EVOLUTION

From Microorganisms to Multinationals

Richard Dawkins Foundation for Reason & Science

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Introduction

Introduction by Jörg Elbe (RDF): Ladies and gentlemen, dear friends of the Richard Dawkins Foundation, I warmly welcome you today to the lecture, to this book here, by an author who has written diverse works, for example on migraine or family management, but today "Evolution: From Microorganisms to Multinationals". I am particularly pleased to be able to welcome him here today: Peter Mersch. And with that I hand over to him.

Thank you very much. I would also like to extend a warm welcome to you. A few words about myself: I turned 75 a few days ago. In my youth I studied mathematics and computer science at RWTH Aachen University. My first job after graduating was here in Bremen at ERNO aerospace engineering. I think I lived in Bremen for a total of 10 years. I then moved to Frankfurt and set up my own business, but Deutsche Börse soon snapped me up again as Head of Systems Engineering. I spent more than 10 years in this position. After that I set up my own company in the IT consulting sector. Now you may be wondering why on earth I want to tell you about evolution here. It has a lot to do with my previous migraine illness, which affected me at the age of 15. And here in Bremen, two neurologists told me independently of each other that I have exhausted all medical options and that this would probably lead to early retirement. That was the point when I decided to take a closer look at this disease. I had to study the human brain metabolism in great detail and how it could have evolved in the first place. And that was my introduction to evolution.

OUTLINE

1. Life and Second Law
2. Competence-based Theory of Evolution
3. Civilization, ethics and social Darwinism
4. Evolution of technology
5. Biological altruism and eusociality
6. Social evolution (division of competences)

- Population development (low birth rates)

OUTLINE (1)

Let's move on to the various topics that will be discussed today. Firstly, there is the relationship between life and the Second Law. This is something that has been widely discussed for some time, since 1944 to be precise. Building on these results, I then present the so-called Competence-based Theory of Evolution. This is a generalization of Darwin's theory of evolution, and it has to be said – and you will see this very quickly – it is a generalization of Dawkins' gene selfishness beyond genes. Only then it is possible to talk about companies, etc.
Then comes a human topic. The Darwinian theory of evolution is a theory for the wilderness. It is not capable of explaining the developments within human civilization. It is explained why this is the case. The Darwinism already lacks the terminology to do so. And in this context, it also explains what the flaw of Social Darwinism was, what exactly it did wrong. And in my opinion, this is still not properly explained today.
This is followed by another chapter on human societies. And this is where the multinational corporations that appear on the cover of the book come into play. Today, technology is very much produced by companies. If you think of cell phones, automobiles, and so on. The topic is how this development can actually be described in evolutionary terms.
And then we return to biology, to the topics of biological altruism and eusociality. Most eusocial communities in nature are social insects, for example honey bees, a classic eusocial organization. The Competence-based Theory of Evolution has occasionally been said to be a theory for sociology. But here it is shown that in a core area of biology it comes to completely different explanations and also results than the currently prioritized evolutionary biological theories such as kin selection.

OUTLINE (2)

Finally, a short detour to social evolution. Unfortunately, I can only say a little about this here, because it is a topic that would fill an entire evening. The core topic is the so-called division of competences. The entire discussion is based on Ricardo‘s theorem. Several Nobel Prize winners in economics have said that this is the most important result in economics, but it is also the most difficult theorem in economics to understand. Basically, this would be a topic worthy of a full evening in itself, but I will make a few comments anyway, because it says something very important about the relationship between humans and the rest of nature.
At the bottom is the point "Population development (low birth rates)". This is perhaps something for the discussion afterwards. The Darwinian theory of evolution cannot explain the low birth rates in developed countries. The Competence-based Theory of Evolution can explain it, and it can also make recommendations on what to do about it.

1. Life and Second Law

Second law of thermodynamics (Second Law)

- In our universe (more generally: in closed systems) there is a general trend (**in the inanimate world) from order to disorder –** or to put it more precisely – from **more improbable to more probable states**.
- Many fundamental laws of physics also apply when time runs backwards (exceptions: 2nd Law; collapse of the wave function). Nevertheless, the **arrow of time has a clear direction**, since disorder is much more likely than order.
- Water flows downhill, but not uphill. Milk and coffee mix to make latte, the reverse process requires additional energy (or is impossible). A glass breaks on the floor, but does not put itself back together again.
- **"The deep structure of change is decay.** (…) The results of decay are not only advanced civilizations, but all events on our planet and in the universe." (Peter W. Atkins)

Second law of thermodynamics (Second Law) (1)

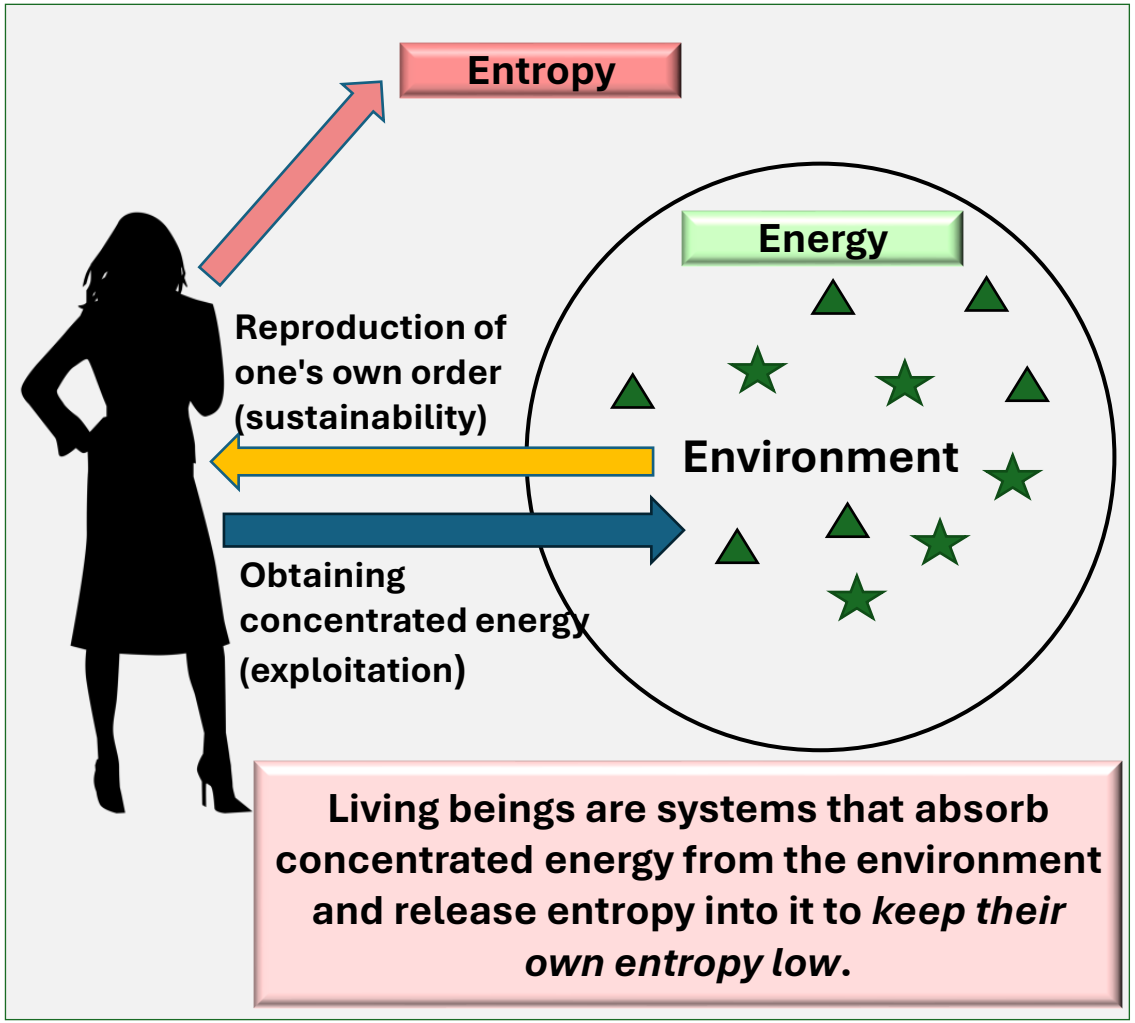
Let's move on to Life and Second Law.
What is the Second Law or the second law of thermodynamics, as it is also known?
There is a general trend in our universe from order to disorder. This is the popular scientific view. You could also say, that there is a trend from improbable states – which are the ordered states – to more probable states. For example, if you have two cups, one cup has coffee and the other has milk, then this is an ordered state – both liquids are in different cups. If you pour the two together, you have latte. It takes a considerable amount of energy to restore the original order – coffee here, milk there. It's even worse when you drop a glass from your hand and it shatters on the floor. You can only restore the original glass with considerable effort, if at all. If it were an egg, it would be impossible to restore.
And when you see a movie in which broken glass miraculously rises from the floor and reassembles itself in the actor's hand to form a glass, you know that the movie is running backwards. The same applies when you see water flowing uphill instead of downhill, for example. This means that the Second Law is closely linked to the direction of time. It is the only, or almost the only, physical law in which time is irreversible. Otherwise, you could always say: The movement is going in this direction. And if you go back in time, then it goes in the other direction. That is temporal reversibility. This is not the case here.

Second law of thermodynamics (Second Law) (2)

Several Nobel Prize winners in physics, including Einstein, have said that this is probably the most important law in all of physics.
A prominent thermodynamicist, Peter Atkins, went even further and said things like the following in his book "The Creation":
"The deep structure of change is decay. The results of decay are not only advanced civilizations, but all events on our planet and in the universe."
Atkins is a very well-known atheist, an Oxford professor. I also believe he is on good terms with Richard Dawkins. But when I first read this, I thought to myself: Why did Darwin bother with natural selection? Here, someone is claiming that everything decays, and in these decay processes, new structures of order emerge as if by magic, for example, the Mass in B minor. That is the gist of his statement. But of course, it cannot be true in this form. And he has been strongly criticized for it. However, significant parts of my book and this lecture show that he is basically right. We will see how.

Erwin Schrödinger: "What is life?"

- Living beings are systems that strive to maintain their own improbable state of high "order". They behave "**loss-of-order averse**".
- To do this, they need a metabolism that allows them to absorb high-quality energy ("negentropy") from the environment and release entropy into the environment.
- According to this definition, living beings are systems that absorb concentrated energy from the environment and release entropy into it to keep their own entropy low.
- Problem: Schrödinger's approach can only explain **self-preservation**, not **biological reproduction.**



Erwin Schrödinger: "What is life?"

The first person to comment on this topic in a truly professional manner was Nobel Prize winner Erwin Schrödinger, an Austrian physicist and co-founder of quantum physics. During the Nazi era, he emigrated to Ireland, where he gave a lecture on the relationship between life and the second law of thermodynamics that attracted a great deal of attention. He then wrote a book on the subject entitled “What is Life?”

Several researchers who were involved in the discovery of DNA later said that this book had been decisive in their decision to pursue this line of research rather than, say, basic research in physics.

Let's just take a look at the image on the page. I'm not sure if you can see the text clearly. This is Schrödinger's explanation of life.

On one side, you can see a person: this is an ordered state. And on the other side, you can see the environment. This environment contains highly concentrated energy, such as food, other animals, or plants that could be preyed upon. Schrödinger's statement is that this living being tries to obtain energy to reproduce or restore its own order through metabolism. In doing so, entropy, i.e., lower-quality energy such as heat, is released into the environment.

