Undergraduate Essay

Open Source Science

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What do leprosy, schistosomiasis, trachoma, Alzheimer's, Crohn's, and Parkinson's all have in common? They are all terrible diseases that have no cure. But

Picture courtesy of *The Synaptic Leap*.

while some of these diseases have specific groups working together on research to find a cure, there are still some that have been overlooked. Leprosy, schistosomiasis, and trachoma are only some of the many tropical diseases that are being neglected. The reasoning behind this is simple; tropical diseases are low on the priority list for big pharmaceutical companies because there is low return on the research and production of these drugs. Since the majority of the population that is affected by these diseases is found in undeveloped countries, they do not have the financial means to pay for such patented drugs. So what is to be done? Do we just leave these people to figure it out alone or even worse, die?

With over one billion people affected (one sixth of the world's population) mostly in the developing world, the World Health Organization calls these neglected tropical diseases "a symptom of poverty and disadvantage." Diseases include but are not limited to Malaria, African sleeping sickness, Dengue Fever, Schistosomiasis, Leishmaniasis, Chagas Disease, Tuberculosis, Leprosy, Toxoplasma, soil transmitted Helminths, and Trachoma. One study shows that if Tuberculosis is not stopped, over one billion people will be infected with Tuberculosis alone by the year 2020!

In November of 2005, an open collaborative research website was launched with the idea of sharing research to find cures for these diseases. Founder and executive director Ginger Taylor leads this group, called The Synaptic Leap (TSL), with passion and persistence. The name comes from the communication of the body's cells through neurons which pass information from dendrite to dendrite across a synaptic cleft. The information then travels down the axon and is sent on to the next cell. Some call this the synaptic leap. This is synonymous to the general idea behind this organization whose mission statement states that they wish "to provide a network of online research communities that connect and enable open source biomedical research." They believe that this will be an effective way to generate ideas more quickly as well as reduce redundant work because other members will be able to see what research has already been conducted and the results of this research.

The Synaptic Leap group is actually a web-based group of collaborative scientists who volunteer their time, computer power, and reagents in hopes that they will eventually lead to enough information that will be available online so that others can

Picture courtesy of the *Neglected Tropical Disease Coalition*.

continue on in the research and freely develop drug portfolios.

Being a part of The Synaptic Leap requires that researchers give up their right to patent information because as soon as it is posted, the data becomes public. Founder Ginger Taylor states that this is not an issue, however, because the drive to make new discoveries is usually based on making a profit. Since there is no money to gain in this "business" there is nothing to lose by forfeiting patents and having access to immediate feedback. Although if one does wish to patent information, they can hold back valuable steps and sufficient information so that the results are public but the means by which the results were obtained are not completely available.

There are so many opportunities to get involved so these projects are not limited only to scientists. Large companies can donate both funding and also their services without giving away their valuable goods and technological secrets and programs. There is always testing to be done such that not all researchers have access to the expensive equipment and analysis software. These services can be performed by these companies.

Picture courtesy of the *Institute for One World Health*.

The Synaptic Leap is currently working on research on several topics including Malaria, Schistosomiasis, Toxoplasma, and Tuberculosis, as well as general open research. While these are the only current projects being worked on, there

is an open invitation for anyone to start new projects at any time. One of the leading and most troublesome projects is that of Schistosomiasis, lead by Matthew H Todd, a chemist at University of Sydney. Currently, about 200 million people are affected by this disease with 400 million at risk. Schistosomiasis is found mostly in the developing world and is passed on by skin-penetrating worms in fresh water. A drug called Praziquantel is currently being used to treat this disease; however there is a danger of resistance. They are now trying to synthesize enantioselective strands of Praziquantel. The challenge is to make an active enantiomer that is less expensive to produce than the current racemic drug, which is 7 cents per 600 mg tablet.

No one scientist can do this alone, and that is why they are turning to others to help out and join TSL. Blog posting can actually be a huge help in improving experimental conditions by the suggestions of others. This is why there is so much value in peer review.

The Synaptic Leap is not the only organization seeking to make a difference in the developing world's disease situation. There are several other programs such as the Tropical Disease Initiative and the World Health Organization that are also concerned for these people. The Institute for One World Health is a non-profit pharmaceutical company that was founded in 2000 with the desire to "develop safe, effective, and affordable new medicines for people with infectious diseases in the developing world." While there is such a large need for innovative and inexpensive drugs to help treat neglected tropical diseases, there are also many undergraduate students who are eager to use their chemistry research experience in helping to solve real world problems. Professor William L. Scott of Indiana University-Purdue University Indianapolis (IUPUI) started and is developing a program called Distributed Drug Discovery, which has undergraduate students performing small units of research in academic laboratories. Dr. Scott is a Research Professor at IUPUI that has taken an interest in the open source science approach in helping to find treatments for tropical diseases. His students, both in the United States and in other countries, have been taking part in performing many

different combinations of numerous amino acid possibilities to synthesize peptidomimetics. This research requires a commitment to open access of all data and can be done using everyday equipment and cheap materials.

While there are many organizations that focus on treating tropical diseases, the Synaptic Leap hopes to become the source of all collaboration and community research so that we can all join together in one united effort to make a difference in the world. Anthropologist, intellectual, and scientist Margaret Mead said, "Never doubt that a small group of thoughtful, committed citizens can change the world. Indeed, it is the only thing that ever has." TSL is growing, including about five new users a week and one active scientist each month. Their ultimate goal is to make scientists' dreams a

reality by empowering them for open, collaborative research that makes the impossible things possible through community pools of information. "It has got so much potential!" said one researcher. Their hope is that one day, these realities will find cures for those neglected tropical diseases that have caused so much pain and sorrow in the developing world.

For more information:

Chemical and Engineering News website
Institute for One World Health website
Neglected Tropical Disease Coalition
The Synaptic Leap website
Tropical Disease Initiative website
Tropical Disease Research website
Contact Dr. William L. Scott, IUPUI
World Health Organization website