accessed on 18/Mar/2020): “*This first vaccination is a success: Joseph Meister will never develop rabies and will become the first vaccinated human being*”. We have drawn attention to the vaccination of some Pasteur collaborators, after Meister’s vaccination, elsewhere <sup>1</sup>.

### The obstinate and unmovable Pasteur’s thoughts and beliefs in the “germ theory” and in the feasibility of vaccination

Many of us never knew that Pasteur had a (left) hemiplegia because of the stroke he suffered at the age of 46 <sup>11</sup>. Thus, we may declare our respectful thoughts when, almost at the end of the movie, Pasteur appears sleepy, after almost four nights awake. The reader may agree easily with us that Pasteur’s performance was as admirable because of his committed work (Figure 3) as for the result of his creative intelligence. Therefore, it would seem reasonable to conclude that a dedicated, tireless, and consistent work is as determinant of success as it is (or even more than those) the intelligence, inventiveness or the genius. It seems that it was Pasteur himself who said: “*chance favours invention only for minds prepared for discoveries by patient study and persevering efforts*”. In some way, these thoughts may communicate the same meaning of the Oswaldo G. Cruz aphorism “*Do not be discouraged to not detract*”.

Another fundamental aspect that deserves to be cited concerns the difficulty in breaking prevalent paradigms in science. Incidentally, we wanted to quote a text that appeared in the presentation of a recent book *Images, Microbes, and Mirrors* written by one of us (C.T.D.R.) in a co-authorship with Yuri Chaves Martins <sup>12</sup> (p. 19-21).

*“The Polish physician Ludwik Fleck (1896-1961) proposed that many of the new scientific knowledge would be generated from concepts that would already exist. The incorporation of concepts belonging to unrelated disciplines is one of the main driving forces in the evolution of ‘Collective Thought’ and ‘Thinking Styles’, as Fleck calls them.*

(...)

*These notions inspired the American physicist and philosopher Thomas Samuel Kuhn (1922-1996) to develop the concept of paradigm in his renowned book ‘The Structure of Scientific Revolutions’. The paradigm, analogous to Fleck’s Collective Thought, would be the set of practices that define a scientific discipline in certain period. For most of the time, which Kuhn calls normal science, scientists would work to solve parts of the paradigm that have not yet been explained as parts of a puzzle. However, over time, data, which cannot be explained or often deny the paradigm in force, accumulate. At first, scientists would do anything to adapt these new data to the reality they are adapted (including denying the importance of discoveries) to the point where this would no longer be possible. Scientists would then accept ‘strange’ data, changing the paradigm, and then a revolution would occur in a field of science.*

(...)

*Max Karl Ernst Ludwig Planck (1858-1947), predecessor of Kuhn, considered that ‘A new scientific truth does not triumph by convincing its opponents and making them see the light, but rather because its opponents eventually die, and a new generation grows up that is familiar with it’. Teaching young people has, therefore, the dual function of having them learn basic concepts for their reflective thinking and nourishing the chances of science advancing in a healthily creative and refreshing way”.*

Of course, we were delighted when Pasteur was finally enthusiastically applauded in a crowded French Academy of Medicine, where he had the recognition from the French scientists and physicians <sup>13</sup>.

This article aimed essentially to analyze *The Story of Louis Pasteur*, as shown in the Dieterle’s movie, to discuss how the scientist’s research affected the French and world scientific scenario. Although somehow marginally, the view of Bruno Latour <sup>14</sup>, who has devoted some good work to Pasteur

**Figure 3**

The full commitment of Pasteur not only with his work but also with the objectives of his endeavour is adequately disclosed in this scene of the film where Pasteur is shown with two of his collaborators examining microscopic slides in search of microbes. The dialogue could be summarized as: Pasteur: *"How about the slides? Did they show anything?"*; Assistant 1: *"58 slides, all negative"*; Pasteur: *"And yours?"*; Assistant 2: *"Here is one, with a few short changes"*; Pasteur: *"According to Semmelweis, there has never been a case of puerperal fever unless the doctor or the midwife has been in recent contact with another victim of the disease; and Pasteur sat down in front of the microscope and start reading the slide"*; Assistant 2: *"What did you find?"*; Pasteur: *"Nothing definitive. Try again"*; Assistant 1: *"Again?"*; Pasteur: *"Yes. Again, again and again! Remember our aim... find the microbe. Kill the microbe"*. Available at Ultimate Movie Rankings (<http://www.ultimatemovierankings.com/paul-muni-movies/>, accessed on 18/Mar/2020).



and the Pasteurian Revolution, is noteworthy and complementarily insertable in this scope. Latour's understanding situates, based on the acceptance of bacteriology and Pasteur's and Pasteurians' theories, the protagonism of hygienists, far beyond the laboratory, since the role they began to play in society, to fight against microbes, also involved reviewing living conditions, social-economic and political relationships.