So basically, it's a process of exploitation: we exploit the environment to behave sustainably toward our own structure.

That this must be correct in principle can be seen from the fact that when a living being dies, the entire process of maintaining its own order collapses and it disintegrates into dust and ashes.

The problem with this approach is that it can only explain self-preservation, not why living beings reproduce or why they eventually landed on the moon or may even land on Mars in the near future.

Paradigm shift I

Entropy increase as information/knowledge loss

- According to Murray Gell-Mann (Nobel Prize in Physics 1969), **entropy** can be understood as a measure of ignorance and an increase in entropy as a **loss of information or knowledge.**
  (Gell-Mann, Murray (1994): The Quark and the Jaguar; preliminary work: Leó Szilárd, Rolf Landauer, Charles Bennett)
- Stephen Wolfram (2020): " Entropy is defined as the amount of information about a system that is still unknown after one has made a certain set of measurements on the system."
- Stephen Wolfram (2023): " The Second Law is often seen as a quintessential part of the content – and culture – of physics. But actually, (…) **the essence of the Second Law is something much more general than physics**. It's really about a very deep consequence of the interplay between computational irreducibility and the computational boundedness of observers like us."

Entropy increase as information/knowledge loss (1)

Now comes the first paradigm shift in this story, which was brought about by physicists, in particular by a physicist named Leó Szilárd. He wrote a groundbreaking habilitation thesis – a Hungarian scientist, he is one of the four Martians, as they are called. These were four scientists born into upper-class Jewish families in Budapest, all of whom had been educated in Germany, including Leó Szilárd, who wrote his postdoctoral thesis in German. They all emigrated to the US during the Third Reich, all together. One of them, for example, was John von Neumann, a name you may have heard before. They are called the Four Martians because they were said to have extraterrestrial intellectual abilities. Szilárd also appears in the Oppenheimer film at a remarkable moment. He wrote the letter to President Roosevelt warning that the Germans might be able to build the atomic bomb and that the Americans should do something about it; Albert Einstein merely signed it.
Building on the findings of Leó Szilárd – I will summarize them here in simple terms – Murray Gell-Mann, who created the quark model and was awarded the Nobel Prize in Physics for his work, said that entropy can be understood as a measure of ignorance and an increase in entropy as a loss of information or knowledge. Just a moment ago, we were talking about order and disorder, and now suddenly we are talking about loss of knowledge. How can this be understood? Well, if you have a container filled with gas, for example, the Second Law states that the gas will somehow spread out over time and so on. If there was previously some order, for example, if all the particles were in a small corner, then they will spread out over time: that is the statement of the Second Law.

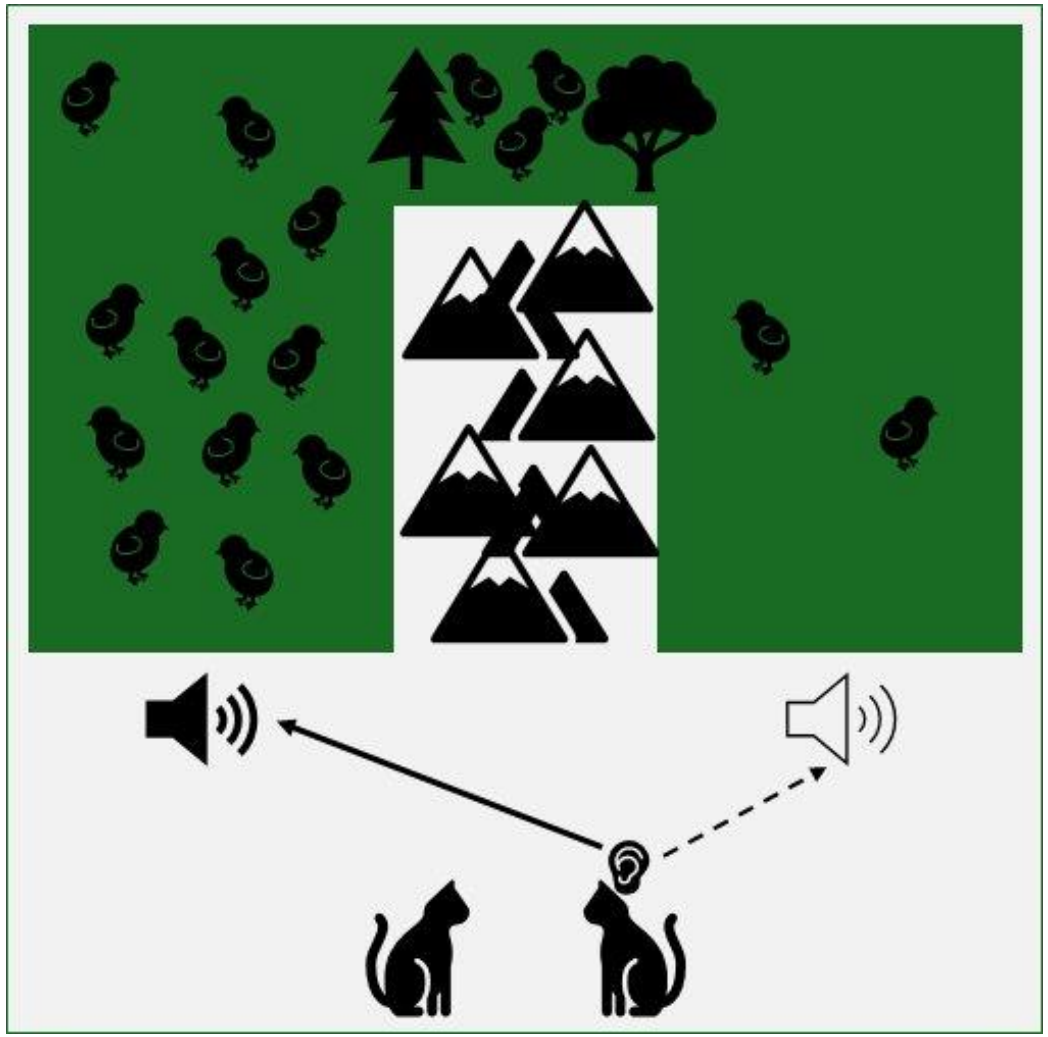
Entropy increase as information/knowledge loss (2)

However, one can also view this from the observer's perspective – which is the step that Leó Szilárd took – by saying, for example: we have measured that here in this small corner the temperature is high and the pressure is high, so we know that (almost) all the particles are up there in this tiny cube, and thus we know a great deal about the position of the particles as a whole. And if these particles now distribute themselves according to the entropy principle, then we lose this knowledge about the position of the particles. This means that entropy increases, as the entropy principle states, and we simultaneously suffer a loss of knowledge. This is basically Murray Gell-Mann's argument.
Others, such as Stephen Wolfram – the creator of the so-called Wolfram Language – have said this in very similar words. So what is written in the second paragraph is just a slightly different way of saying the same thing. But here in the third paragraph he says something completely different, something that goes beyond that. Namely, he says that the Second Law is basically something more general than physics, because according to him, it applies not only to particles, but also to billions of living beings running around in a meadow in a completely indeterminate manner. And when they are observed by what he calls mathematically limited observers, the Second Law also applies. He speaks of "computational irreducibility" when it comes to the movement of living beings. If you observe ants, for example, you can't simply calculate an ant's next position using a formula like you would with a rocket, so you could say, for example, "The ant is here now and will be up there in half an hour." Instead, the ant makes a new decision every second based on some kind of stimulus: This is computational irreducibility in Wolfram's sense. And when you have such a situation before you, according to Stephen Wolfram, the entropy theorem also applies.

Information entropy and habitat hypothesis

Deaf cat versus hearing cat

- If thousands of birds normally inhabit the habitat, then the perception (“it's louder on the left”) and the habitat hypothesis (“there are therefore more birds on the left”) of the hearing cat are compatible with far fewer bird positions than the perception and habitat hypothesis (“the positions of the birds are arbitrary”) of the deaf cat.
- From the perspective of the hearing cat, the habitat is therefore “more orderly” or of lower entropy than from the perspective of the deaf cat.



Information entropy and habitat hypothesis

Let's take a closer look at this. Here you see a habitat containing, let's say, thousands of birds. In the middle there is a dividing wall – this is a classic physical scenario, similar to that found with gases – so in the middle there is a dividing wall, in this case a mountain range. The birds cannot simply fly over it.
But they have a kind of opening at the back, a passageway where they can run across. But most of the time, mainly for reproductive reasons, they stay together in a flock. And down here are two prey animals, two predators, two cats. Both have excellent eyesight, but only one has excellent hearing. The other cat is deaf.
And the cat that can hear sits down in front of these two halves and listens here and there and then says to itself:
“Ah, the chirping is much louder here. I'd better go into this half, because I can catch much more prey there.”
It's similar to measuring the temperature of gases.
This means that, as stated here, the habitat is more orderly, or has lower entropy, from the perspective of the hearing cat than from the perspective of the deaf cat. The hearing cat has more information about this habitat and can therefore make better decisions.

2. Competence-based Theory of Evolution (CBTOE)

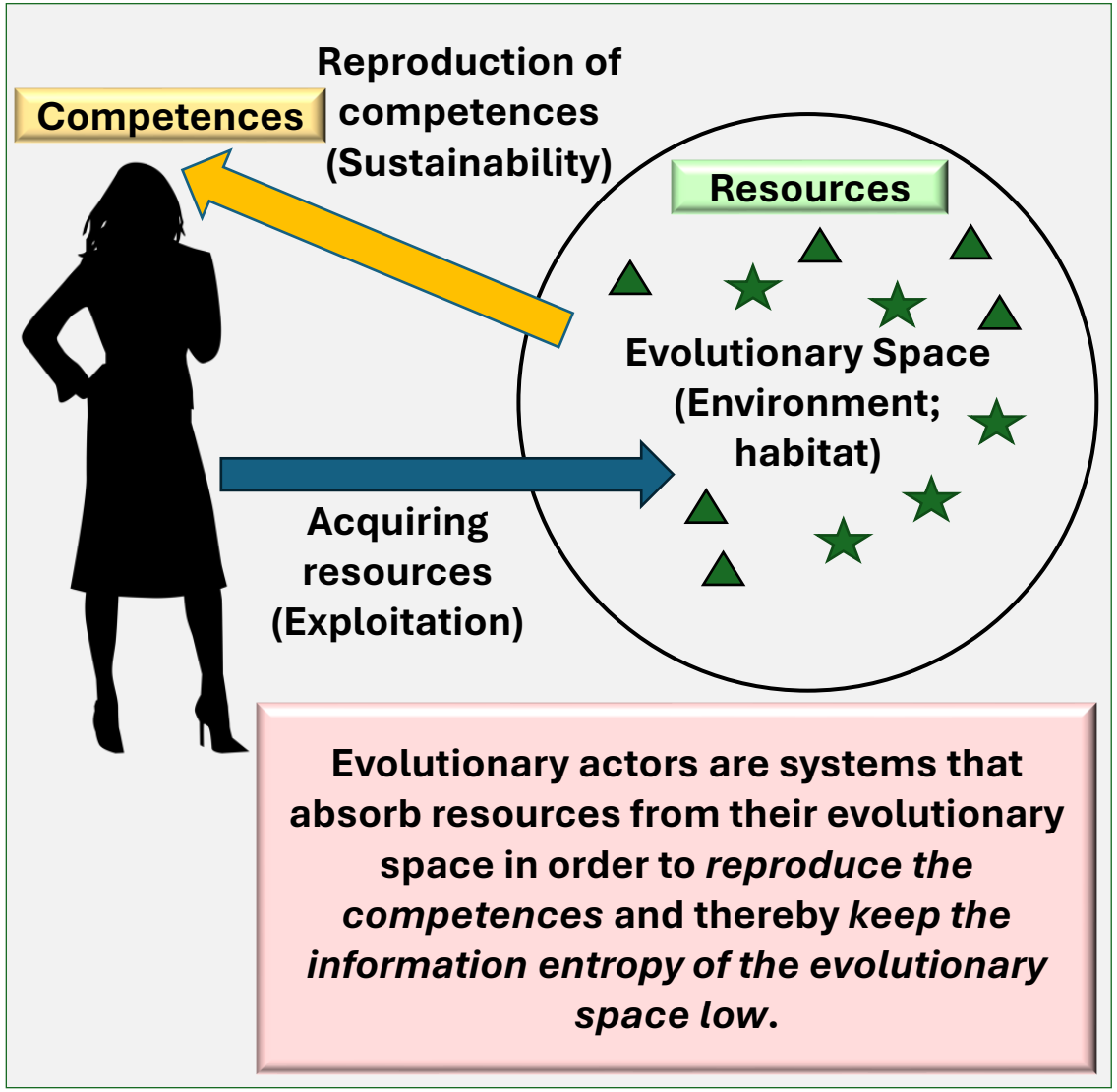
Competence-based Theory of Evolution (CBTOE)

