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College Writing Seminar
September 17, 2022

The Scientific Attitude of Semmelweis

The philosophy of science is often debated whether it is over proper procedures of conducting science or what is considered proper science. A notable scientist when it comes to how science was approached was Dr. Ignaz Semmelweis. Dr. Ignaz Semmelweis approached his experiment with the proper scientific attitude that helped him obtain effective and useful results. But what is the proper scientific attitude?

There are two components to the scientific attitude. The first component of the proper scientific attitude is caring about the empirical evidence. “If one does not care about evidence, one is resistant to new ideas. One is dogmatic. Such a person might onto their beliefs no matter what the evidence shows” (McIntyre 48). Caring about the evidence produced in the trial means being open minded about what is observed. This can mean challenging your current theories with new ideas. It is important not only for the scientist to care about the evidence, but for the scientific community to also keep the same open mind. It becomes clear through Semmelweis’s experiments that he did care about his empirical evidence.

The other component to the scientific theory is the willingness to change theories in light of new evidence. When it comes to caring about the empirical evidence, you must be “willing to test our theory against a reality that might refute it”(McIntyre 48). In light of new evidence, there needs to be a willingness challenge and reject the current theory. Isaac Newton comes to mind as when his theory on gravity was challenged by John Couch Adams and Urbain Le Verrier when they observed that Neptune had a slight perturbation in the orbit of the planet Uranus. Le Verrier for example stuck to Newton’s theory leading him to falsely believe to his that Mercury's perturbed orbit was caused by an unseen planet he named Vulcan. The unseen planet was however never proven to be observed. Despite that, Le Verrier “went to his grave in 1877 believing that Vulcan existed. Later, Albert Einstein developed a non Newtonian theory that

explained Mercury's perturbed orbit. Le Verrier demonstrated the problems with not challenging current theories in light of new evidence.

To understand and demonstrate the legitimacy of Semmelweis's experiments, it is important that his history is explained. Ignaz Philipp Semmelweis was born on July 1, 1818 in Budapest, Hungary. "Educated at the universities of Pest and Vienna, Semmelweis received his doctor's degree from Vienna in 1844 and was appointed assistant at the obstetric clinic in Vienna" (Zoltan). Semmelweis came from an educated background and was an assistant in the clinic that dealt with childbirth. Additionally, the clinic was the largest maternal clinic in the world. "His duties were to examine patients each morning in preparation for the professor's rounds, supervise difficult deliveries, teach students of obstetrics and be 'clerk' of records"(Medicine in stamps-Ignaz Semmelweis and Puerperal Fever). In Europe, maternity institutions were set up as a way to deal with infanticide and illigetimate children. These maternity institutions were gratis institutions which offered to take care of the infants, making them especially attractive to prostitutes and underprivileged women. In return for free services, the women were subject to train as doctors and midwives.

During this time Dr. Ignaz Semmelweis got involved with the puerperal infection or Childbed fever that was plaguing maternal wards. During this period in time, most mothers gave birth at home but some women had to give their births in hospitals due to issues such as "poverty, illegitimacy, obstetric complications" (Zoltan). The women who had to give birth at these maternity wards faced mortality rates ranging as high as 25 to 30 percent. At the maternity wards that Ignaz worked out, there were two maternity clinics. The first maternity clinic had the highest death rates compared to the second maternity clinic. This fact was so well known that many women requested to be in the second maternity ward. Women were even willing to give birth on the streets in order to qualify for the child care benefits without being admitted into the ward. This puzzled Semmelweis as he stated, "To me, it appeared logical that patients who experienced street births would become ill at least as frequently as those who delivered in the clinic. What protected those who delivered outside the clinic from these destructive unknown endemic influences?" (Medicine in stamps-Ignaz Semmelweis and Puerperal Fever).

During this time, germ theory didn't exist. The main medical theory for diseases revolved around the imbalance of the "four humours." The four humours consisted of four categories, those being blood, phlegm, choler or yellow bile, and melancholy or black bile. The way the

humours worked was that “The ideal person had the ideally proportioned mixture of the four”(Britannica 2018). This meant that an ideal person had a balance in all four of these categories and that disease was caused when the humours were imbalanced. The main treatment for these imbalanced humours was bloodletting. The other working theory was that disease was caused by the bad air.

