Computational Platform using Biological Analytics to Find Hidden Patterns in Data to Improve the Production Process for Pharmaceuticals, Food and Beverage Companies and the AgBio Industry

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CEOCFO: *Mr. Reed, would you tell us the idea behind Mimetics?*
Mr. Reed: The idea is to take certain advanced bio-computation techniques and apply them to improving various processes in the discovery of new traits in crop plants, fermentation processes in food and beverage, production of biologically based pharmaceuticals, and other applications.

CEOCFO: *How does that work?*
Mr. Reed: The basis of the technology is the insight it gives us into the way biological processes taking place inside of cells are controlled. For example, a yeast cell once it is divided from its mother starts to grow and at a certain point it stops growing and starts to divide again. There is some mechanism inside that cell that tells it, "… you have done enough growing, you are big enough and now you need to divide." This is a control mechanism based on genes and molecules interacting inside of the cell. There are now widely used techniques for sequencing genes and understand the biochemistry of cells, but gaining an understanding of the mechanisms by which these molecules and genes interact with one another has been hard. We have a new and much better technique for doing that than has been available. Once you have that technique, you can apply it in lots of different places.

CEOCFO: *What is the technique?*
Mr. Reed: The algorithms start with data that you can get from the cells using technology and instruments that are readily available right now. This technology generates large and complex data sets. Our system then applies mathematical analysis from dynamical systems to try to uncover, for example, which gene is causing certain other genes turn on and off and when. Remember that genes are always the same in the cells but they are not always on and not always off; there is some interaction that goes on that changes that. It is this kind of dynamical process that our algorithms can bring out.

CEOCFO: *Who is turning to you for services?*
Mr. Reed: We are working now with some of the leading companies in AgBio. The ones that produce new kinds of seeds with new traits for crop plants, traits that help the plants to respond to stresses in the environment like drought or high temperature. They are always innovating and trying to breed new plants. This has been a hit-and-miss proposition up to now and it costs them both a lot of time and a lot of money. The outputs from our data analysis can help shorten that process and reduce the amount of time and money spent in finding these new traits and developing new products. That is one example. Another example are the craft brewers who have very complicated fermentation processes that fermentation science as it has been developed up to now cannot analyze effectively. If you understand what is going in inside the yeast cells as they produce the beer you have a much better chance at controlling these processes and making

sure for example that each batch of beer takes the same amount of time to produce each time it is made so that the production efficiently matches up with the supply chain.

CEOCFO: *Is it somewhat the same type of analysis whether in a plant or in a fermentation process?*
Mr. Reed: That is the beauty of it. Mimetics algorithms take gene expression data which is readily available from various gene sequencing equipment as their input. Once we get the data we do not need to know very much about it. The algorithms work independently of that whether it is plant, yeast or animal. The more we know about the experiment that we have done and the organism, the more refined our analysis can be, but the basic analytical steps are the same.

CEOCFO: *How long might a typical analysis take?*
Mr. Reed: Right now, a large data set, say from a crop plant experiment takes a few days in the computer. Interpreting the data then takes a while. On the front end, it also takes a while for the customer to actually do the experiment. It takes a certain amount of time do breed and grow a plant. If you need to do a beer fermentation on the other hand, it only takes a few days. You have to pull material out of the process so you have to take a few samples from the beer as it is being made or you have to clip a few inches off the leaves of the plant over time and sample them. There is some time involved in the experimentation, but once that is done, the whole process is very fast and we get answers back to people in weeks when normally these types of analysis have taken years.

CEOCFO: *What goes into the interpretation and what have you learned so that you are interpreting better today than a year ago?*
Mr. Reed: What we get out of this is our networks. They look like graphs with dots and arrows connecting them. The dots represent the genes and other molecules in the cell and the arrows are showing which genes other genes and in what way. You have to understand how that flows and what is turning on first and what is turning on next, what is going to be important and what is secondary. That takes a certain amount of understanding of the biology involved. We have gotten better at doing this because we have seen many more data sets over the course of the last year than we had when we first began. We began with data from yeast, which is the standard organism that biologists study very heavily. Now we have branched out into bacteria, into plants, and a little into human cells. We have seen many of these networks now and we know what to look for and it is a lot faster. We have tuned the algorithms a little bit so they are giving us the data that we want. Now we are working on migrating our data analytics to the web so people can upload the data that they have, choose from a menu of analytical steps, run those steps, and get the answers back. If they want us to help them interpret the results, we can do that and if they don't want help they can do it themselves. The service will be available on a one-off basis or a subscription basis. That will make this accessible to a much wider range of people and much more efficiently.