And from this follows the *fundamental assumption of Competence-based Theory of Evolution*.
The theory will also be abbreviated CBTOE in the course of the lecture so that I don't always have to write it out in full.
This stands for *Competence-based Theory of Evolution*.

Paradigm shift II

Fundamental assumption of CBTOE

- The life cycle of living beings (evolutionary actors) consists of using their competences to acquire sufficient resources from the evolutionary space for competence reproduction, so that even after the reproduction of competences, sufficient resources for further competence reproduction can continue to be obtained from the evolutionary space (environment).
- Fundamental assumption of CBTOE: **All life behaves loss-of-competence-averse.** (gene selfishness → **competence selfishness**). They strive to avoid a loss of competence toward the habitat (or entropy gain of their model of the habitat).
- *Loss-of-competence aversion = adaptation to the general decay into chaos (Second Law) = primary adaptation of life*



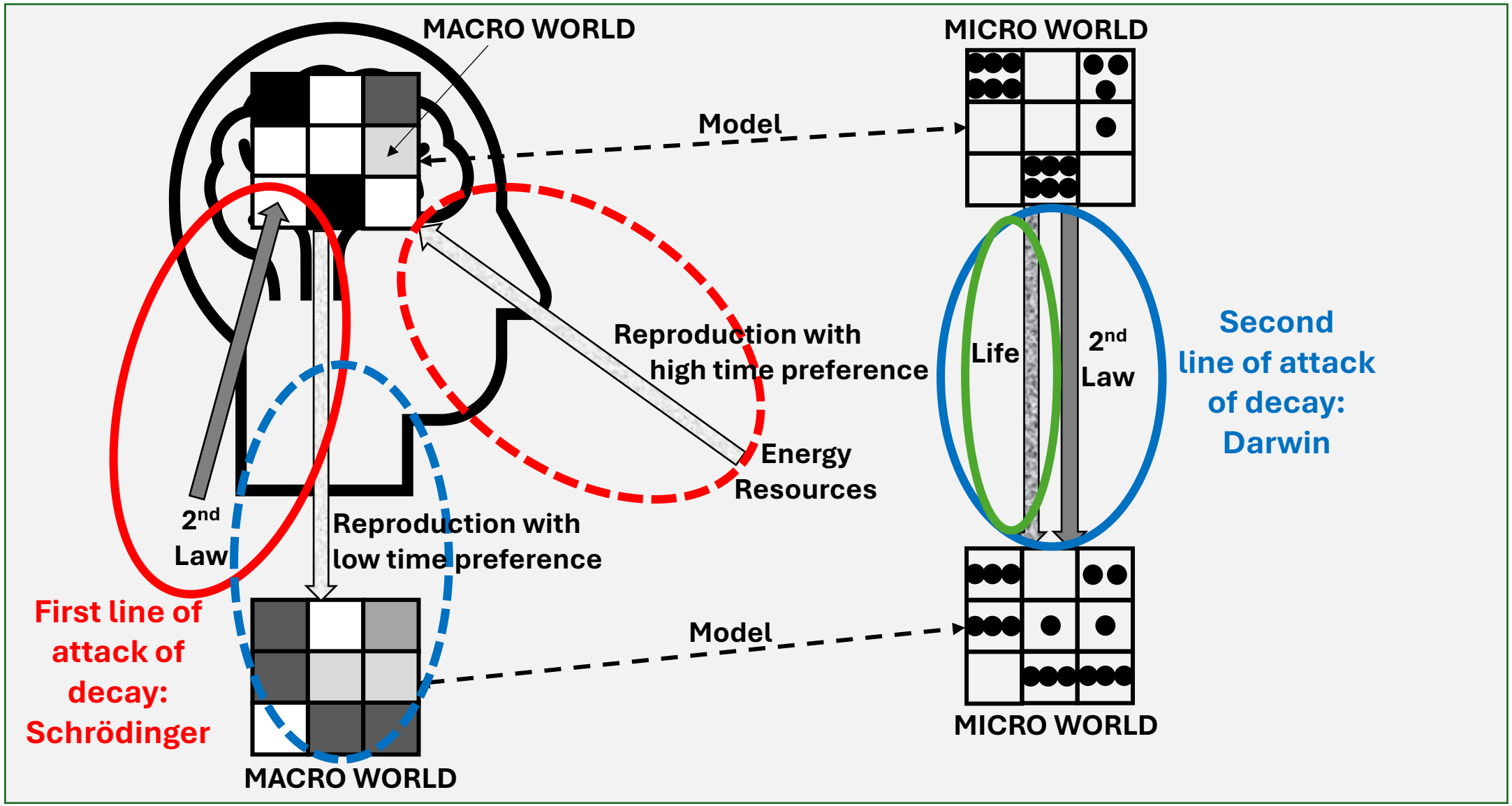
Fundamental assumption of CBTOE (1)

Now comes the second paradigm shift, this time from me.
We now have the same situation as with Schrödinger earlier.
The picture is still familiar: here again is the environment with its resources, i.e., the animals and plants that could potentially be hunted and utilized. But the differences are already apparent: Schrödinger said nothing at all about how the living beings obtain the resources. This requires competences. It requires competences in relation to the habitat. Darwin refers to this as adaptation: living organisms must adapt to their habitat.
However, the decisive step is that living organisms only use these resources indirectly for their own structural maintenance – which is irrelevant in evolutionary terms – but rather for the reproduction of their competences. This ensures that they are still able to obtain resources from the environment at a later point in time and that this process can continue.
The basic assumption of competence-based evolutionary theory is therefore:
“All life behaves loss-of-competence-averse.”
Once you have applied this to all kinds of situations for long enough, you will find: it holds true everywhere.
Where does the term “loss aversion” come from? It is a term coined by Daniel Kahneman. Through his tests, he discovered that when faced with uncertainty, people in decision-making situations weigh potential losses more heavily than potential gains, i.e., they behave in a “loss-averse” manner. This was one of the reasons he was awarded the Nobel Prize in Economics.

Fundamental assumption of the CBTOE (2)

However, it can be said that what he actually means is loss-of-competence aversion. For example, if you play the lottery and think, “Well, I might lose $10, but I can just about afford that,” then you are not behaving loss-averse. But if you could lose your condominium, then people behave highly loss-averse, i.e., loss-of-competence-averse. When it comes down to the nitty-gritty, people behave loss-averse. That is why the term “loss-of-competence-averse” is actually more correct. And it is also directly related to Dawkins' gene selfishness.
Instead of loss aversion, one could also say selfishness. And then you see that loss-of-competence aversion is something similar to Dawkins' gene selfishness but broadened to competences overall. Because Dawkins pointed out specifically in his book “River Out of Eden” – I think that's what it's called – that this river that sprang from Eden is the river of information that flows on and on. So, the individual living beings, which he somewhat casually calls survival machines in his model, come and go, but what remains is the flow of genes, or more precisely, genetic information. And if you now simply generalize this to “all information” that one has about the environment, not just genetic information, then you arrive at loss-of-competence aversion.
There is another important factor to consider: loss-of-competence aversion is an adaptation to the general decay in the universe, or, one could say, to the universe itself. Life can only exist if it has already adapted to energetic decay in accordance with the Second Law. Only then does adaptation to different habitats occur. Loss-of-competence aversion could therefore be described as a kind of basic adaptation.

Competence and entropy (decay)



Competence and entropy (decay) (1)

Here is a more detailed explanation. I must admit that this is a difficult slide. On one side, we have reality, which is divided into boxes, into quadrants, and these contain different numbers of particles. These could be living beings; in physics, they would be elementary particles or whatever. However, a living being never sees reality directly, but perceives it through its sensory organs. The information is then transformed into a model, which in our case consists of different shades of gray for the sake of simplicity.
The model is the basis for the living being's actions (pragmatic information), for example as follows: “If I see a black field, that's where most of the prey is. I therefore go there to gather food.”
However, Erwin Schrödinger had already stated that the organizational structure of living beings – including their model of the environment – is subject to the Second Law, and therefore gradually disintegrates. It must therefore be continuously reproduced. Biology refers to this process as self-preservation. The areas affected are outlined in red circles on the slide.
In economics and also in the Competence-based Theory of Evolution, the same process is called reproduction “with high time preference”. For example, if a machine breaks down on a production line at a company that manufactures cars, i.e., vehicles, then this machine must be repaired or replaced immediately so that production can continue. In economics, this is called reproduction “with high time preference”.

