Thank you for the invitation to be here. I'm flattered to be a part of this fascinating group. I am very excited to have conversations with you all and to learn from you. Ill use my five minutes for a brief statement of the thought process that led me here.

My name is Charlie Munford. I'm a writer and entrepreneur. I'm here because I don't think very many people have really understood the significance of Dr. Noble's critiques of Neo-Darwinism in his beautiful books. The problem Dr. Noble really explores is the origin of biological order. We all recognize that organisms must have some natural process which acts as a filter separating order from disorder, and the order must be stored somewhere in heritable form. Neo-Darwinism presupposes that the only filter for order is natural selection and the only storage place is the genome. But many lines of research have now shown that the genome is not the only location where heritable forms of order are acquired and stored. To me, this seems to require that there must be another naturally occurring filter that hasn't been discovered yet that stores order in the whole organism. Depending on what university building you are in, this order is called "function," or "adaptation," or even "knowledge."

This second filter is very obvious and it's quite strange to ignore it. When we learn our brains change, but not our genomes. Is it really wise to assume that learning happens only in human neural cells and no other cells in Nature? If we assume instead that all organisms learn and it involves all their cells, then it resolves all the contradictions pointed out by the Extended Evolutionary Synthesis. I nicknamed this second filter "epistolution" because I couldn't find any word that really described it directly. That's "epistemology" combined with "evolution." I've been writing about epistolution for about four years in print, on my website, and on Medium.

Neo-Darwinism is a beautiful theory but its notion of genetic causation has been disproven, and its explanation has always been incomplete. We can't explain self-organization and reproduction by referencing natural selection because it's a circular argument; these are the prerequisites for natural selection. But to discard it we also must reinvent the whole epistemology of life. If the genome does not control the cell, then what produces the knowledge in the organism that instructs the genome in how to be expressed? This means that finding a mechanism for self-organization is not just about explaining the historically distant origin of life, it is urgently necessary to make sense of function in every organism in the present day.

More profoundly, it means that life must have a motive that is prior to survival and reproduction, the motive of producing knowledge. This knowledge is not just about solving problems; machines are great at problem-solving, and always have been. Abacuses can solve many problems that humans alone cannot. What is unique about life is the ability to *discover* problems, to realize that contradictions exist and try to resolve them. This has something to do

with what we call “agency,” or “intelligence” or “selfhood.” The distinction between self and non-self is a valid biological distinction and it only occurs in biology. I think it is selfhood that allows us to form expectations and to investigate the world when our expectations are refuted. This motive could be what gives organisms their curiosity and vitality, and makes them biased towards useful adaptations.

It might be difficult to discover the epistolution filter by working with particular molecules or cells, because the problem situation in which single cells are learning is so remote from our own experience we might not be able to analyze it. But we might make progress by observing and comparing whole organisms, including ourselves. It must be a fairly simple mechanism because all organisms on earth must embody it. All life forms are examples of it, but if you aren’t looking for it you probably wouldn’t discover it by accident. My hunch about it is that it involves oscillators, or chemical reactions that cycle on a flexible schedule, such as circadian rhythms. They must be adapted by a Lamarckian process of use and disuse. I think the essential requirement of sleep as a repair process is a critical clue. That’s as far as I have gotten. I’ve been trying to build a software proof of concept of my oscillator hunch, but I’m not a computer engineer, so I’m afraid I’m out of my depth there. So I’ve been waiting for a group just like this to collaborate with to work out this mechanism.