Title: *Homo sapiens* in the 21st century

(Knowing our origin as *Homo sapiens* gives us hints how we should behave at present)

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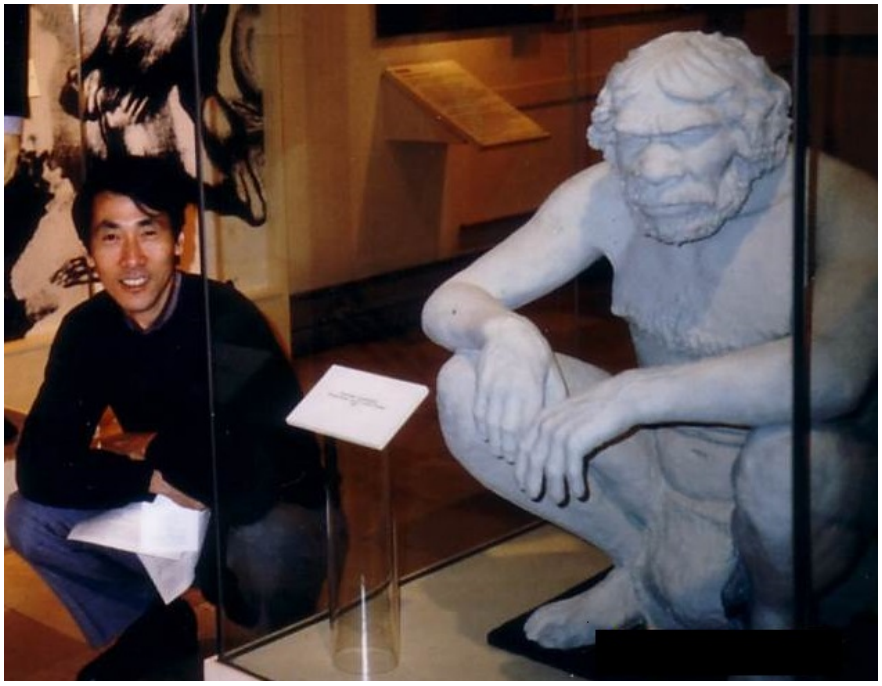

Right, replica of a neanderthalensis; Left, *Homo sapiens* at present (at Neanderthal in Germany)

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Introduction (The Contemporary Alienation of Humankind)

In the 19th century, the industrial revolution bore its first fruit. Due to capitalism (or competitionism), developed countries experienced flourishing industries, accumulated wealth, and active expansion overseas; however, within individual countries, many people were forced to live in miserable conditions due to societal inequality characterized by wealth-based stratification. This stratification gave birth to disparities between countries in the form of colonies, in which people were often oppressed. Similarly, out of a belief in Adam Smith's "invisible hand" (1776), the economy was left to free competition, where losers were forced to submit to tragic fates, and domestic and foreign waves of both economic prosperity and recession were left unchecked, tossing people about. Concerned about this situation, many thinkers made proposals seeking a unified social organizational system for humanity in which all people are entitled to and can enjoy happiness. The best example of this is Marx's communism (1848), which appeared alongside the collapse of Russia during World War I and the birth of the Soviet Union. However, during this time there were also lesser-known writers and thinkers, such as Silvio Gesell (1862-1930; for details on his ideology, see Chapter 6, "The Merits and Demerits of Money"), who targeted the totalitarian tendencies of the era's communism and proposed the idea of free money (i.e., depreciating money) as a counter-measure. Even so, the results of countries' laissez-faire, imperialist doctrines appeared throughout the 20th century, during World War I, and, after the Great Depression, during World War II. Keynes' modified capitalism was proposed as an economic theory for dealing with the Great Depression, and people came to recognize the importance of governments participating in or controlling economic activity. After World War II, amidst public reflection on the act of war, the restoration efforts and economic development of Japan and Germany received attention. The importance of science and technology was recognized, and they began to contribute greatly to the world's economic development; for example, the theory of relativity and quantum mechanics were epoch-making events, which are considered the basis for calling the 20th century the era of physics. Subsequently, molecular biology arose with the 1953 discovery of the double-helix structure of DNA by James Watson and Francis Crick. Because academic fields that investigate the phenomenon of life on a molecular level are now advancing greatly, the 21st century is expected to be the era of the life sciences.

Despite this economic development in the 20th century due to modified capitalism, unease and threats to humanity's future continue to increase, from the fall of the Soviet Union, the rise of fundamentalist Islam, the North-South problem, and environmental pollution (e.g., CO_2), among others. Japan experienced a doubling of household income, "catch-up and pass" (*oitsuke oikose*) economic activity, transformation into a production powerhouse, a bubble economy (and the long economic stagnation that followed the burst of this bubble), all in the aftermath of World War II. Currently, China is becoming a formidable competitor with Japan. Under the shadow of competition within and among the world's countries and washed over by waves of American globalization, a severe situation for humanity continues that is characterized by the widening of domestic and international disparities.

