200 Years of Pasteurizing the World of Science

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Abstract: Professor Henrik C. Wegener, Rector of the University of Copenhagen, writes about the impact of Louis Pasteur and his legacy as a role model in science at the centennial of the Danish Pasteur Society and the bicentennial of Pasteur’s birth.

In August 1884, something peculiar happened in the city of Copenhagen. Its citizens suddenly developed the strange habit of calling each other funny names. “Good morning, Mr. Microbe”, “Have a nice day, Madam Bacillus”. In doing so, the Copenhageners showed that they understood the invisible sphere of microbes that a certain French researcher had revealed to an astonished world. No wonder Louis Pasteur was the talk of the town when he arrived in Copenhagen that summer as a science celebrity and delegate to the Eighth International Medical Congress. He had - among many other things - shown that bacteria by contamination (not bad air - miasma) can cause disease, like the cholera epidemic which had struck Copenhagen and claimed thousands of lives only three decades earlier. That was roughly the storyline in the popular weekly magazine *Illustreret Tidende* 138 years ago. But Pasteur’s work still has an impact that very much merits attention today.¹

At the outset, Pasteur (1822-1895) would not strike you as a rising star of science. Born 200 years ago to a penniless family in the parochial town of Dole in Eastern France, biographers agree that he was by no means an A-student. Rather, he was a slow starter, drawn to the bookless leisure of fishing and painting. At university, he would zigzag

¹ Allow me to insert a disclaimer. I am not a historian by trade but a microbiologist and admittedly one who has always perceived Pasteur with admiration and the bias of a fan. Furthermore, science superheroes in the premier league of history – like Pasteur or Einstein – are surrounded by mythology, multiplied by the internet which in the worst cases attributes unverified anecdotes and quotes to their thinking and achievements. This calls for due diligence and hesitation in the interpretation of Pasteur’s legacy – which in any case is breathtaking (see sources below).
through academic disciplines, at times with mediocre performances. He started out in philosophy, got a degree in mathematics, and another in chemistry, where he gradually found his calling. He then squeezed himself into the elite school École Nationale Supérieur (ENS). Upon graduation, he landed one of his first academic jobs as professor of chemistry at the University of Strasbourg, before he was appointed Dean at the University of Lille. Finally, he returned to the prestigious ENS in Paris as Director of Scientific Studies where he would reach his career zenith.

What lessons can be extracted from this unconventional CV? Given his extraordinary talent for science, it is difficult to understand the accounts of Pasteur as an average student. Perhaps great researchers are not always obedient pupils, who simply reproduce what their teachers define as correct. And more often than not, profound discoveries are not always hidden within disciplines, but between them. Pasteur cannot easily be confined to one field but established (or greatly influenced) entire new ones: From microbiology to biomedicine, urban planning and food science.

Only an exquisite selection of persons or companies get their name promoted to a word. Platonic is one. Google is the millennium verb, now part of everyday language. Pasteurize covers the discovery that most germs are killed if you heat them to something like the temperature in a sauna. No fresh milk in the fridge or Bordeaux in the cellar, had it not been for Pasteur. Please visit the street Pasteursvej in Copenhagen, enter the old HQ of Carlsberg Brewery and you will encounter the father of microbiology portrayed in a marble bust. As Carlsberg founder J.C. Jacobsen would write to Pasteur in a letter of gratitude: "In memory of the services that have been given to chemistry, physiology and the brewery by your work on fermentation." Danish food and dairy manufacturers, who make a living from shipping food and dairy products across the globe, as well as present days’ biotech and life science industries, could express the same words of gratitude.
Today, pasteurization alone would suffice to earn a Nobel Prize, but this polymath has achieved enough to make him a triple Nobel laureate, at least. He settled one of the big disputes of the epoch – the origin of life – by proving that all living organisms can only derive from other living organisms. He showed some of the fundamental links between microorganisms, illness and death. And perhaps with greater impact than anything else, standing on the shoulders of Edward Jenner and others, he proved that if you deliberately inject a weakened infectious agent, the body is capable of fighting it and achieving immunity when it later on meets the heavy artillery of a genuine virus or germ. Had it not been for Pasteur, rabies, plagues and smallpox would still be lethal. Infectious diseases are still the big global killers, primarily due to poverty, but the fact that the world population has risen by factor of seven since 1822 can partly be attributed to Pasteur.

Which character lies behind these awe-inspiring accomplishments? Biographers describe him as strict, if not authoritarian, in his capacity as ENS Director, in particular vis-à-vis the students who revolted twice during his tenure. He introduced a student dress code, outlawing the fashion of sailor’s clothes and straw hat, which he used as an example of ridiculous attire. Moreover, after prohibiting smoking, the majority of students even quit. In hindsight, his ruthless management style and lack of social skills seem totally out of place. Although one cannot help speculating on the harsh sanctions he might have imposed on present-day students, who pay more attention to their social media distractions than their professors’ teaching. But perhaps some of these personal traits – the perseverance and resolve of a rhino – are instrumental when you want to crack the fundamental codes of life and disease in the laboratory.

Pasteur’s method of inquiry is sometimes boiled down to his famous statement: “In the field of observation, chance favors the prepared mind.” Discoveries are not always the result of deliberate aims and chasing a clear hypothesis, but rather pure chance and the ability
to wonder why the experiment did not go according to plan. This practice is sometimes
described by the term “serendipity”, which covers the ability to pursue, rather than dismiss,
unusual observations that turn out to be “happy” accidents. The prime example is Alexander
Fleming who discovered Penicillin by sheer luck, wondering why the fungus that had
wrecked his experiment was able to kill bacteria.

In this anniversary year of Pasteur, it makes so much sense that a fellow
professor of chemistry at my university, and former scientist at the Carlsberg Laboratory,
Morten Meldal, is awarded the Nobel Prize, sharing it with Barry Sharpless from Scripps
Research and Carolyn Bertozzi from Stanford. Because the way they discovered click
chemistry is very much in keeping with the spirit of Pasteur’s science – being prepared to
pursue chance.
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