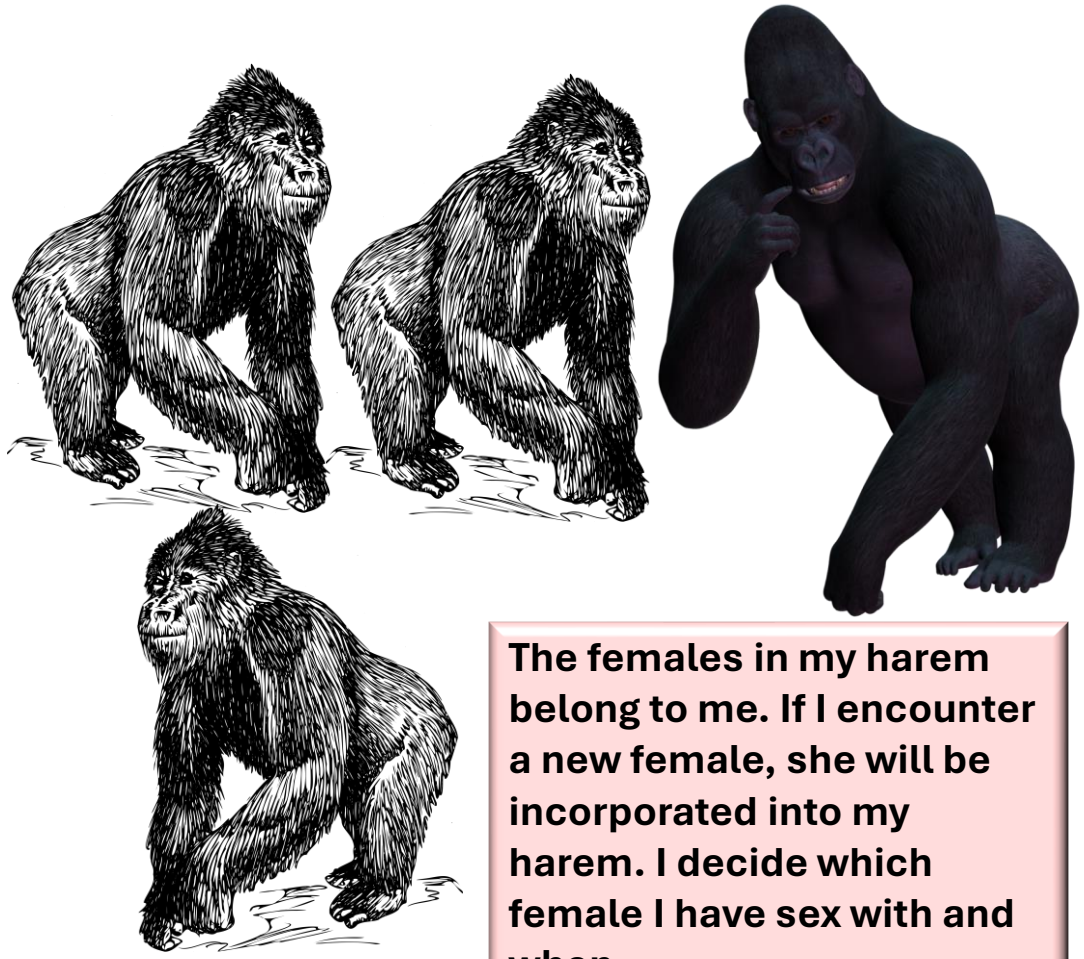
Competence and entropy (decay) (2)

There is also another reproduction marked with blue circles on the other side of the slide. In biology, this is biological reproduction according to Darwin, while in the corporate world it is called research and development. Research and development departments are staffed by people who think about how the company can continue to manufacture products and sell them on the market in the future. Technology keeps advancing, so the company has to keep improving its tech and so on. In Competence-based Theory of Evolution, this is called reproduction with “low time preference”, and it's the same in economics, but in biology, it's just biological reproduction. According to biology, real genetic organisms can only change their adaptation to the environment during biological reproduction, whereas companies do this continuously through research and development. However, both are essentially the same process.

3. Civilization, ethics and social Darwinism

Law of the strongest versus Law of the owner

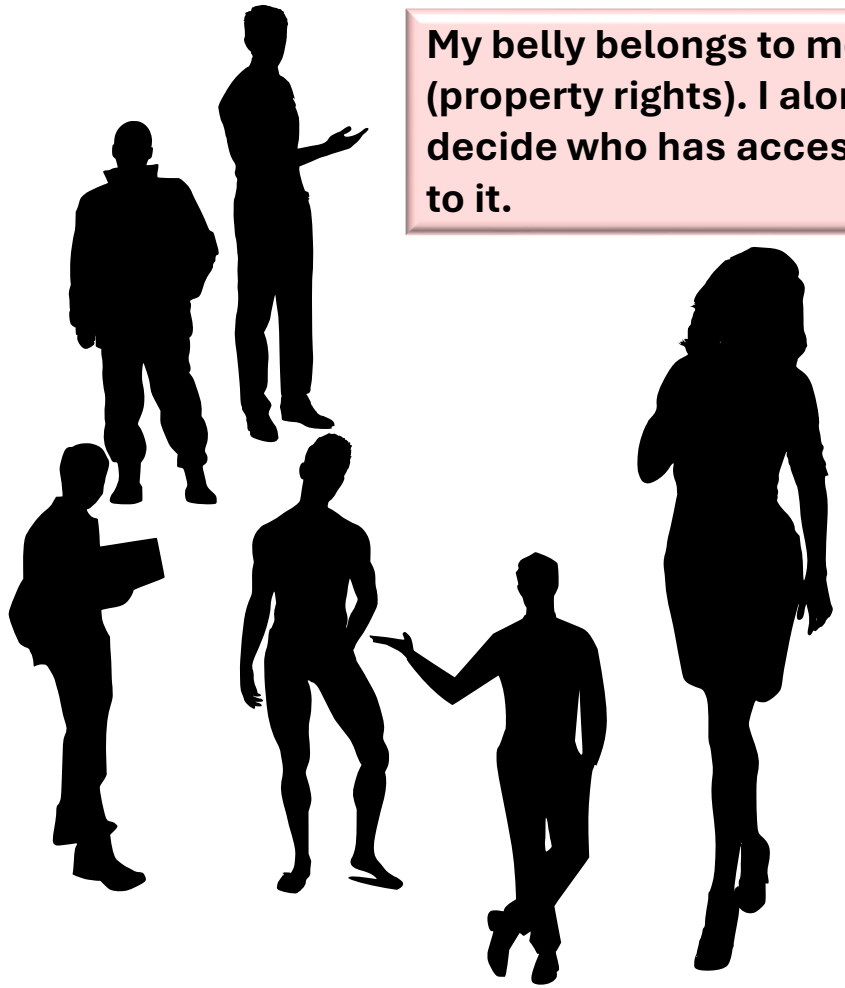
Law of the strongest (without property rights)



The females in my harem belong to me. If I encounter a new female, she will be incorporated into my harem. I decide which female I have sex with and when.

Law of the owner (with property rights)

My belly belongs to me (property rights). I alone decide who has access to it.



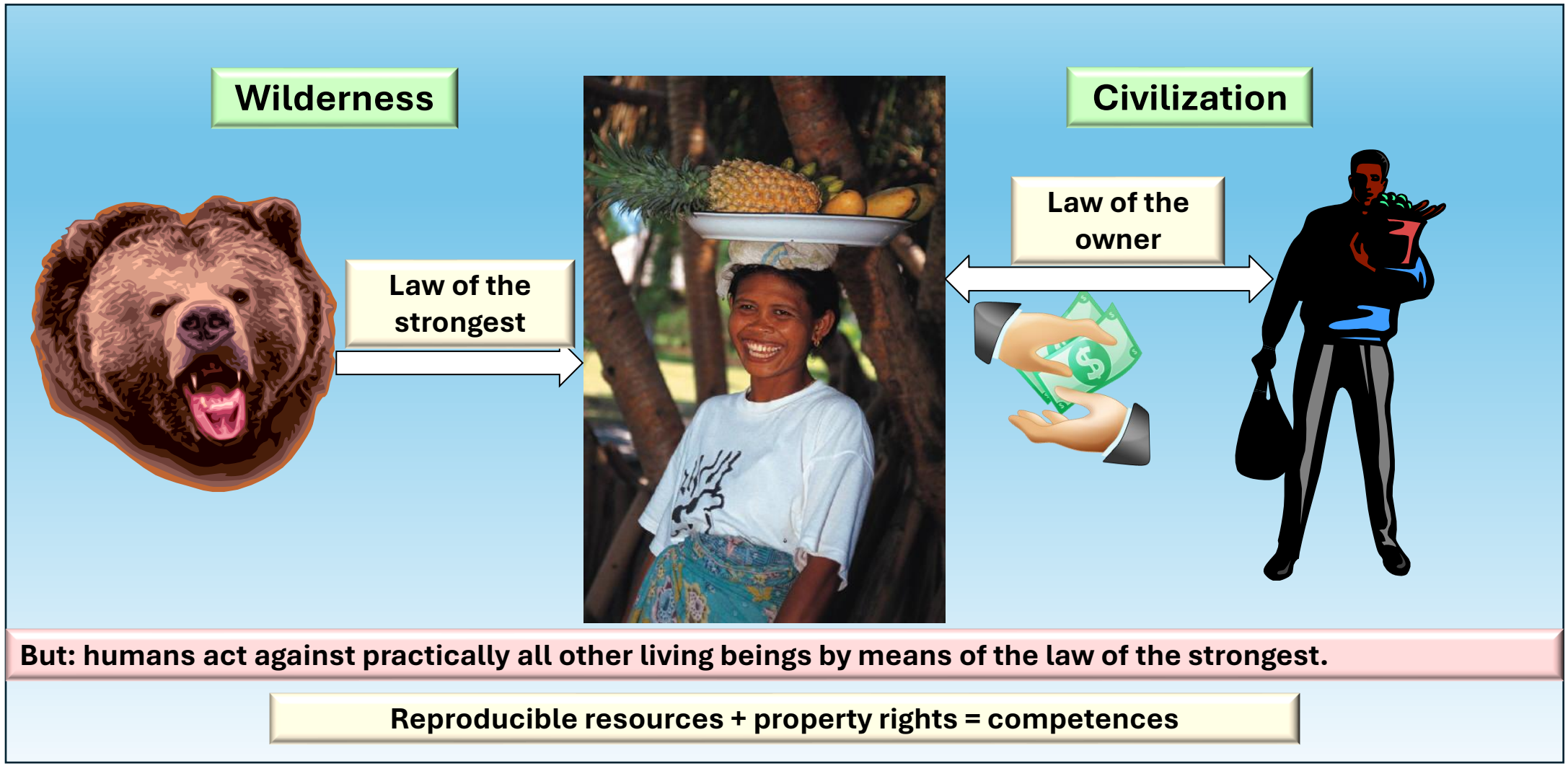
“Law of the strongest“ versus “Law of the owner“

And now we move into the realm of application and come to a familiar human topic: civilization. What exactly is civilization? Here on the left side, it says something about the “law of the strongest,” followed by the phrase “without property rights”. The expression “law of the strongest” has often been criticized, along the lines of “it's not always the strongest who prevails, sometimes it's the smartest or the fittest, according to Darwin.” However, that's all irrelevant here. What matters is that the “law of the strongest” does not assert any property rights to the resources that are being competed for.
And here you see a silverback who has gathered a harem of several females around him. And down here he also says: “The females in my harem belong to me. If I encounter a new female, she will be incorporated into my harem. I decide which female I have sex with and when.”
In other words, the females have no property rights to their reproductive resources or cannot claim them for themselves.
I don't know if this is exactly the case with gorillas. With elephant seals, it is definitely exactly as it says.

Law of the strongest versus Law of the owner (2)

So, on the next page is what Darwin eventually discovered, namely sexual selection. In his memoirs, he wrote that the problem had given him headaches. At first, he couldn't explain why a peacock had such a huge tail or why birds could sing such beautiful songs, and how this could have come about through natural selection. And so he invented sexual selection. In my opinion, however, this was a conceptual error, because what he actually discovered for the first time was the property rights in nature. Namely, that females were able to claim and enforce the property rights to their reproductive resources.
Here you can see an example of this. This woman here says: “My belly belongs to me. I have the property rights to it. I alone decide who has access to it.” And this, in turn, led to a complete change in behavior on the part of the male sex. The males now have to try to find favor with this female, as in the song:
"The men are buzzing around me
Like moths to a flame
And when they burn
Yes, I can't help that"
Marlene Dietrich, 1930 in “The Blue Angel.” At the time, some may have found this to be an immoral, wicked text, but now, after this lecture, you know that it is a song of praise for civilization.

Wilderness versus Civilization



Wilderness versus Civilization (1)

Humans have now extended the property rights to every conceivable resource. They are the only living beings in nature to have achieved this. Here you see a woman who has gathered some fruit in nature. And the civil code already states that if you gather fruit in a forest or area that is public property, i.e., that belongs to no one, then you gain ownership of that fruit through the act of gathering it.