Even after entering the 21st century, events such as 9/11, the Iraq War, the 2008 financial crisis, the Great East Japan Earthquake, stock plunges, and the near economic bankruptcy in Europe and America illustrate that humanity continued to face failure. People have even suffered from considerable disparities in Japan, a country that was proud of its affluence — where “everyone is in middle class” since political and economic structural reforms were carried out under the Junichiro Koizumi administration between 2001 and 2006. An indefinite majority of people across the world has a deepening sense of isolation and is losing sight of an independent self. In such a situation, individuals develop a sense of unease and doubt: Why were humans (why was I) born? What is a happy way of living? Is there value in humans (me) living? It appears that the world is becoming a difficult place in which to live; it is turning into a place where people lose understanding of why they are living, feel ill at ease, and have a sense of discomfort regarding the laissez-faire social system. There are multiple books that attempt to search for the meaning of living in such a world. In the past, such answers were expected from philosophy and religion; however, recently these sources have been unable to present answers that are accepted by modern humanity. Furthermore, values in the world today are being questioned; television pundits frequently point out that we must re-establish what true happiness is; I think everyone agrees to that extent. However, one never hears specific hints or is provided with a roadmap for reaching true happiness. Some authors advocate the liberation of desire. The neurobiologist Antonio Damasio (2003), for example, asserts that behavior which obediently follows emotions that unify information from inside and outside of the brain—in a sense, behavior that follows desire—is happiness. However, he does not discuss what kind of desires these are, or what kind of emotions are "obedient" emotions. Prior to this research, I had never

met endeavors that use natural science-based understanding of humans to reconsider their mode of existence, and serve as societal operators to help discover the meaning of life. In other words, what proposals regarding specific types of social organization systems can liberate people's "obedient" emotions that follow human nature?

Today, the life sciences are developing at a rapid clip, and our picture of evolution is becoming clearer. I believe that we are beginning to understand human nature thanks to new social science analyses based on natural science knowledge. I would like to introduce this recently illuminated way of being. First, I consider what constitute obedient emotions and desires that follow human nature. This has been proposed by international researchers in several books based on their studies of animal and human evolution. Because humans' most immediate ancestors were chimpanzees, it is reasonable to think that evolution into humans was accompanied by cooperativeness. In other words, I would like to show that human cooperativeness can be defined on a scale of 50 people (the range for which one can be aware of each community member), and propose a social organization system for liberating human-like desires, or obedient emotions. When considering a group form or organizational system that aims to overcome the aforementioned problems of a disparate society, I frequently used as a tool the "prisoner's dilemma" game theory named by A. W. Tucker in 1992, which is also used in economic, ecological, and evolutionary theories. When doing so, with the resource-depleted environment of the earth today in mind, I utilized comparisons of behavior patterns in restricted and unrestricted environments. I also used a 50-person direct democratic system as the basis for my proposed social organizational system. While this may have been realistic in ancient village societies, in society today, insofar as it is an efficient one due to specialization, a 50-person direct democracy system is not likely to be possible. In other words, I have been unable to construct a concrete proposal regarding the ideal form of a social organization system that follows human nature. I therefor would like to ask for the cooperation of scholars in the social sciences and humanities in the creation of such a concrete proposal. First, for the time being, I believe that decentralized self-governing villages of approximately 5,000 people should be foundational; regardless, essential principles of this social organizational system would be as follows: decentralization of power, the guarantee of freedom (including charitable behavior), and equality of opportunity. If possible, a partially self-sufficient and self-supporting system that can restrict free competition to some extent should be put in place. For this reason, groups should be kept to fewer than 50 people and, as Gesell proposed, free land, free currency, and negative interest should be introduced. In addition, I propose the development and securing of networks in order to share information and, for greater social organization, the construction of a political system that mimics the Internet, which has no center but rather many scattered, independent servers.