When Dr. Ignaz Semmelweis began his experiments, he began to throw out different hypotheses based on the differences between the first and the second ward. One of his hypotheses was that childbed fever was caused by overcrowding within the maternal wards. However when Semmelweis counted the number of patients in the first and second ward, he found that there was a higher number of patients in ward two than in ward one. This was likely due to the fact that many of the women were trying to avoid the first ward where more of the patients died. Another hypothesis was formed when it was observed what path the priest took. Priests were often brought to the maternity ward in order to perform dying patients their last rites. It was observed that the priest on his way to the first ward had to pass way more beds while ringing a bell. It was hypothesized that the ringing bell was causing patients to get scared making them more susceptible to contracting the disease. Semmelweis asked the priest to take an alternate silent route through the maternity ward to see if it had any effect on the deaths. The priest's new approach in the ward had no effect on the mortality rate in the first ward. Another test that Dr. Semmelweis tried getting women to perform their births in different positions by laying on their sides. This test however was fruitless and didn’t have any effect on the mortality rates.

Dr. Semmelweis got closer to the answer when he realized one of the main differences to the first and second ward was that the first ward was run by medical students whereas the second ward was run by midwives. Dr. Semmelweis would get his part of his miracle answer when he returned to Venice and “got back to the hospital, some sad but important news was waiting for him. One of his colleagues, a pathologist, had fallen ill and died” (Davis). Despite the sad news that his friend had died, it was observed that after he cut himself during an autopsy on a woman with childbed fever, he had developed the same symptoms that the women with childbed fever had. Semmelweis then realized there was a big difference between where medical students came from before going to the maternity ward which was usually after doing an autopsy. Although there was no germ theory at the time, he concluded that cadaveric material was getting

transferred to the pregnant women causing them to get childbed fever. He soon began ordering his students to wash their hands in chlorine which had an immediate effect on the death rates as the observerved “rates in June were 2.2%, July 1.2%, August 1.9% and, for the first time since the introduction of anatomical orientation, the death rate was zero in two months of the year following this discovery” (Medicine in stamps-Ignaz Semmelweis and Puerperal Fever). Semmelweis was able to discover the cause of deaths through his scientific attitude.

Semmelweis’s success comes back to his use of the two core ideas of the scientific attitude. It can be seen through his multiple different trials that he clearly cared about the empiric evidence. Through each failed experiment, he was able to eliminate each possibility that separated the first ward’s mortality rate from the second ward’s mortality rate. Most importantly, Semmelweis was willing to change his theory in order to get a better understanding of what he was researching. The biggest example can be seen when he began to conclude that childbed fever was caused by the transferring of dead tissue (and eventually live tissue). These ideas challenged the current theories of how disease was transferred such as the imbalance of the “four humours” and the commonly held belief of it being transmitted through the air. Additionally, Semmelweis was even willing to challenge that religion could have had some effect on the death rates in the first ward by altering priests' path through the maternal ward. Despite his findings, they were rejected for decades as many practitioners stubbornly refused the idea that gentlemen were filthy enough to be causing the deaths of many women. In a sense, this demonstrated how the medical community's lack of scientific attitude was ultimately holding it back from making more advancements. While Semmelweis never got the recognition he deserved until much later, his demonstration of the scientific attitude greatly demonstrates how it can benefit the scientific community.

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The Scientific Attitude of Semmelweis Revision

The proper approach to science is heavily debated. However a notable scientist when it comes to the approach to science was Dr. Ignaz Semmelweis. Dr. Ignaz Semmelweis approached science with the scientific attitude that helped him obtain effective results.

There are two components to the scientific attitude. The first component was caring about the empirical evidence. “If one does not care about evidence, one is resistant to new ideas. One is dogmatic. Such a person might hold onto their beliefs no matter what the evidence shows” (McIntyre 48). This leads to the second component of the scientific attitude.

The second component was the willingness to change theories in light of new evidence. Scientists need to be “willing to test our theory against a reality that might refute it”(McIntyre 48). In light of new evidence, there needs to be a willingness challenge and reject the current theory. Le Verrier’s unwillingness to abandon Isaac Newton’s theory of gravity led to him believing that Mercury’s perturbed orbit was caused by an unseen planet. It was only when Einstein's non-Newtonian theory of relativity that Mercury's perturbed orbit was explained.