And this woman here, for example, might now have to walk through the wilderness on her way home to her village. And if she encounters a dangerous predator that is interested in these fruits, it will make use of the “law of the jungle” (Law of the strongest) because it does not accept or recognize any property rights. And then she can only try to run for her life.

The same thing could happen to her on the right-hand side, where it says “civilization.” If she encounters a much stronger man there who has just been shopping for his family at the market but was unable to buy the very thing she is wearing on her head, because it wasn't available there. And he might say to himself, "There's no one here to see. I'm stronger than her, so I'll just take the fruit from her.“

But that's not acceptable in a civilization; it's a crime, a violation of her property rights, it's plain theft. And that's why the only option left to him is to negotiate with her. Because in a civilization, it's not the “Law of the strongest” that applies, but the “Law of the owner” (with recognition of the property rights to resources).

But perhaps the situation is favorable anyway: she has gathered the fruit to sell at the market. And now he comes along. He hasn't seen the fruit at the market yet. And then they will surely be able to agree on a price. The fact is, this is now a new form of communication in which existing property rights to resources are recognized.

Wilderness versus Civilization (2)

And here are two more crucial sentences:
Humans treat virtually all other living beings according to the “Law of the strongest”.
The “Law of the owner” (respect for property rights) applies only within human civilization and only to humans, not to animals:
When a chicken lays an egg, the egg does not belong to the chicken, but to the farmer. And if I break into the chicken coop and take three eggs, I have not stolen from the chicken, but from the farmer. That is how things are in our society. I don't know if it will always be this way. We certainly behave a little differently today when it comes to a lapdog. But that's basically how it is.
And the other thing is also a significant innovation in human society: reproducible resources plus property rights are competences.
For example, I can do a whole lot of things with my cell phone that I couldn't do otherwise. My competences have expanded significantly thanks to my cell phone. The cell phone is my property. It belongs to me.
This means that the moment I can assert these property rights to a resource, it becomes an independent competence and not just a simple resource.

The foundation of civilizations

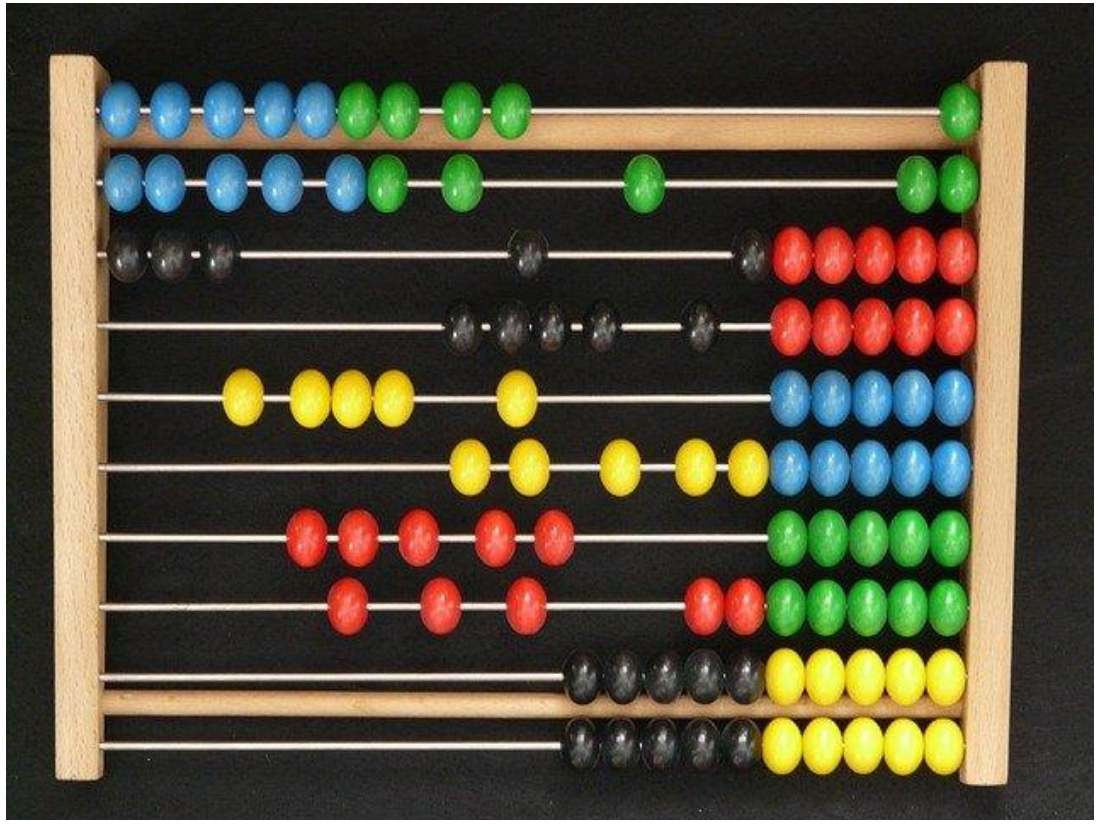
- The introduction of property in conjunction with the principle of the **inviolability of individual property rights to resources** and the competition type of the **Law of the owner** was the turbocharger of human socio-cultural evolution and the decisive step toward civilization and sedentarism.
- In a society where there are no individual property rights, or where these rights are not generally recognized or enforced, there is no concept of **mine and yours**. But how should hundreds or even thousands of people, most of whom have never met before, behave toward one another in marketplaces and narrow streets? What criteria and principles would prevent a starving person from stealing the bread another person had acquired to feed their family? And what criteria and principles would be used to punish them if they did so?
- In other words, a significant advantage of the **Law of the owner** as opposed to the Law of the strongest is that it enables **the potentially peaceful coexistence of a large number of unrelated people in an extremely simple way**.

The foundation of civilizations

The foundation of civilizations is the principle of the inviolability of individual property rights to resources, naturally in combination with the competition type of the Law of the owner.
And this was also the turbocharger of human sociocultural evolution and the decisive step toward civilization and sedentary living. Because look here:
In a society in which there are no individual property rights to resources, or where they are not generally recognized or cannot be enforced, there is no "mine" and "yours." How should hundreds or even thousands of people, most of whom have never met before, behave toward each other in marketplaces and narrow alleys? What criteria and principles could prevent a starving person from stealing the bread another person had acquired to feed their family? And according to what criteria and principles would one punish them if they did so anyway?
There simply aren't any appropriate means available.
Therefore: A significant advantage of the Law of the owner – with property rights, as opposed to the Law of the strongest – without property rights, is that it enables the potentially peaceful coexistence of a large number of unrelated people in an extremely simple way.
This has even influenced our rules of politeness. For example, if you are in a foreign city and don't know where the train station is, and someone approaches you, you usually have to apologize first because you want to make use of the other person's resources: their knowledge, their attention, their time, and so on. But the other person has the property rights to these.
Therefore, in this case, you must apologize.

Property and cultural achievements

- The Law of the owner enables the development of competences that were previously unimaginable.
- In a world in which, with few exceptions, there is no ownership and in which, consequently, no property rights can be acquired to any object, it would not be respected that the abacus that a tribe member has spent weeks constructing to simplify the counting of the fruit collected by the tribe for the winter belongs to him alone. No one would therefore see a serious problem if the wooden balls of the abacus were stolen by another tribe member for a piece of jewelry.
- In such a world, could there be an evolution of sociocultural competences in the way we know it? Answer: No.



Property and cultural achievements

The property rights have also massively advanced cultural achievements. Here is an example of a tribe collecting fruit for the winter.
The fruit is to be distributed fairly to all families in the tribe. One member of the tribe has been tasked with counting the fruit so that it can be distributed fairly. He has constructed this abacus to make the counting easier.
But if there is no mine and yours, then someone else could steal the abacus from him at night, take the pearls from it and use them to make a pearl necklace for his own girlfriend. No one could punish him for this if there is no mine and yours. Could cultural development as we know it take place in such a society? No, it is not possible without property rights to resources.

Ethical principles and Second Law

- According to the Competence-based Theory of Evolution, living beings are loss-of-competence-averse systems. If this is generally understood in a society and at the same time it is accepted that all people have the same concerns and the same rights in this respect, then the *Golden Rule* immediately follows:
  - Do *not* treat others in ways that you would *not* like to be treated.
- Under the Law of the owner, the aforementioned abacus would be the property of its creator and thus part of the creator‘s competences. If someone were to steal the abacus, he or she would have caused its creator a loss of competences, which is to be avoided according to the Golden Rule (because the thief is also a loss-of-competence-averse person and does not want to be deprived of competences by others). In other words, the 8th commandment of the Old Testament follows: You shall not steal. The Biblical Commandments 6 to 7 and 9 to 10 can be derived in the same way.
- It is striking that both the Golden Rule and the 10 Biblical Commandments are formulated in a loss-of-competence-averse or harm-avoiding manner. This corresponds to the common view that everyone is allowed to seek their own happiness and make profits, but not by unfair means such as exploitation, deception, or causing harm.

Ethical principles and Second Law

Here is a note on well-known ethical principles. We have just seen that the Competence-based Theory of Evolution is based on the fundamental assumption that all humans (all living beings) behave loss-of-competence-averse and justifies this with the Second Law. However, if it is generally accepted in a society that people behave in this way and I therefore do not want to suffer a loss of competence and, above all, do not want to be inflicted with a loss of competence by other people, then it is not far to conclude that I should not inflict a loss of competence on others either.
In other words, you immediately have the Golden Rule:
- Do *not* treat others in ways that you would *not* like to be treated.
Basically, most of the ethical rules of this kind are formulated in a loss-of-competence-averse manner, for example the Ten Commandments in the Bible: You shall not murder, you shall not steal, you shall not commit adultery, you shall not covet your neighbor's wife, you shall not tell lies about others so that their social status is threatened, and so on. Even God has claimed for himself: You shall have no other gods before me.
So he does not want to suffer any loss of competence either.
The Universal Declaration of Human Rights is also essentially formulated in a loss-of-competence-averse manner.
This corresponds to the idea in modern human societies that everyone is the architect of their own fortune.
Consequently, people are allowed to strive for their own happiness, but they should not do so at the expense of others. They should not take advantage of others, they should remain fair, and so on. They should not harm others just to gain advantages for themselve.

The fallacy of social Darwinism

- In welfare states, natural selection only plays a subordinate role. Today, it is primarily *social selection* that occurs there, in accordance with the organization of the welfare state. Applying the principle of natural selection to modern human societies, as envisaged by social Darwinism, is therefore a category error.
- Darwin's theory of evolution is a theory for the *wilderness*, in which the *law of the strongest* is usually applied when accessing resources. Human *civilizations*, on the other hand, are based on the *law of the owner*, that is, on *individual property rights to resources*.
- Because Darwin's theory of evolution does not recognize such differentiations between the different competition types, social Darwinism assumed that the law of the jungle (law oft the strongest) could also be applied in human societies. According to its ideas, European conquerors had the right to attack other cultures or ethnic groups and subjugate or even wipe them out. According to their argument, this was an expression of the superiority of European culture and evolution in the sense of Darwin and the law oft the strongest. Eugenic coercive measures against the carriers of "inferior" genetic material – cripples, certain ethnic groups, slaves, etc. – were also permitted.