I was thinking of presenting the above as a "life scientist's proposal to humanity after retirement," but due to the unrest in the Middle East, people's revolution-style changes in government administrations in various North African countries, the Greek debt crisis, and Internet-based demonstrations for the correction of social disparity in the United States, it seemed more desirable to present the proposal as soon as possible to better incorporate views and information from the life sciences. With the cooperation of Professor Yasuhiko Masuho from the Tokyo University of Science's Faculty of Pharmaceutical Sciences—with whom I frequently discuss biological evolution, human evolution, happiness, and nature issues—I decided to put it together as quickly as possible in the form of a dialogue between the two of us. While my career has been solely as a university professor, Professor Masuho worked for more than 25 years at various companies after graduate school before becoming a professor approximately 10 years ago, he has wide experience in industry and other areas. In addition, he generated most of the topics for our dialogues. While there are some parts that still need to be ironed out, we agreed on the basics throughout our discussions. However, since it was between two researchers in the life sciences that were discussing topics such as evolution, economy, society, and even history, the dialogues probably contain some misunderstandings and mistakes, and we ask for the reader's understanding. I also ask that specialists in these fields share any mistakes that they find, as it would be wonderful if readers could consult this book as an authoritative voice when they think about the future of humanity as well as their own lives.

Chapters 1 through 4 focus on the individual desires of humans (e.g., food, sex, and cooperation) and characteristics of families. Chapters 5 through 7 focus on the social issues of poverty and wealth, monetary systems, and globalization. Chapter 8 discusses the hearts and minds of people living in a competitive society, and Chapter 9 presents possibilities for developing the universe in such a way to solve these related issues. Chapter 10 focuses on types of academic fields needed in the future, and Chapter 11 is a proposal for achieving human happiness through a concrete social organizational structure that

includes the establishment of partially self-sufficient and self-supporting spheres. In order to assist readers in understanding this proposal, I developed a "happiness function" (Figure 3, Chapter 8), which is a type of numerical formula, a style familiar and desirable to people in the natural sciences. Each chapter is structured so that we first cover contemporary problems, and then trace their origins back through evolution and history; lastly, each chapter proposes a model for the future based on this knowledge.

Note: In our dialogue, "humans" refers to humans as a kind of animal, and "*Homo sapiens*" refers to humans that are of the same species as modern humans. (Yamatō)

It is now October 2014, and one year has passed since the first publication of this book. Since then, various events have occurred, such as the recent Mt. Ontake eruption and the Ebola scare. It appears that the world is groaning more and more. A key example of these continued human struggles is the "Islamic State," which relates to Tomohiro Katō, who is discussed in Chapter 8. It appears that rather than placing themselves in a blessed environment, young people are sympathizing with the multitude of others who are suffering, and unconsciously hope to place themselves on equal footing with and, in a sense, be present with them. I interpret this as a rejection of desire for upward mobility and instead an aspiration for downward mobility. Furthermore, in March of this year, I was introduced to life sciences-based humanities research, such as *Sei to kenryoku no tetsugaku* [Philosophy of Life and Power] by Tatsuya Higaki (Chikuma Shinsho, Chikuma Shobō, 2006), by someone who had read the first version of this book. It starts with Foucault's concepts of biopower and biopolitics, and thanks to this work, my eyes were opened regarding power structures and politics. Professor Masuho and I talked about also discussing power structures; however, since we do not have extensive knowledge on the subject, this book does not include such dialogues. While we probably should have added another chapter in this second version, we decided to only add some simple revisions to the first edition. However, it is worth noting that we became newly aware that the emergence of the Islamic State can be accounted for nicely within Foucault's theory that while traditional power exists outside of people, and resistance to such a clear enemy is also unambiguous, power today has been internalized, and a management/control society developed in which people keep watch over each other. In other words, while in the past, power structures were clear and referred to negotiations between states, the Islamic State is the first case in which the art of negotiation does not exist, since the Islamic State is not a “state” in the conventional sense. This kind of power structure aligns with the isolation and slow loss of happiness in a confined society in which “the individual” has disappeared and people constrict one another. This concept is discussed in this book's dialogues. The reason why many people cannot be fully and heartily willing to acquire money, fame, and power (i.e., alternative indicators of cooperativeness) through work may be due to vague or unconscious feelings that even if they engage in activities aimed at cooperative justice in this society, such activities will only reinforce this system rather than turn into resistance. Conversely, we could also see this as a wonderful era in which the "outside" power that had existed in the recent past is inconceivable and everything has been internalized. I believe that in this "biopolitical" situation, the beginning of overcoming the current rut will come into view by each individual forming his or her "internal" world again, returning to their nature as *Homo sapiens*.

Chapter 1 Appetite: An Era of Satiation and Starvation

Similar to this picture, various types of food are currently abundant and easily available in Japan, and people are normally satiated. However, as can be seen in Figure 1 in Chapter 9, "Developing the Universe," even today approximately 10% of people worldwide suffer from starvation.

＜Contemporary Issues Surrounding Appetite＞

Yamatō Animals have three basic desires, or instincts: "food," "running away from predators" (i.e., survival), and "reproduction." There is a fourth desire, however, that is unique to humans: "cooperativeness" or "altruistic reciprocity." Of these, "food" is the focus of this chapter.