## Conclusions

Pasteur's life story, by itself, is fascinating. His relentless and tireless pursuit of scientific discoveries, aiming at clarifying phenomena that had oppressed physicians and patients for centuries, is an example for all those who know that only committed and persistent work can lead to a rewarding outcome. Pasteur had many challenges to prove his theories; however, he never gave up his goals, not even when he was rejected by the French Academy of Medicine. We consider that the movie director knew how to capture impeccably this great scientist's tenacity.

Dieterle's movie was produced and released in the 1930s, when the creation of the cinema by the Lumière Brothers was just over 30 years old, but Hollywood was already emerging as the Mecca of the art movie. During that period, several directors and producers used biographies of scientists, writers, artists, and composers, among other notable characters, as a subject for their films. This not only attracted audiences to theatres but also cast prominent actors and directors, who left a legacy of memorable works from the beginnings of the so-called "Seventh Art". It corresponded equally to the first steps towards the today's highly valued policy of dissemination of science and technology through the scientific diffusion.

The context created by the precedent researchers enabled Pasteur to work in the direction of the consolidation of a new paradigm and his legacy to science, medicine and humanity, as postulated by Fleck<sup>15</sup> and Kuhn<sup>16</sup>.

Finally, it would be tempting to link some passages shown in Dieterle's movie, possibly responsible, at some degree, for the appreciation obtained at the Seminars, with issues concerning attitudes observed among researchers until nowadays. Two have been pointed in the manuscript and deserve to be emphasized: (i) the inertial resistance of science to new paradigms; as shown in the movie by the enormous opposition, even hostility, of the medical community to the proposition of a simple practice with no harmful potential such as washing hands and boiling medical instruments; and (ii) the overconfidence, even arrogance, of some scientists instead of the wisdom, serenity, modesty and, even, delicacy raised in conditions of committed study and accumulated knowledge.

## Contributors

C. T. Daniel-Ribeiro drafted, designed and reviewed the manuscript. M. M. Lima extended and reviewed it, writing many of its parts.

## Additional informations

ORCID: Cláudio Tadeu Daniel-Ribeiro (0000-0001-9075-1470); Marli Maria Lima (0000-0003-4424-8924).

## Conflict of interests

The authors declare no competing interests.

## Acknowledgments

C.T.D.R. is recipient of a Research Productivity Fellowship from the Brazilian National Research Council (CNPq) and is a "Scientist of Our State" from the Rio de Janeiro State Research Foundation (FAPERJ). The Malaria Research Laboratory is an INCT (National Institute of Science & Technology) Associated Laboratory. Both authors acknowledge the comments and criticisms by Dr. Jean-François Pays (from the French Society of Exotique Pathology) and are grateful to the Brazilian Graduate Studies Coordination Board (Brazil) for providing access to the banks of indexed publications.

## References

1. Daniel-Ribeiro CT, Lima MM, Pays JF. Réflexions sur trois épisodes de la vie de Louis Pasteur vus au travers du film de William Dieterle (1936). *Bull Soc Pathol Exot* 2019; 112:22-9.
2. Menchero MS. Cuando decir Napoleón III significaba decir Hitler. *Los biopics de Dieterle y Muni (1935-1939)*. Valenciana 2017; 10:169-205.
3. Lemaire JF. L. Pasteur et Napoléon III. *Revue du Souvenir Napoléonien* 1996; 407:19-27.
4. Bryan AH, Bryan CG. *Bacteriology: principles and practice*. 5<sup>th</sup> Ed. New York: Barnes & Noble; 1953.
5. Iommi Echeverría V. Girolamo Fracastoro and the invention of syphilis. *Hist Ciênc Saúde-Manguinhos* 2010; 17:877-84.
6. Pouyan N, Pasteur A. Chemistry graduate who revolutionized the medicine. *J Microbiol Res* 2014; 4:148-51.
7. Tuthill K. John Snow and the Broad Street pump: on the trail of an epidemic. *Cricket* 2003; 31:23-31.
8. Salomon-Bayet C. La gloire de Pasteur. *Romantisme* 1998; 100:159-69.
9. Chagas C. Valor dos estudos de hematologia patológica. In: Chagas C. *Estudos hematológicos no impaludismo*. These Inaugural. Rio de Janeiro: Faculdade de Medicina do Rio de Janeiro; 1903. p. 5-18.
10. Debré P. *Louis Pasteur*. Paris: Flammarion; 1994.
11. Martinez-Palomo A. The science of Louis Pasteur: a reconsideration. *Q Rev Biol* 2001; 76:37-45.
12. Daniel-Ribeiro CT, Martins YC. *Imagens, micróbios e espelhos: os sistemas imune e nervoso e nossa relação com o ambiente*. Rio de Janeiro: Editora Fiocruz; 2017.
13. Pitt D, Aubin J-M. Joseph Lister: father of modern surgery. *Can J Surg* 2012; 55:E8-9.
14. Latour B. Le théâtre de la preuve. In: Salomon-Bayer C, editor. *Pasteur et la révolution pastoriennne*. Paris: Payot; 1986. p. 335-84.
15. Fleck L. *Genesis and development of a scientific fact*. Chicago: The University of Chicago Press; 1981.
16. Kuhn TS. *A estrutura das revoluções científicas*. São Paulo: Perspectiva; 1970.

