Thesis Project Portfolio

Strain Scout: A novel device for the discovery and validation of mechano-pharmacological targets of disease

(Technical Report)

Trust in Medical Professionals after COVID-19

(STS Research Paper)

An Undergraduate Thesis

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Sociotechnical Synthesis

The technical report discusses the design and creation of a new device, Strain Scout, that allows cells cultured for experimental drug testing to be stretched *in vitro*. The STS research paper outlines the three mechanisms that propagated distrust amongst the public toward medical professionals during COVID-19, specifically, *misinterpretation*, *misalignment*, and *misguidance*. The technical paper and the STS research paper are related by the themes of medical research and drug discovery; however, each paper approaches the respective topics from different points of view. The STS research paper dives into how people receive certain innovations in medicine and how it affects their trust of the medical research process and the treatment they receive from medical professionals including doctors, biomedical engineers, and other laboratory scientists. Therefore, the results of the STS examination are critical for the future integration of Strain Scout as a tool for drug discovery that will lead to treatments affecting the public. The conclusions of the STS paper could help explain how the science behind Strain Scout must be delivered to individuals to explain its uses and importance and increase trust with people receiving a treatment discovered with Strain Scout.

The technical report reviews how the research team aimed to create the innovative Strain Scout by defining two aims: first, make a Strain Scout user interface that is easy to use and more compatible with current imaging microscopy techniques, and second, make Strain Scout more high-throughput to enable the testing of multiple experimental conditions at once. Mechanobiology is the study of how one of the most important things about physiology: movement, affects our cells. One way this is done is by culturing cells on a soft surface and then stretching the surface. We can see with labeling molecules and microscopes how the cells react to being stretched. The current design for performing this kind of analysis is hard to use and can

only test one experimental condition at a time. This is not ideal for a field that still has so many unanswered questions, and for pharmacological applications where industries want experimental replication to be as accurate and efficient as possible. An optimized design will eliminate all these problems, and the technical report illustrates how the design was modified to accommodate aims 1 and 2.

One day, when Strain Scout has been fully optimized and can be used for translational sciences, drug discovery, and medical treatment analysis, it will be responsible for the demonstrating evidence in support of medicine that will be prescribed to people. Therefore, it is important to understand how the public interprets and trusts innovation in medicine. This is the very topic discussed in the STS paper, with a specific focus on the vaccinations, quarantine protocols, and drug analysis process introduced and revealed during the COVID-19 pandemic in the United States. The STS paper will be divided into three sections that analyze three different case studies: Hydroxychloroquine sulfate controversy, decreased primary care, and vaccination side effects. Each analysis will be done with two STS frameworks: social construction of technology (SCOT) and sociology of scientific knowledge (SSK). Analysis will break down an innovation and identify actors that were responsible for creating it and spreading knowledge about it. Individual analyses culminate in three mechanisms through which distrust during the pandemic propagated: *misinterpretation*, *misalignment*, and *misguidance*.

Medical innovation is extremely important for the well-being of individuals, however, all the research and technological development in the world mean nothing without public acceptance. Therefore, the two studies included in this thesis complement each other in making strides towards innovation while simultaneously learning how to communicate scientific knowledge in a way that encourages trust of medical professionals.