Let's begin by discussing the kinds of problems related to food, as well as how they should be understood when viewed through the lens of our biological origins. I posit that the recent trend encouraged by television and mass media of "gourmet orientation" is problematic, in the context of famine due to food shortages in Africa.

＜The Origins of Appetite＞

My research centers on microbiology. Wanting to eat is a basic desire of organisms (including humans) because it is necessary for living. Living beings cannot exist in a state of equilibrium; they come into existence amidst a flow of materials, energy, and information. In order to create and sustain their bodies, be active, and multiply, it is necessary to intake nutrients and energy. Let's consider the example of *E.coli*.

Even *E.coli* has preference for nutrients that they like and dislike. If one puts the amino acid leucine in an *E.coli* culture, the bacteria will try to avoid it. On the other hand, if one gives them nutrients important for energy metabolism such as glucose or serine, they are drawn in that direction. This is a response behavior called

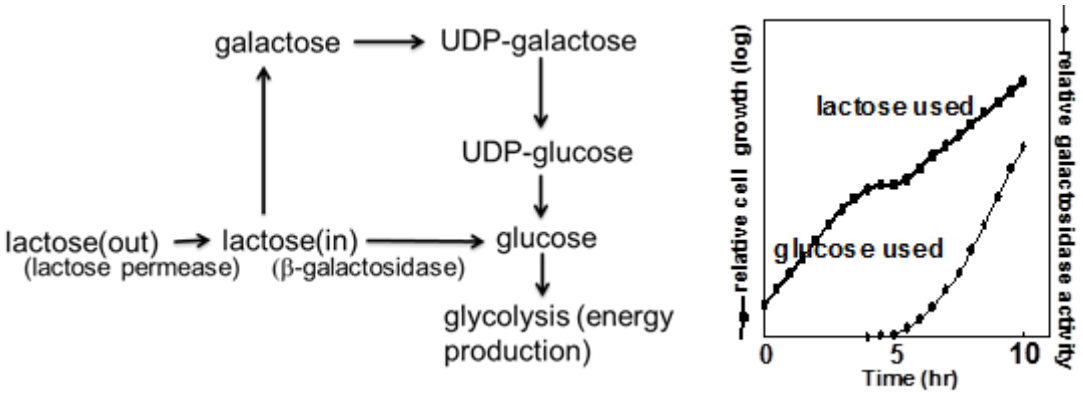


Figure 1 Two-Stage Growth of *E.coli* (Glucose / Lactose Culture). In the left figure, lactose in the culture medium is taken into cells by lactose transport proteins, broken down by the degrading enzyme β-galactosidase located in the cytoplasm, and becomes galactose and glucose. Galactose is converted into glucose by multiple enzyme reactions, broken down by the glycolytic system, and produces energy necessary for a living body. The right figure is a growth curve of *E.coli* in a mixed glucose - lactose culture. The vertical axis shows growth (bacteria growth logarithm) and the horizontal axis shows time. At first, the *E.coli* grows in number while only consuming glucose (thick line). When glucose runs out, this information is transmitted to the inside of the cell. With the desirable glucose having run out, the bacteria have no choice but to use lactose. β-galactosidase is produced (thin line) and preparations are made to use lactose. At this time, the bacteria stop multiplying in order to adapt to their environment. They then begin using the lactose in the culture, and start multiplying again.

chemotaxis. Similarly, humans tend to dislike things with a bitter or astringent taste (such as leucine), even though they are not poison. On the other hand, they like glucose, which has a sweet taste. Let's consider one more example of the likes and dislikes of *E.coli*. If one gives them glucose and lactose (lactose is made from two sugars: glucose and galactose), they actually first eat the glucose. Despite the fact that lactose is a valid source of energy since it is made from glucose and galactose, they eat it second. The enzyme ß-galactosidase is needed to break down lactose into glucose and galactose, and so they must produce it excessively. This additional galactose requires multiple enzymatic reactions for it to be turned into glucose, which is an important substance in energy metabolism. Therefore, for *E.coli*, glucose is a much more energy-efficient nutrient. In other words, if glucose and lactose both exist at the same time, the bacterium will eat the former first because it prefers this simplest option (Figure 1). Similarly, when presented with rice or a cake, many people choose the cake. Rice is primarily starch, which must be chewed extensively and digested before it turns into glucose. In contrast, since sugar is made from glucose and fructose, it can be converted into energy more quickly. This is why humans tend to love sweet things, such as items based on glucose and sugar, because they immediately convert into a source of energy. In this way, we are just like *E.coli*.