## Resumo

O artigo examina a história de Louis Pasteur do ponto de vista de um filme clássico que foi projetado durante os Seminários Semanais do Instituto Oswaldo Cruz no final das atividades de 2017. Embora bastante antigo, o filme *The Story of Louis Pasteur* (Warner Bros., 1936) inspirou os espectadores e deu lugar a um debate animado que levou os autores a decidir publicar os comentários da Coordenadora dos Seminários, do debatedor convidado e do público. O filme incorpora personagens reais e fictícios para comunicar ao público o legado de um dos maiores precursores da história da saúde pública. O artigo destaca os episódios reais da biografia de Pasteur e também os ficcionais, sem desmerecer o trabalho dos criadores cinematográficos. O principal mérito do filme, um dos primeiros passos de uma política de divulgação científica, é de revelar a importância das vacinas e da higiene das mãos na prevenção das doenças infecciosas. Os autores argumentam que o cineasta retratou primorosamente a tenacidade do grande cientista na busca incansável por descobertas, além de sua ideia de que somente o trabalho persistente pode levar a resultados recompensadores, lembrando que o contexto criado por pesquisadores anteriores permitiu que Pasteur estabelecesse paradigmas novos. Finalmente, os autores citam trechos do filme que ilustram realidades que persistem até os dias de hoje: (i) a tendência da ciência de resistir, por inércia, aos paradigmas novos, exemplificada pela oposição da comunidade de ciência médica à proposição de práticas simples como a lavagem de mãos e a fervura de instrumentos e (ii) a confiança excessiva, e até arrogância, de alguns especialistas, em vez da serenidade e da humildade que nascem da pesquisa dedicada e do conhecimento acumulado.

*Biografia; Comunicação e Divulgação Científica; Antraz; Raiva; Vacinas*

## Resumen

Este artículo examina la historia de Louis Pasteur desde el punto de vista de una película clásica, presentada en los Seminarios Semanales del Instituto Oswaldo Cruz, al final de las actividades de 2017. A pesar de ser muy antigua, la película *The Story of Louis Pasteur* (Warner Bros., 1936) inspiró a los espectadores y provocó un animado debate que condujo a los autores a la decisión de publicar los comentarios de la Coordinadora de los Seminarios, así como los del comentarista invitado y de la audiencia. Utilizando también personajes de ficción, la película transmitía al público el legado de uno de los más grandes precursores de la historia de la salud pública. El artículo señala pasajes fidedignos en la biografía de Pasteur y ficticios, sin menospreciar el trabajo de los creadores cinematográficos. El mayor mérito de la película, uno de los primeros pasos hacia la política de divulgación científica, es revelar la importancia de las vacunas y de la higiene de las manos para prevenir enfermedades infecciosas. Los autores enfatizan que el director de la película capturó impecablemente la tenacidad del científico en su búsqueda sin descanso de descubrimientos, así como su idea de que solo un trabajo persistente podía conducir a resultados gratificantes, recordando que el contexto creado por investigadores previos permitieron a Pasteur establecer nuevos paradigmas. Finalmente, los autores citan pasajes de la película que ilustran realidades todavía muy vigentes: (i) la resistencia por inercia de la ciencia a nuevos paradigmas, ilustrados por la oposición de la comunidad médico-científica hacia la propuesta de prácticas simples, tales como lavarse las manos y hervir los instrumentos, así como (ii) la excesiva confianza, e incluso arrogancia, de algunos especialistas, en lugar de la serenidad y humildad que surgen del estudio realizado y el conocimiento acumulado.

*Biografía; Comunicación y Divulgación Científica; Carbunco; Rabia; Vacunas*

Submitted on 14/Aug/2019

Final version resubmitted on 21/Jan/2020

Approved on 27/Jan/2020