CEOCFO: *Are people in the industries you serve aware of Mimetics?*
Mr. Reed: We are getting there but we are small. We are not as well-known as I would like us to be. We are located here in North Carolina and this is a hub for research and agriculture. There are a number of leading AgBio companies that have much of their worldwide research activity located here. So this has been an excellent place for us to get started and in our community people are becoming aware of us. In the local craft beer community, they are also becoming aware of us. We need to do a lot more to get out there.

CEOCFO: *Are companies understanding your computational platform?*
Mr. Reed: Yes, in the companies that have substantial R&D efforts. Ten years ago you could not get a PhD degree in bio computation and now there are numerous of programs. Bio-computation is a very rapidly growing area because the volume of data coming out has exploded. The volume of data has grown much faster than the ability of people to analyze the data, which is essentially the niche we are trying to fill. These companies do have teams of people who are trying to do bio-computation but they are pretty much overwhelmed. It is hard for them to keep up with new techniques when they are trying to do their jobs. There is awareness on the part of senior management that bio-computation is powerful and awareness that they need help.

CEOCFO: *What should a company do with an analysis?*
Mr. Reed: We did an analysis for one company on some kinds of stress in their crops and we noticed that certain kinds of genes were quickly activated once the plant sensed the stress. Our analysis showed them this in a way that they could not see before. They already knew that at some point in the process those genes were activated but they did not realize how early on they were activated and that they caused other genes to start to turn on as well. There was a cascade effect and there was also feedback, meaning that there was another set of genes which turned off these responsive genes after they had been active for a while. They could see the whole process from the point where the plant sensed the stress, reacted to the stress and then decided to turn that reaction off. So now they are in a position, if they do not want that

reaction to be turned off so quickly, they now know exactly which gene they need to influence. They knew exactly which transcription factors and which genes they needed to silence to allow the plant to continue to have the reaction that they want it to have. In other words, they now have a target to go to and that is incredibly valuable because they know how to influence that target! Once you see what the target is, there are many lot of techniques for dealing with it but finding the target in the first place can be extremely difficult.

CEOCFO: *Have you found that people follow-through or are many companies looking at it but not embracing the value?*
Mr. Reed: The well-organized companies have people who are looking at these kinds of engagements. We are not the only external technology source that they go to but the well-organized companies have people whose job it is to make sure that either the engagement is valuable to the company and they are using what comes out of it or they cut it off. The less well organized companies have R&D people who go off on their own and hire us or somebody else, pay us money and then the data comes in and whether it is useful or not there is very little review. This does vary from organization to organization.

CEOCFO: *Do you have the funding or are you seeking partnerships?*
Mr. Reed: The technical side of this is funded by an NSF SBIR. What we need now is to build up the business side. You asked previously whether people know our name and our capabilities. We need to build that up. We are looking for investors and we are looking at various possibilities. The funding could also come from a strategic partner, but that is a little more difficult to imagine given that it is one of the big agricultural companies, I am not sure they would want their competitors seeing the technology. There are very few big companies doing this kind of data analysis work. I think we be looking for financial partners to help us build the business side of this by building up our marketing and sales.

CEOCFO: *What surprised you about the whole process so far?*
Mr. Reed: One of the things that surprised me was that the vast differences in the way these companies are organized to be able to take on external technology and use it. I was expecting that it would not be quite so varied and that by now these companies would know how to do this. We have to be very careful when we go in to a big company and start to engage. We are small and dealing with a big company takes up a lot of my time and a lot of my team's time. If we, get into an engagement and then we are left in limbo as to whether there is a follow-on or how the information is going to be used that is not a good outcome. I was not expecting that we would have to determine out the way in which the company uses these outside services and how they are organized to use them before we got deeply involved. We learned that the hard way.

CEOCFO: *What should people remember about Mimetics?*
Mr. Reed: They should remember that we can do data analytics and biology and there is a huge amount of data out there right now and not nearly enough analytical capability. We are filling a part of that that gap but we think in a very important way. That gap is there and growing. This data will be tremendously valued allowing companies whether they are I agriculture or pharmaceutics, to do their jobs much more efficiently.