When it comes to nutrient intake, it is more efficient for living beings to first use substances that are beneficial in energy metabolism. Since this is their nature, related likes and dislikes appear. Due to their basic metabolic regulation, *E.coli* work solely in this way. Similarly, if humans listen to their innermost desires, it can be assumed that they will eat food necessary and good for their bodies, rather than only foods that we "want" to eat.

However, television, radio, and the Internet have been promoting the idea of "gourmet," and people want to eat at restaurants chosen by celebrities. I am worried that, due to this, people are now not eating food that is good for their bodies but rather food that is fashionable.

＜An Analysis of Contemporary Issues Surrounding Appetite＞

Masuho Watching food and cooking shows on television, it appears that they have two aims: to stimulate people's desire to eat tasty food, and to give them the feeling of being a celebrity,. In other words, these programs seek to satisfy people’s desire to become a high-status person. Let us put aside the issue of feeling like a celebrity, and focus on human desires. Is it really true that by listening to desires closely one will eat suitable food? I propose that this is not necessarily the case. For example, humans want salt, sugar, fat, rice, and *umami* elements. While the body needs vitamins, I would not suggest that people desire them.

For example, in the past, beriberi was common but its cause was not known.

Even the people who suffered from the disease did not know what to eat to prevent it. What they wanted, in fact, was Vitamin B1, which is found in high quantities in brown rice; however, some people who lived luxurious lives would only eat "silver" or white rice, and therefore would contract beriberi. (Hence, it was called a luxury disease.)

As another example, Japanese people today typically take in 12 to 13 grams of sodium chloride (table salt) per day. As a result, they have a high tendency to develop hypertension, have strokes, and other related ailments; however, Yanomami Indians in Brazil only take in one gram of salt, and as a result, do not suffer from hypertension and so on. My acquaintance that is an elementary school nutritionist said that even a small bit of extra salt in school meals can result in children ultimately eating a lot of food. But because people are aware that too much salt is bad for the body, there are rules about the amount that can be put in food. If people continue to seek only gourmet or fashionable food, Japan may be at risk of having many lifestyle-disease patients.

Yamatō It is an issue of whether a person feels that something is "delicious" as a result of actually listening to their body's desire, or because they are following external information, which includes a lot of noise.

I sometimes experience the feeling that my body is alive. In the summer, we drink a lot of water. In order to prevent heat stroke, one must drink water that includes salt. When I feel unsteady even though I have already consumed water, I realize that my body actually wants salt. And indeed, if I put salt in the water, I feel relieved. In such cases, the level of salt in my blood is probably low. I think that this is also an example of how if people properly listen to the voice that says "this is necessary for my body" and follow it, a healthy response will certainly follow.

Masuho In the summer, water and salt are lost from the body in the form of sweat. If one only drinks water, the level of sodium in one's blood will decrease. This leads to low blood pressure, which makes one feel unsteady. While it is certain that an appropriate level of salt is necessary, in developed countries where people take in a lot of salt over long period of time, many individuals become high blood pressure. This high intake is a problem, but if developed countries' salt intake amount is reduced, many people's blood pressure should go down to normal levels.

Yamatō This might be because people in ancient times lacked salt due to its scarcity, and therefore their bodies always wanted it. However, today, due to humans' unchanged constitution, people want salt even though they are actually getting enough or too much.

Masuho That's certainly the case. Evolutionary processes shaped the body's structure to seek necessary nutrients. If sodium ions in the blood are lacking, the heart will not work properly, and one's body will not move as one wants it to; therefore, the body is structured so that it feels that salty things are tasty. Today, since salt can be adequately produced, we take in more of it than we need. As a result, people develop high blood pressure. I think that people's bodies frequently feel unsatisfied and, thus,

take in more than is necessary. This goes for fat as well—people aren't satisfied with the amount that is necessary for the body's health. For example, middle-aged men tend to eat large well-marbled steaks. Taking this into account, our bodies don't necessarily say "no more" when a healthy amount of something has been reached.

Yamatō Isn't this a case of people following trends in contemporary society, and wanting to eat lots of steak even though their bodies' desires are different?

Masuho While I think this also comes into play, excessive desire is the bigger problem. I think that this is the case with food as well as sex. If left unchecked, excessive desires overflow, and society changes so that they can be met, no?

Speaking in terms of the process of evolution, the human body's basic structure and desire levels were established after human lineage split off from chimpanzees and started living in the Savannah five to seven million years ago, then again when *Homo sapiens* emerged 400,000 years ago (including the 40,000 years ago when Cro-Magnons came into existence). On the Savannah, since the body evolved so that it could fully take advantage of the limited supply of food, water, and salt, excessive intake of these elements actually had negative effects. There is no way that the body of these primitive *Homo sapiens* could handle the amounts of salt, fat, and sugar we currently consume due to changes in civilization in the past 100 years.