To understand Semmelweis’s experiments, it’s important that his history is explained. Semmelweis was “Educated at the universities of Pest and Vienna, Semmelweis received his doctor’s degree from Vienna in 1844 and was appointed assistant at the obstetric clinic in Vienna” (Zoltan). “His duties were to examine patients each morning in preparation for the professor’s rounds, supervise difficult deliveries, teach students of obstetrics and be ‘clerk’ of records”(Ataman, Vatanoğlu-Lutz, Yıldırım). In Europe, maternity institutions were set up to deal with infanticide and illigetimate children. These institutions were gratis institutions which offered to take care of the infants, making them attractive to prostitutes and underprivileged women. In return for free services, the women were subject to train as midwives.

During this time Semmelweis got involved with Childbed fever which was plaguing maternal wards. The women who gave birth at these maternity wards faced mortality rates “as

high as 29 percent (McIntyre 53). At Semmelweis's maternity ward, there were two maternity clinics. The first maternity clinic had the highest death rates compared to the second maternity clinic. This fact was so well known that many women requested to be in the second maternity ward. Women were even willing to give birth on the streets in order to qualify for the child care benefits without being admitted into the ward. This puzzled Semmelweis as he stated, "To me, it appeared logical that patients who experienced street births would become ill at least as frequently as those who delivered in the clinic" (Ataman, Vatanoğlu-Lutz, Yıldırım).

Since germ theory didn't exist, the main medical theory for diseases revolved around the imbalance of the "four humours." The four humours consisted of blood, phlegm, yellow bile, and black bile. The way the humours worked was that "The ideal person had the ideally proportioned mixture of the four"(Britannica 2018). An imbalance in the humours was believed to lead to disease. The main treatment for these imbalanced humours was bloodletting.

When Dr. Ignaz Semmelweis began his experiments, he began to throw out different hypotheses. One hypothesis was that childbed fever was caused by overcrowding within the maternal wards. However when Semmelweis counted the number of patients between the wards, he found that there was a higher number of patients in ward two than ward one. This was likely due to many of the women trying to avoid the first ward where more of the patients died.

Another hypothesis was formed when the priest performing the death rites path was observed. The priest's path made him pass many beds while ringing a bell which was hypothesized to scare the patients making them sick. However when the priest took a silent path with no bell, there was no change to the mortality rates.

Dr. Semmelweis got closer to the answer when he realized the main difference between the two wards was ward one was run by medical students while ward two was run by midwives. Dr. Semmelweis would get his part of his miracle answer when he returned to Venice and "got back to the hospital, some sad but important news was waiting for him. One of his colleagues, a pathologist, had fallen ill and died" (Davis). It was observed that after he cut himself during an autopsy, he had developed the same symptoms of Childbed fever. Semmelweis realized that Childbed fever was related to Medical students doing autopsies. Although there was no germ theory at the time, he concluded that cadaveric material was getting transferred to the pregnant women causing them to get childbed fever. He soon began ordering his students to wash their hands in chlorine which had an immediate effect on the death rates as the observerved "rates in

June were 2.2%, July 1.2%, August 1.9% and, for the first time since the introduction of anatomical orientation, the death rate was zero in two months of the year following this discovery" (Ataman, Vatanoğlu-Lutz, Yıldırım).

Semmelweis's success comes back to his use of the two core ideas of the scientific attitude. It can be seen through his multiple different trials that he clearly cared about the empiric evidence. Through each failed experiment, he was able to eliminate each possibility that separated the first ward's mortality rate from the second ward's mortality rate. Most importantly, Semmelweis was willing to change his theory in order to get a better understanding of what he was researching. The biggest example can be seen when he began to conclude that childbed fever was caused by the transferring of dead tissue (and eventually live tissue). These ideas challenged the current theories of how disease was transferred such as the imbalance of the "four humours.". While Semmelweis never got the recognition he deserved, his demonstration of the scientific attitude greatly demonstrates how it can benefit the scientific community.

Citations (less than 1000 words excluding citations)

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