The fallacy of social Darwinism

I already mentioned this earlier: What exactly was the mistake of social Darwinism? And I have to admit that Wikipedia and books on the subject contain some very adventurous claims, all of which are somehow trying to say: “Yes, social Darwinism was bad. It was all completely wrong, but it had nothing to do with Darwin. Darwin was misunderstood.”
The fact is, however, that social Darwinism is about crimes against civilization, for which Darwin's theory of evolution has no language whatsoever. In other words, social Darwinists assumed that they could land on a foreign island and, if there were already people living there – Indians or savages, as they were called – who possessed, for example, jewelry with precious stones and gold, then they could take it all away from them. And if the savages resisted, they would simply be killed. In addition, the women would be raped and impregnated. That is evolution in Darwin's sense and the law of the strongest.
This was the idea of social Darwinism. It went even further with eugenics: according to its principles, people with great characteristics can be brought together against their will in order to produce even greater people, or cripples and disabled people can be sterilized and prevented from reproducing altogether.
However, the fact is that in a civilization, these people have the property rights to their reproductive resources. So you can't do that. In a civilization, however, incentives could very well be created. For example, a disabled person whose disability may have a genetic cause could be told: “If you do not reproduce, you can gain certain advantages. For example, money, or medical treatment, and so on and so forth.” But you cannot simply decide this against the will of that person.

Social Darwinist John Ratcliffe in Disney's "Pocahontas"

- John Ratcliffe: "They want to kill us. All of us. They've got our gold, and they'll do anything to keep it."
- John Smith: "But here is no gold." (...)
- John Ratcliffe: " And I suppose your little Indian friend told you this?"
- John Smith: "Yes."
- John Ratcliffe: "Lies, lies, all of it. Murderous thieves. **There's no room for that kind in civilized society.**"
- John Smith: "**But this is their land!**"
- John Ratcliffe: "**This is my land.** I make the laws here. And I say anyone who so much as looks at an Indian without killing him on site will be tried for treason and hanged!"

Social Darwinist John Ratcliffe in Disney's "Pocahontas"

Here we have a classic social Darwinist dialog from Disney's Pocahontas.
On the one hand, there is Governor John Ratcliffe, who has landed in this area. And he immediately said that this is now his country. On the other hand, there is the adventurer John Smith, who has already made contact with the savages – Amazon Prime calls them Indians in German and savages in English. And he has fallen in love with the chief's daughter Pocahontas.
And he now hears that John Ratcliffe wants to kill all the savages in order to get their gold. The following dialog appears:
John Smith: “But here is no gold.” (...)
John Ratcliffe: “And I suppose your little Indian friend told you this?”
John Smith: “Yes.”
John Ratcliffe: “Lies, lies, all of it. Murderous thieves. There's no room for that kind in civilized society.”
John Smith: “But this is their land!”
John Ratcliffe: “This is my land. I make the laws here. And I say anyone who so much as looks at an Indian without killing him on site will be tried for treason and hanged.”
What is John Ratcliffe doing here? He denies savages the ability to own property.
His basic idea: The savages cannot acquire property. And because they don't understand that at all, they wouldn't respect our property either. They are like wild animals, like lions, and that's why we can kill them all.
That is the logic of the social Darwinist John Ratcliffe. And it has a lot to do with property rights, which only exist in civilization and not in the wilderness. There, every resource is usually a common good.

4. Evolution of technology

The CBTOE's explanation for the evolution of technology

- It is not the technology that evolves, but rather the competences of the companies offering it, which are organizational systems (superorganisms) and thus loss-of-competence-averse systems.
- The companies (suppliers) are interested in the resources (money) of the customers (buyers) that they need to reproduce their competences.
- The competition type of the law of the owner applies on the market. Companies compete for customers' resources with their offers as an expression of their competences. The customers choose from the offers. In doing so, they "select" the competences of the companies.
- Companies that are particularly successful on the market can invest more in the reproduction of their competences → Evolution.

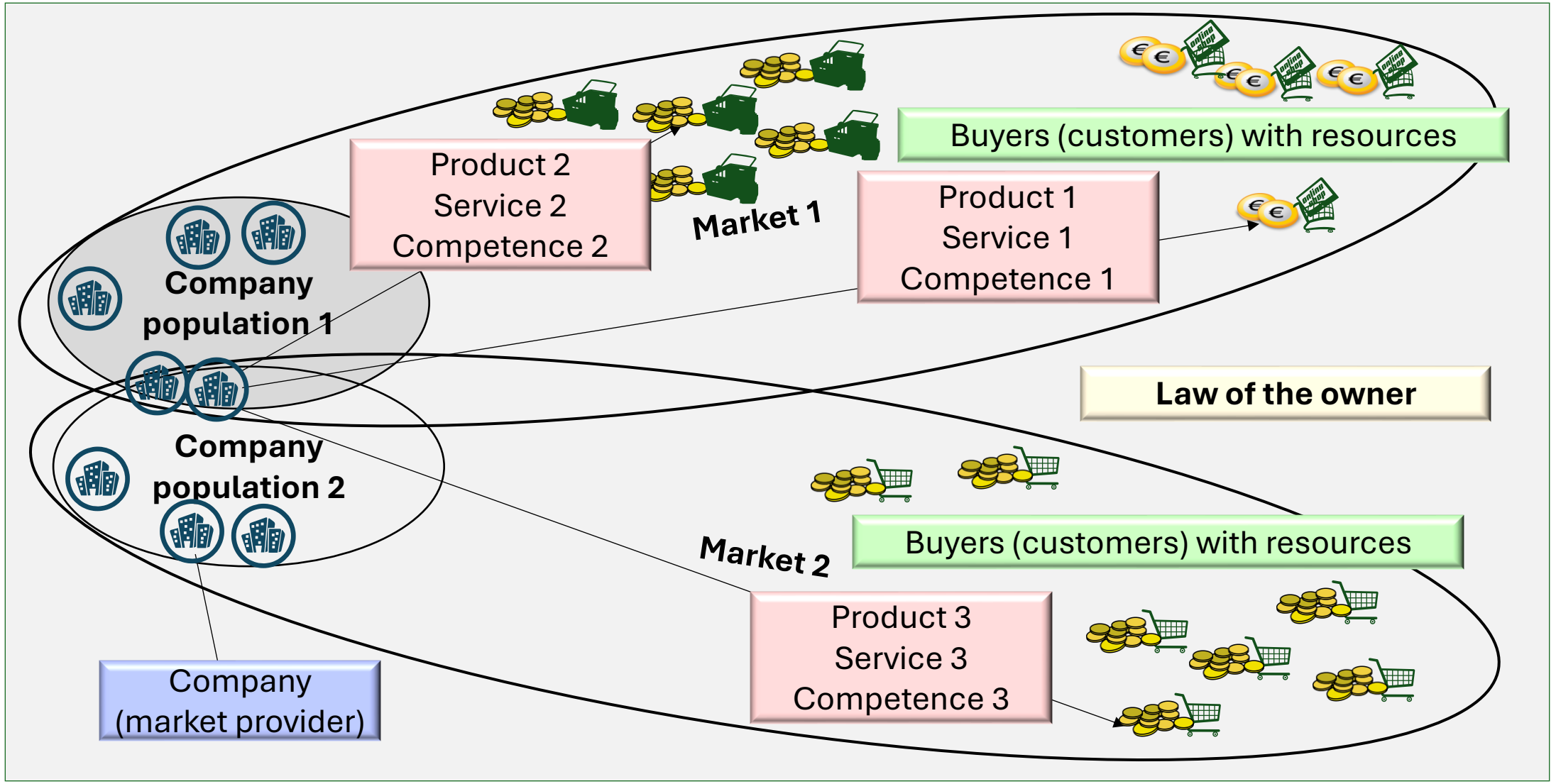
The CBTOE's explanation for the evolution of technology (1)

Let's turn to the evolution of technology and the corporate world. You'll see, it's not terribly different from everything else. It's almost self-explanatory from what we've said so far: It's not technology that's evolving – that's a common mistake – so it's not mobile phones that are evolving, but the competences of companies, that is, the companies that supply or manufacture them, which are organizational systems and thus so-called superorganisms.
What is a superorganism? A superorganism is a structure composed of organisms or other superorganisms. For example, a bee welfare state is a superorganism. However, it's not made up of cells, but of bees, i.e., organisms. And the interesting thing about this is: the superorganisms have independent competences.
For example, a bee colony is a homothermic system, whereas bees are alternating-warm systems. For many bee researchers, this poses a huge problem. Years ago, I discussed this with the well-known German bee researcher Jürgen Tautz. He said, in essence, that Darwin's theory of evolution was unsuitable for his field of research. A bee welfare state, as a superorganism, does not reproduce; consequently, it has no relative lifetime reproductive success. The fitness variable of Darwinian evolution is thus undefined, and therefore, from an evolutionary perspective, he cannot say anything at all about the evolution of these structures. This means that the terminology needed to describe the evolution of bee welfare states as superorganisms is already lacking.
Companies are also superorganisms with independent competences. For example, Apple has the competence to manufacture mobile phones. And the company behaves loss-of-competence-averse with regard to this competence. This means that it intends to continue selling us these mobile phones in the future.

The CBTOE's explanation for the evolution of technology (2)

The evolutionary spaces of companies are the markets. They therefore operate on the markets and compete for resources with other companies.
What are the resources that are obtained in the process? Mostly it's money, our money. The companies want to sell us their products in order to get our money.
Fortunately, the law of the owner applies. They are not attacking us in order to take our money, as would perhaps be the case in the wilderness, but they are offering us their products in order to get our money.
If you turn on the TV in the evening and there's another commercial break: that's the mating song of the companies. They advertise what a great company they are, what great products they have and why we absolutely want to have them, just like songbirds do to their mates.
And companies that are now particularly successful on the market can invest more in their competences, i.e. in research and development or in new or improved products, which also improves their competences, and that is the evolution that then takes place. However, this does not necessarily mean that a company that invests more in research and development – because it has made more money than the competition – will be the leading company again in the future. It may have overlooked some technological development and so on and so forth, and it may fall behind a competitor.

Companies, markets, products, customers



Companies, markets, products, customers

Here's a graphic representation of this again. It's a bit more complicated than is usually the case in nature.
A company – notice the intersection here – can operate in different company populations and markets. Let's assume this one below is the market for cell phones, and this one above is for automobiles. A company could theoretically produce both cell phones and automobiles, and it generally has different competences in these markets, and sometimes even different competences per market.
So, for example, this could be the private customers, and this one might be the corporate customers. And corporate customers are more interested in trucks, and private customers are more interested in fancy SUVs, whatever. The law of the owner fundamentally applies here, meaning these customers have the property rights to their resources. You have to woo them; you have to convince them to buy a cell phone or a car and pay with their money.

Corporations: Population Ecology Approach

From the dissertation "The Emergence of Core Competences. An Evolutionary Perspective" (Entstehung von Kernkompetenzen. Eine evolutionstheoretische Betrachtung) by Hanna Fearns based on the Population Ecology of Organizations proposed by Michael Hannan and John Freeman:

- "Transferred to the competence perspective, companies with different competence profiles represent the variations that compete with each other for scarce resources from the environment. If a company has a suitable competence profile, then it will successfully prevail in this competition and accordingly ensure its continued existence. It is subject to the selection mechanism of the market and, if successful, is positively selected."
- "(...) If we accept the arguments of the resource-based and competence-based strategy perspectives, a company that possesses core competences will prevail at the population level, be positively selected and thus remain in the market."