Another example is American Indians, who have a genetic link to Asians and can similarly withstand hunger yet not excessive nutrition. Today in this satiation era, the percentage of the American Indian population with diabetes is much higher than Caucasian Americans. While you are saying that excessive intake is due to the information people get from society, I think that while this may play a role, it rather is due to a lack of a biological stopping mechanism. Basically, if one does not suppress one's desires with a strong will, one will consume too much.

Yamatō So, the proper understanding is that thanks to the restricted food environment of ancient times, desires were left unfulfilled, and the animals and people that lived during this time were healthy because of this restricted and moderate food environment.

Masuho Yes, *Homo sapiens* have evolved in this way.

This is slightly off topic, but it is said that in today's world, while there are people who take in many nutrients, there are 600 million people who cannot get enough and are in a state of starvation. Since there is still nothing stopping the population from increasing, the amount of starving people in the world will probably increase even more. This is one example of the unfairness of the world.

Yamatō I think you're saying that we're exploiting them in the sense that we are living luxurious lives, right? However, the 600 million starving people would surely live in luxury if they could, and they would suffer from lifestyle diseases. In this sense, humanity is truly foolish.

Masuho Hasn't humanity prospered so much because we have been able to suppress

our desires with wisdom to some extent? If people leave unchecked their desires regarding food, there is no end. This would also damage the Earth's environment, as well as people's internal bodily environments.

After listening to a certain researcher endlessly explain his studies on a medicine to curing nephritis (a complication of diabetes), a famous professor of internal medicine replied, "That's not interesting. Just cure diabetes. We don't need medicine for diabetes' complications." (Laughter). This professor's way of thinking is completely different than the stance of pharmaceutical companies. Some people know they are going to get diabetes and cannot avoid it, which is why medication for its complications becomes necessary.

Yamatō Right. For example, Japanese people easily contract lifestyle diseases like obesity and its extension, diabetes. In some cases, this is probably because they have retained genes (a thrifty genotype) that can withstand hunger and save bodily energy due to their ancestors having lived in harsh food environments. For example, while there may have been rice in the Jomon period, there were lots of nutritionally deficient foods such as acorns. However, today there is an abundance of high-energy food containing carbohydrates, fat, and so on. This in itself should equate to happiness, in the sense that we are liberated from hunger. However, since their bodies are genetically built to survive hunger (the thrifty genotype) more so than Europeans and Americans, it is hard to avoid becoming obese when subsisting on modern food. Today, if people are not careful, it is easy to naturally contract lifestyle diseases (Figure 2). In this sense, Japanese people might have a strong tendency to intake energy sources more than needed if they truly follow their bodies' desire to eat (though not in an unlimited fashion). Incidentally, there are approximately 40 types of thrifty genes (leptin, which suppresses appetite, is one), and thanks to genomics, we know that the difference between Europeans/Americans and Japanese people is an SNP (single nucleotide polymorphism). Rather than a difference of having or not having genes, it is more of a small difference in biological activity.

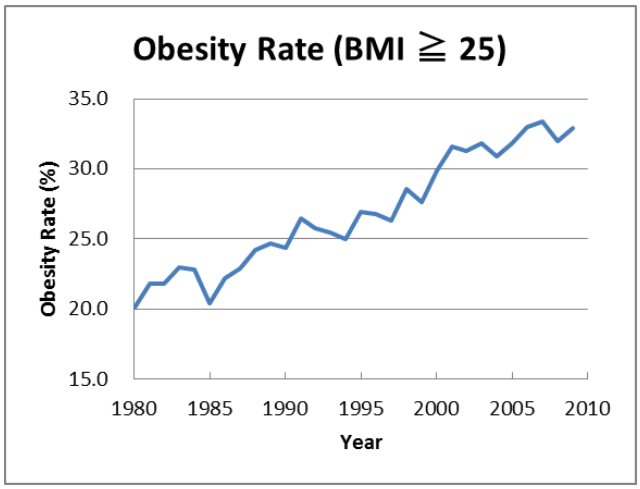


Figure 2 The Yearly Changes in Obesity Rates of Japanese Men in Their Fifties (BMI≧25) (Graph created based on data from the Japanese Ministry of Health, Labour and Welfare's "National Health and Nutrition Survey in Japan").

Masuho We have to control our desires in the future. We have to control them by having not too little yet not too much, and taking in a balance of various nutrients.

While this is from a bit of a different angle, Japanese people are buying and eating tuna, shrimp, and other seafood in massive amounts. It is not because they have a biological need for such things, they just like their flavor.

