

Sex, Death, And Complexity

Blithering Genius

2019 January 5

Contents

1 Why Do We Die?	1
2 The Importance Of Sex For Making Multicellular Organisms Maintain Their Coherence	2
3 The Organization Of Other Complex Systems	2

1 Why Do We Die?

Why do we die?

One reason is entropy. Our bodies accumulate damage over time. The damage is not just to physical structures, but also to the genetic information stored in our cells. Over time, we gradually lose ourselves. Youth is beautiful because it better reflects the ideal form of the body. As we get older, our bodies and cells degrade away from their ideal forms. Even though our bodies and cells have many mechanisms to resist entropy and maintain their forms, entropy slowly increases. Eventually, this leads to death.

The older you are, the less “you” you are. From your gene’s perspective, it is better to reproduce when you are young, because you are more likely to pass on an unmutated copy of the gene.

The other reason is evolution. Most of the damage to our cells is purely destructive and simply makes them less functional. Occasionally, however, a cell is damaged in a way that makes it reproduce freely within the body. You could say that it reverts back to being a single-celled organism. Instead of carrying out its function within the body, it reproduces freely, generating many descendants by mitosis. These cells act like selfish reproducers at the cell level. They compete with the other cells of the body for resources. They are free riders within the body. Unless they are killed by the body’s defenses or by medical intervention, they will eventually destroy the body.

Cancer can be understood as evolution within the body. Cancer is a mutation, and that mutation is selected for, while the body is alive. The cancer cells are more “successful” than other cells, because they are selfish reproducers. They out-compete other cells for the resources of the body.

So, if you live long enough, the coherence of your body will break down because of evolution within your body. Selfish reproducers will replace the cells that work for the good of the body as a whole. The multicellular contract will dissolve into anarchy.

2 The Importance Of Sex For Making Multicellular Organisms Maintain Their Coherence

This raises the question of how multicellular organisms maintain their coherence at all. Why do the cells of your body work for the good of the body as a whole?

The reason is that when the body dies, all the cells of the body die. None leave behind descendants. They cannot pass on their genes, in the long run, except by the sexual reproduction of the body as a whole. Sex is a reproductive bottleneck. It gives the cells of the body a coherent purpose.

The body as a whole reproduces by creating haploid sex cells (eggs or sperm), which can then combine with a sex cell from another body to form a zygote: a single cell from which a new body can grow. The cells of the new body are all descended from the zygote by mitosis. The body grows by cell division and differentiation. Each cell in the body inherits its genes and its purpose from the zygote.

That's why the cells of the body act "altruistically" for the good of the body, rather than as selfish individuals. They are descended from a zygote, and that zygote is descended from the sex cells of two bodies that managed to reproduce sexually. The information in their DNA has passed through the bottleneck of sexual reproduction many times, so it has been selected to have that effect. The form of every cell has been selected by evolution to reproduce sexually, by helping the body to create a new zygote.

However, if the body lives long enough, there is enough time for the cells of the body to evolve into selfish individuals. As a reproductive strategy, selfishness beats altruism. Within the lifetime of the body, mutations can occur that make cells act as selfish individuals that reproduce at the expense of the body.

The coherence of the body depends on its cells retaining the information and the purpose that they inherited from the zygote. Over time, that information and purpose is degraded by entropy and changed by evolution. Without death, the body would eventually dissolve into a battleground of competing cells — a tragedy of the commons.

I think that's why almost all multicellular life forms reproduce sexually rather than asexually. There are other reasons (sexual reproduction allows beneficial mutations to come together in the same organism), but *maybe the most important reason is that sex forces the cells of the body to work together. If only the sex cells can reproduce, and they need a mate to reproduce, then there is no way for the cells of the body to cheat on the multicellular contract and win in the long run.*

Sex, death and complexity are all linked.

3 The Organization Of Other Complex Systems

(Note: This section was deleted from the newer version of the essay.)

There are other examples of reproductive bottlenecks producing complex wholes out of individual parts. The hives of ants and bees are organized on that basis. The queen is a reproductive bottleneck. Hives can only be reproduced by queens, and bees can only live in hives. That is the explanation for the "social" (not really social) behavior of bees and ants.

What about human societies? Are they organized on this basis? No. Societies are very different from bodies or hives. The individual members of a society can reproduce independently from the society as a whole. A society can split into multiple societies, and multiple societies can merge into a single society. Individuals can migrate between societies. Individuals can survive the collapse of a society. Societies are not based on individuals working for the good of the whole. I've explained the basis of social organization before (here, here, here), so I will just leave it at that.

Not all complex systems are organized around reproductive bottlenecks. But some are, and you are one of them.