Corporations: Population Ecology Approach (1)

The interesting thing is that there has been a well-known evolutionary theory for the corporate world in organizational science for decades – it is called the Population Ecology of Organizations or Population Ecology Approach – but it has never really been successful. At some point I came across the book "The Emergence of Core Competences. An Evolutionary Perspective" (Entstehung von Kernkompetenzen. Eine evolutionstheoretische Betrachtung) by Hanna Fearns, who wrote a dissertation on the subject. Let me read you this section here:
"Transferred to the competence perspective, companies with different competence profiles represent the variations that compete with each other for scarce resources from the environment. If a company has a suitable competence profile, then it will successfully prevail in this competition and accordingly ensure its continued existence. It is subject to the selection mechanism of the market and, if successful, is positively selected."
When I read this for the first time back then, I was startled because I immediately thought: "That's the same jargon I use in my books. It's almost identical."

Corporations: Population Ecology Approach (2)

But why then has this theory of evolution not been successful? It is the common mistake that is almost always made, as is the case here: The theory relies on Darwin, namely on the fact that companies are selected. So, this is even before Dawkins, so to speak. Dawkins pointed out that it is not the individuals that are selected – they are not the object of selection – but the gene, so to speak.
But here, too, the companies are selected. They either succeed or fail on the market, and if they don't succeed, they drop out of the market. However, some scientists were quick to point out that there are very innovative markets – with rapid product improvement – where the same companies have been around for decades: None drop out, none join, it's always the same companies, yet strong innovation takes place.
So, what needs to be done? It's about the competences. Competences are selected on the market, competences improve, competences evolve and so on.
This small step has not been taken here, although people have been talking about competences all along. The mechanism of Dawkins could not be used because companies do not have genes. But the obvious thing to do was to focus on competences.

5 Biological altruism and eusociality

What is eusociality?

- Several generations living together
- Cooperative brood care (and thus generally also joint food procurement and distribution)
- *Division of the group into fertile and infertile animals*

- The currently prioritized explanatory model in evolutionary biology for the phenomenon of eusociality in the animal kingdom is the *overall fitness theory* (also known as *kin selection*).
- This is based on *Hamilton's rule*: R (A1, A2) · Benefit > r (A2) · Cost
- R (A1,A2) = relationship coefficient of A2 to descendants of A1
- r (A2) = relationship coefficient of A2 to own offspring

What is eusociality?

This brings me back to biology, to a biological topic. And I've already mentioned that the Competence-based Theory of Evolution differs massively from the common evolutionary biological models in its explanations on this topic.
What is eusociality? The crucial point is in the third line: "Division of the community into fertile and infertile animals." As in honeybees, for example, into workers and queens.
More precisely, it should actually read: "Division of the community into fertile and infertile females." Because this has always existed in the male world.
Thus, when harems are formed, some males are left out, while other males have a whole group of females. The same applies to sexual selection. For example, it has been observed in capercaillie that in arena courtship grounds, sometimes a single male is involved in 87% of all matings.
So, there is a very strict selection at work, which has essentially always existed in the male sex. In eusociality, for the first time, things are different in that not all females reproduce.
The currently prioritized model in evolutionary biology for explaining this phenomenon is the total fitness theory, also known as kin selection.
And for this, there is a so-called Hamilton's rule, which can be used to calculate under which kinship relationships it might be worthwhile to forgo one's own reproduction because one could also have one's genes reproduced by other individuals.

Thoughts on kin selection

Example from Robert Sapolsky:

- The geneticist J. B. S. Haldane, who, when asked if he'd sacrifice his life for a brother, is credited to have quipped, "I'll gladly lay down my life for two brothers or eight cousins." You can leave copies of your genes in the next generation by reproducing, but also by helping relatives reproduce, especially closer relatives.

However, the statement is clearly false in this generality (and also un-Darwinian): If in a dairy farm one of the siblings is lactase persistent, while the others are lactose intolerant, then it obviously does matter who reproduces.

Thoughts on kin selection

Unfortunately, evolutionary biologists have attracted attention with very unrealistic statements. I have quoted here from a book by Robert Sapolsky, which explains this very well:
"When the geneticist J. B. S. Haldane was once asked whether he would sacrifice his life for a brother, he is said to have joked: "I would willingly lay down my life for two brothers or eight cousins.""
And then Robert Sapolsky writes seriously:
"You can pass on copies of your genes to the next generation by reproducing, but also by helping relatives, especially close relatives, to reproduce."
Yes, that's absolutely unrealistic. Imagine three brothers, two of whom have only just managed to finish secondary school. And they also have a completely normal job.
One, on the other hand, is a real high-flyer, graduated with flying colors and is now already on the board of a DAX company. Do you seriously think he would sacrifice himself for his two brothers? Maybe for his fiancée, but certainly not for his brothers.
And then it is also recognizably wrong from another point of view and also undarwinistic. If, for example, five sisters run a dairy farm – something like McLeod's daughters – and want to opt for the following eusocial organization: "We are five sisters, four run the farm and the other does the reproductive work", then it doesn't necessarily matter who takes on which role.
If, for example, one sister is lactase persistent, i.e. can digest lactose perfectly, and the others are lactose intolerant, then it is only a sensible decision if the lactase persistent sister is selected for reproduction, otherwise the gene will be gone again immediately. It is therefore obviously not irrelevant which of the 5 sisters reproduces. But this is exactly what kin selection claims: it only depends on the degree of kinship.

Altruism versus loss-of-competence aversion

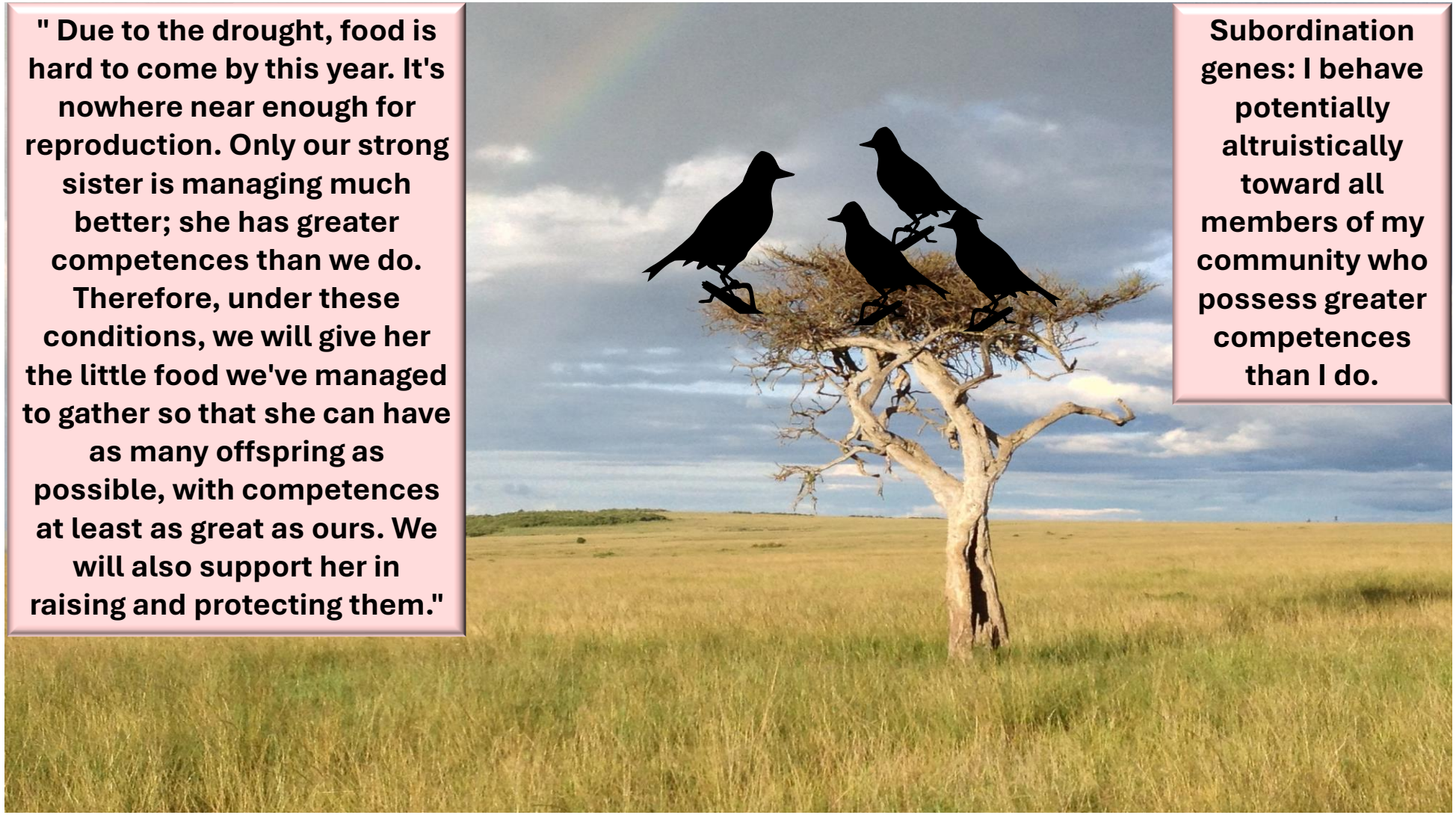
- **Biological altruism** is defined as behavior that increases the reproductive success (fitness) of others at the expense of one's own fitness.
- **(Conditional) Generalized loss-of-competence aversion**: I behave potentially altruistically (alternatively: subordinately) toward all members of my community who have greater competences than I do.
  - Such behavior would be based on population-wide genes for loss-of-competence aversion that give priority to more competent individuals under certain conditions (loss-of-competence aversion toward a competence per se, not just one's own competence realization).
- Kin selection: altruism toward individuals with the same genes, CBTOE: altruism toward individuals with greater competences.

Altruism versus loss-of-competence aversion

Two different terms are explained here:
Biological altruism – which has already been mentioned – refers to behavior that increases the reproductive success (fitness) of others at the expense of one's own fitness.
The opposite of this is selfishness (egoism).
The Competence-based Theory of Evolution explains such behavior quite differently. Robert Sapolsky already wrote that altruism is primarily a human concept. For him, this creates the danger that we often interpret natural phenomena as altruism without knowing whether it is really altruism. He therefore already has some doubts about the existence of genuine biological altruism.
The Competence-based Theory of Evolution therefore interprets the same – supposedly altruistic – natural phenomena instead as generalized loss of competence aversion:
"I behave potentially altruistically (alternatively: subordinately) toward all members of my community who have greater competences than I do."
This is the same generalization as Dawkins' gene selfishness, which also does not refer to one's own gene, but to the gene itself. If, for example, the same gene is also present in other individuals, then an individual could decide to leave the reproduction of the gene to others for reasons of gene selfishness.
It is similar here: If multiple individuals have similar competences in their environment – but one is clearly more capable – the less capable individuals, especially under unfavorable conditions where resources are scarce, may focus on supporting the more capable individual, as it reproduces their own competences.

Loss-of-competence-averse subordination as altruism

" Due to the drought, food is hard to come by this year. It's nowhere near enough for reproduction. Only our strong sister is managing much better; she has greater competences than we do. Therefore, under these conditions, we will give her the little food we've managed to gather so that she can have as many offspring as possible, with competences at least as great as ours. We will also support her in raising and protecting them."



Subordination genes: I behave potentially altruistically toward all members of my community who possess greater competences than I do.