Yamatō With regard to this topic, I agree on all fronts. Japanese people were poor in the past. Everyone was starving after World War II. In contrast, at the time, Europe and the United States seemed very wealthy. We worked to "catch-up and pass" (*oitsuke oikose*) these countries, and in the end, this influenced us to live luxuriously. Today, thanks to globalization and a strong yen, we're buying various resources from around the world. This leads to people starving in places like Africa. This situation really needs to be changed, but it is difficult.

Masuho While the biggest problem is an increase in the number of starving people, another problem, biologically speaking, is that if food becomes uniform, an environment is created in which organisms other than these specific types of food are unable to live.

For example, if everyone in the world ate only wheat, rice, and corn as their staple foods, massive fields of these grains would be planted throughout the world. As a result, natural vegetation that used to be where the fields are now is eradicated. The same goes for stock farms. If we farm fish in the ocean, the natural fish that were supposed to be there decrease. In a sense, our diets are destroying natural ecosystems. From the perspective of biological diversity, this is truly a large problem.

Yamatō Right. This isn't just a political issue—it is a big problem from the perspective of biological diversity. Today, there are already so many genetically modified foods and organisms appearing. They are not hurt by pesticides, are resistant to harmful insects, easy to raise, produce a large crop, and so on. However, this is something that cannot be avoided in today's society when it comes to making money.

Masuho While this is not an example of something that was genetically modified, there is an example from history of the sole use of a seemingly wonderful crop being dangerous. Around 1845 in Ireland, the potatoes that were being grown in large quantities caught a communicable disease, and the country fell into a serious famine. Until then, these were wonderful potatoes, and so they were the only crops grown in Irish fields. However, due to a pathogen, the country experienced incredibly destructive damage due to their reliance on one crop. Over one million people died from starvation, and one to two million people emigrated to England and the United States. From this example as well, it can be seen the homogenization of food can cause serious damage to humans.

Yamatō While the topic of biodiversity might come up in one of our later conversations, I'd like to point out that, thanks to this very diversity that has been present in Earth's biological evolutionary process, living beings have overcome threats of extinction that arose from environmental changes. In this sense, biodiversity should be very important, but as you said, if one thinks about moneymaking and efficiency, of

course it is better to homogenize foods so that they are uniform. Conversely, nothing can be done about reversing the state of the world.

Masuho In addition to homogenization, people also will choose to leave the production of such food to land on which it can be harvested the most efficiently. Since Japan cannot produce such foods due to space considerations, it will all be done overseas. Japan will end up just producing cars. If people end up no longer needing cars, what will happen? I think that specialization itself is dangerous. Today, the Trans-Pacific Strategic Economic Partnership Agreement (TPP) is a hot topic, right? If tariffs are abolished and countries become completely specialized in terms of production, the rug might be pulled out from under our feet.

Yamatō That's certainly the case ... but with regard to food production and comfortable lives for humans, it is kind of hard to say whether or not it is bad or good if things become efficient due to specialization.

Masuho I think that emphasizing specialization too much is very dangerous.

Yamatō In history up until the present, everything had to be done by the village, tribe,

Figure 3 Changes in the World's Population. When we evolved into *Homo sapiens*, 50-person groups appeared. Forty thousand years ago, when we left Africa, there were probably 100- person groups. The population increased due to the invention of agriculture 10,000 years ago. In recent times, population increase has been explosive. (From the United Nations Population Fund's Tokyo Office Homepage. Only Japanese language version was available.)

or blood relatives. Subsequently, tools emerged, agriculture started, productivity increased, and people had energy to spare. Thanks to this, we have become able to support people who are not involved in food production. This is why specialization emerged within villages. Historically speaking, specialization *within* a village expanded into specialization *among* villages.

Masuho Now, this is on a worldwide scale. I think that this is very dangerous (Figure 3: Population Change Graph), because a worldwide scale is, as you say, like a prisoner's dilemma in a restricted environment (see Chapter 3, "Desire for Cooperation"). While there are various theories, according to one prediction, if all seven billion people on Earth tried to maintain a Western lifestyle standard, we would have already consumed

the equivalent of 1.5 Earths. In the November 4, 2012, *Yomiuri Shimbun*, there was a discussion of ecological footprinting. According to this article, the amount of resources the Earth can currently offer (expressed as land area) is 1.8 ha per person. However, it seems that Japan's lifestyle level is already lavishly consuming an average of 4.2 ha per person. Furthermore, today, approximately 80% of the Earth's population is already enjoying a developed country lifestyle. This will turn into a selfish scramble for resources, which can turn into problems like those surrounding rare metals. The one country that is producing most rare metals, China, can control the world. This causes trouble for world's electronic industries and others that use rare metals.

