

# Statement of Academic Purpose

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Below the quote on my coffee cup, a disclaimer reads: “This opinion does not necessarily represent that of Starbucks.” This intrigues me, as it suggests that Starbucks, as a corporate entity, has its own opinion. Long before I studied neuroscience and before I learned of the concept of emergence, I was fascinated with such corporations, which innovate rapidly, permeate large markets and play a part in many people’s day-to-day activities. The actions and influence of these companies extend far beyond that of any individual employee. In a way, the collective work of so many people results in the formation of a new, independent entity, which assumes an identity and role in society. These entities - often called human complex systems - form the core of my graduate interest. I intend to research the catalysts (economic, technological and political) under which such systems arise and the conditions and design (incentives, hierarchies and relations with external systems) that enable such systems to operate both effectively and efficiently.

Although I have long been intrigued by corporate entities and their ‘behavior’, it was during college that I learned to put a label on this phenomenon - emergence - and further realized how many aspects of our world and our lives involve emergence. One of the best definitions I have found describes it as “the arising of novel and coherent structures, patterns and properties during the process of self-organization in complex systems.”<sup>1</sup> More simply stated, the whole is greater than the sum of the parts. This concept is crucial in biology and neuroscience, where putting together proteins that each carry out a very mechanical function will create a cell, and with that, life. Then put together trillions of cells, and the human mind emerges, capable of emotion, rationality, language and creativity. That last sentence makes it sound simple and straightforward, but the concept is both complex and - in my opinion - beautiful in its elegance. In the early stages of human development, trillions of cells are created, which then proceed to organize themselves and hone their connections in order to effectively carry out the tasks of life. And this self-organized structure has provided the ballast for the world’s great art, writing, science and philosophy.

As this concept came up throughout my neuroscience curriculum, I drew the parallel with modern society where individuals are increasingly organizing themselves to create new, larger entities such as governments, corporations and economies. With this increase in organization and a new level of emergence, society has prospered in many ways and experienced a century of rapid growth and innovation. Much of the technological innovation plays back into the emergence, helping to facilitate and further promote the formation of new entities and structures. In many ways, this cycle has brought around creative new products, better service delivery and a general improvement in the quality of life around the world (not always consistently, as I have seen during my time as a Peace Corps volunteer).

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<sup>1</sup> Goldstein, Jeffrey (1999). “Emergence as a Construct: History and Issues.” *Emergence: Complexity and Organization* 1 (1999): 49-72.

At the same time, there are negatives associated with the appearance of these new emergent entities. It seems that, in some cases, these emergent systems diminish the value of an individual's contribution to the larger society. With the role of the individual decreasing, people have become more of a commodity to the larger emergent systems, with individual distress often overlooked. Based on the writing of economists, philosophers and even on the changing idea of heroes within society,<sup>2,3</sup> it is clear that a new form of individualism has emerged, one that some point out is not focused on individual influence, but instead on each individual's taste and preferences.<sup>4</sup> This new form of individualism is achieved through targeted, personalized consumerism, such as Netflix with 75,000 movie titles or iTunes with 3.5 million songs. These secondary repercussions of emergent systems are important to understanding and refining the role of such systems in the modern world.

In general, I want to focus my graduate research on human complex systems and their role in today's society. I hope to look at the catalysts, conditions and incentives that result in a coherent larger system emerging; and I hope to look at how the organization of such complex systems influences their actions, efficiency and trajectory. These, of course, are broad questions, and I feel that answers can be found in many disciplines and fields. My interests and previous focuses suggest three key areas where I would like to direct my research.

First, I think that the study of smaller scale systems, where the building blocks do not have the same intricate behavior associated with humans, will help open the door to understanding human complex systems. For this, computer models of cellular automata can shed some light on the catalysts of emergent systems and the patterns that result from the actions of the individuals. Much of this research and modeling has already been done by people like Stephen Wolfram. I consider a good understanding of such existing research and modeling to be fundamental to comprehending the complex systems that exist on a societal level.

Next, behavioral economics provides a remarkable set of tools and significant insight into the incentives that transform individual actions into a system-wide cohesion. Economics provides a perspective and a way to begin answering the questions about emergent systems such as corporations and governments. It can be used to look at the incentives that cause individuals to function and work within such large hierarchies, as well as at the structure that allows such large systems to act as individual entities (for example, how corporations and governments interact and influence each other, much like social interaction on a human scale).

Finally, I am interested in identifying the recent role of policy and technology in promoting such systems. I think that public policy, corporate policy and the permeation of technology have all come together in the last few decades to facilitate the appearance of more functional, more influential complex systems within our society. By

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<sup>2</sup> Liechty, Mark (2002). *Suitably Modern: Making Middle-Class Culture in a New Consumer Society*. Princeton: Princeton University Press.

<sup>3</sup> Hayek, Friedrich (1980). *Individualism and Economic Order*. Chicago: University of Chicago Press.

<sup>4</sup> Anderson, Chris (2004). "The Long Tail." *Wired Magazine*, October 2004.

understanding these recent changes, there is insight to be gained about the role of these systems within our society and how they can be harnessed to prevent undermining individuals within our society, while still continuing their history of remarkable innovation.

Emergence and complex systems play a fascinating and important role in many aspects of life, ranging from the proteins working together as a cell in our body to the people working together to create vast economies. By furthering our understanding of these systems, I believe people will better understand our world today and - even more so - the one that will exist many years in the future. Such understanding can lead to more productive use of emergent systems, continuing and building on our history of progress and innovation. I hope to have the opportunity to do research within this field and eventually contribute to the better understanding and utilization of human complex systems within society.