Loss-of-competence-averse subordination as altruism

Here's an example to illustrate this once again. The entire environment is parched, and food is almost impossible to find. Four siblings of a bird species are sitting in a tree. Three are a little smaller, one a little larger. And then the smaller birds say to themselves:
"Due to the drought, food has been difficult to find this year. There's not enough food for reproduction. Only our strong sister has it much easier; she has greater competences than we do. She can fly farther than we do and perhaps find a food source or a watering hole somewhere. Therefore, under the given conditions, we will give her the little food we have captured so that she can produce as many offspring as possible with competences at least as great as ours. We will also support her in raising and protecting her offspring. And so on and so forth.“
Also important in this context is: The inheritance mechanism of such subordinate genes is much easier and more coherent to describe than the inheritance mechanism of genes for biological altruism.

Competence-based Theory of Eusociality

- Key message: Eusocial division of labor can be of evolutionary advantage for the participants when the *potentially fittest individuals disproportionately take on the reproductive tasks*.
- The statement can be proven quite generally with **Ricardo's theorem**.
- Eusocial communities can be understood as **superorganisms** by Competence-based Theory of Evolution (the biological theory of evolution is not capable of this).
- Competence-based organized eusocial communities are – similar to sexual reproduction – able to **efficiently reduce** the **number of harmful mutations** (Muller's ratchet).
- In addition, Competence-based organized eusocial communities are able to spread particularly **advantageous mutations** (e.g. lactase persistence in a dairy industry) very efficiently throughout the population.

Competence-based Theory of Eusociality (1)

But what is the Competence-based Theory of Eusociality? Its basis is, once again, Ricardo's theorem.
I discovered that this theorem is completely unknown in biology, even though it is considered the most important theorem in economics. Ricardo's theorem addresses the question of when a division of labor between different individuals can be beneficial for all parties, and who should do what in this process. I have now applied Ricardo's theorem to the problem of eusociality. For example, to the following situation:
Five siblings possess different competences with respect to their habitat. In particular, they differ in their ability to gather food. However, they do not differ in their ability to reproduce. Which individual should then take on the reproductive work in a eusocial cooperative relationship? The answer according to Ricardo's theorem is clear: The individual with the highest habitat competences (the most efficient food gatherer) should take on reproduction. This is, in a sense, its core competence.
This is a remarkable result insofar as this individual is initially excluded from the gathering process. It results in less food being gathered than could have been gathered because the most efficient forager is used for reproduction. And indeed, this population does suffer disadvantages in the first generation.
In the second, third, and all subsequent generations, however, this is dramatically reversed, and enormous advantages emerge compared to any other solution. The core message of Competence-based Theory of Eusociality is therefore that eusocial cooperation can be of evolutionary advantage for the participants when the potentially fittest individuals disproportionately take on the reproductive tasks. And this behavior can be observed everywhere in nature – except currently in humans.

Competence-based Theory of Eusociality (2)

In virtually all species, it can be observed that the most competent individuals disproportionately often take on the reproductive work.
There are also other aspects that, strangely enough, are never seriously discussed in this context. For example, a significant advantage of sexual reproduction over asexual reproduction is the so-called Muller's ratchet.
This states that individuals with particularly good adaptation or high competences generally have very few harmful mutations. This is one of the reasons why they are so efficient. And if, for example, these individuals are increasingly chosen by females during sexual selection, then the subsequent generation will also have relatively few harmful mutations.
In this way, the number of harmful mutations in a population can be systematically reduced (this is the Muller's ratchet). The same is not possible with asexual reproduction, or only with great difficulty. However, exactly the same thing happens in eusocial cooperation, in which the individual with the fewest harmful mutations, i.e., the most efficient individual, is selected for reproduction.
Most offspring will then also have few harmful mutations.
Conversely, particularly favorable mutations, such as the aforementioned lactase persistence, can spread rapidly throughout the entire population in the same way. This is not possible if a less fit individual is selected for the reproductive task instead.

Neo-group selection / multilevel selection

- Robert Sapolsky: "As a chicken farmer, you want your groups of chickens to lay as many eggs as possible. Take the **hardest-working egg-layers from each group**, form them into a group of super chickens, which by human standards must be extremely productive. But unfortunately, egg production remains dismal.
  Why was each superstar the egg queen in her original group? *Because she pecked aggressively at the subordinate hens until their fertility was impaired*."
  (Better results are achieved by choosing the **most productive group of chickens**.)

Explanation of the Competence-based Theory of Evolution for the miserable egg production of the super chicken group:

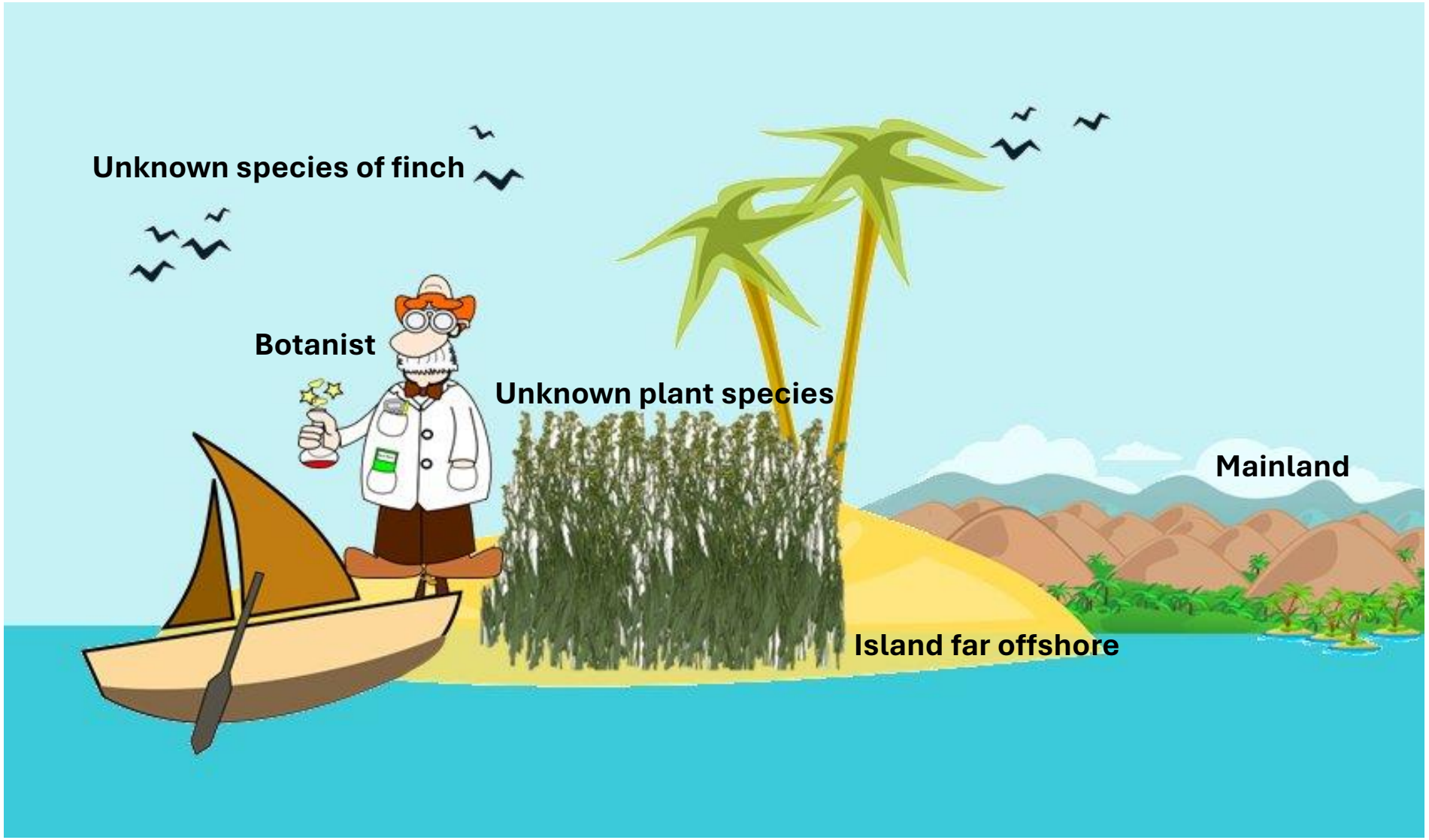
- *Because the differences in competence between the individuals in the superstar chicken group are so small that a stable pecking order and group dynamic cannot be established.*

Neo-group selection / multilevel selection

A new type of group selection is also being discussed, known as multilevel selection. For reasons of time, however, I will leave this out for now, especially as the popular example of chicken groups can also be explained by Competence-based Theory of Evolution.

6. Social evolution (division of competences)

Division of species (animals) versus division of competences (humans)



Division of species (animals) versus division of competences (humans)

Perhaps one last word, since time is already quite advanced.
I also expand on the following example in my book. It describes a key difference between animals and humans. When animals adapt to nature in different ways – for example, if you have an animal population, and one part adapts to a certain plant variety and the other to another – then after a short period of time, what is known as species splitting occurs.
In other words: The division of competences in the animal kingdom is species splitting.
Humans can do the same thing, but in a much more efficient way within the same species. In the example I constructed, an unknown species of finch has spread to an island far off the mainland. On this island, there is also a special species of plant that exists nowhere else in the world. It is therefore a different species than those found on the mainland. At some point, a botanist lands on the island and soon discovers that the finch species and the plant species are unknown new species. He decides to try the seeds of the plant – the finch's main food source. To his surprise, he discovers that consuming the seeds gradually completely cures his chronic rheumatism. He therefore takes some of the seeds home for self-treatment. However, he gives a sample of the seeds to a friend who is an organic food supplement entrepreneur. Sooner or later, this will result in the island's food sources being exploited in a way that the finch species hasn't been able to achieve for thousands of years.

Why humans are not animals

- Humans are the only biological species capable of genuine **division of competences.** Humans are also the only biological species that can develop evolutionarily significant **core competences**. In this way, humanity has probably **accumulated more competences than the rest of nature put together**.
- Humans are the only living beings that have mastered the handling of individual **property rights to resources** (and thus also of **property**). However, the concepts of property and property rights are alien to the **biological theory of evolution –** which was conceived for the **wilderness** (resources are always common property).
- Humans are the only living beings that have succeeded in **storing and processing of competences externally** (writing, digital data processing).
- As a result, humans are also the only living beings that can pass on competences to individuals who live far away or will be born many years from now.
- Humans can form complex **superorganisms** in an extremely flexible way.
- We are currently in the **Anthropocene**, the **age of man**. This is another reason why we urgently need a theory of evolution that includes humans and its societies.

Why humans are not animals

And that's why, in the end, one can say, and this is the last slide of my presentation: Humans are no longer animals, just as computers are no longer machines. They are, of course, also machines, but they are also something completely different.
Humans possess characteristics, such as the division of competences described above, which have allowed them to develop more competences in relation to our Earth than all of the rest of nature combined. And they are the only species that has succeeded in externally storing and processing competences, for example through data processing, writing, and so on.
Humans can pass on competences to other people who live 10,000 kilometers away or who will be born in 1,000 years.
Humans can form superorganisms, i.e., companies and other organizational systems, in an extremely flexible way.
We are currently in the Anthropocene, the age of humans.
This is another reason why a theory of evolution that includes humans and its societies is urgently needed. At the moment, we only have the biological theory of evolution, and that cannot represent human evolution.
Thank you for your attention and I remain available to answer any questions you may have.