Yamatō This is an issue of specialization among countries. However, in the future—this might just be an ideal—there will be a single world country and specialization between the Earth's regions.

Masuho Maybe there will be one world country, but if the Chinese people say, "We're not going to provide any," people would have to buy rare metals for an unreasonably high price. On a broader scale, it is possible that other groups will die out because they cannot obtain certain goods. In this sense, while there is the TPP approach, I think we should rather set restrictions and produce more than 30% to 50% of a certain good. A self-sufficiency rate of 50% should definitely be maintained. I think Japan should at least take this kind of approach. You said that in the future, there will be one world country. But I think that it is impossible to solve this food problem with just one world country.

Yamatō I agree. It is difficult, and a separate issue. Things might be able to be adjusted with the laws of the one world country to avoid conflict with regard to specialization. But by promoting specialization, efficiency would improve, and it could become possible that the population would rise far greater than the seven billion people currently on this planet. If this happens, the Earth's resources would become really scarce, and humanity might become extinct. Or, another large war over the Earth's resources might occur.

Masuho Conversely, what would happen if countries isolated themselves? Close their doors to the world? Maybe it would be good for Japan to do this; however, many troubled countries would then emerge. What would desert people in Africa do about food? There will probably be other countries without food as well. What would happen to countries in the Middle and Near East that have oil but basically cannot engage in farming?

Yamatō But things will definitely not move in the direction of isolation. Today, thanks to the rise in education, science, and technology levels, humans (*Homo sapiens*) today feel more united than ever, regardless of race. Basically, just like biracial children, awareness that we are the same species or group is expanding. In this kind of world situation, I think it is pretty hard for a country to isolate itself.

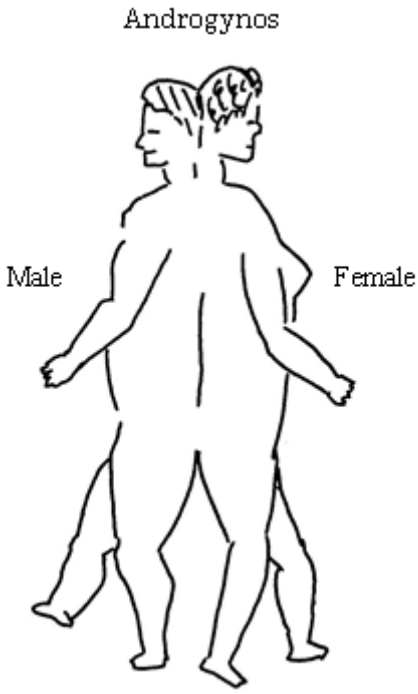
Masuho I don't mean complete isolation like Japan did during the Edo period. We

would simply produce a certain percentage of the food, clothing, and shelter necessary to live in Japan. Furthermore, in this laissez-faire context, we could thoroughly strengthen the industries Japan is good at and maintain predominance in the world market.

＜View into the Future＞

Yamatō At any rate, if Japan were to isolate itself, it would fall into a pretty rough situation. If one brings to mind the rise in education levels and the advancement of culture and civilization, it appears that the future of globalization holds not national isolation, but probably rather the birth of a political and social world system. Last year (2012), the Nobel Peace Prize was given to the EU. I interpret this as an expression of the hope for or the ideal of a unified humanity without national borders. However, in the context of economic growth and the prioritizing of efficiency under contemporary-style globalization-based free competition, the failure of humanity is still very present. It might be most accurate to imagine the future as a social system somewhere in between isolation and worldwide unification, in which self-sufficient and self-supporting spheres are established to restrict free competition. With regard to the earlier half of our conversation about individual appetite, while maybe we *should* follow the body's biological desires, I think it is appropriate to conclude that in the current social situation, caution is necessary, because our health might be damaged if we do not tame desire with reason.

Chapter 2　Sexual Desire: An Era of Loveless Sex and Sexless Love



Mythology states that the first people in the universe had two heads, four legs, and circular bodies that appeared as if two modern-day humans were standing back-to-back. There were three combinations: male/male, female/female, and male/female. They were called **androgynos**. These first people acted without fear of the gods. This provoked the wrath of the great god Zeus, who split their bodies into two. From this time forward, people have sought their former other halves through love. This is why love appears as not only man and woman, but also as man and man, and woman and woman (homosexuality).

<Contemporary Issues Relating to Sex>

Masuho Here, we will talk about sex. It takes various forms even among primate monkeys. Generally speaking with regard to partner relationships, humans are monogamous, chimpanzees are polyamorous, and gorillas are polygamous. In the order of primates, monogamy is unique to humans (Figure 1).

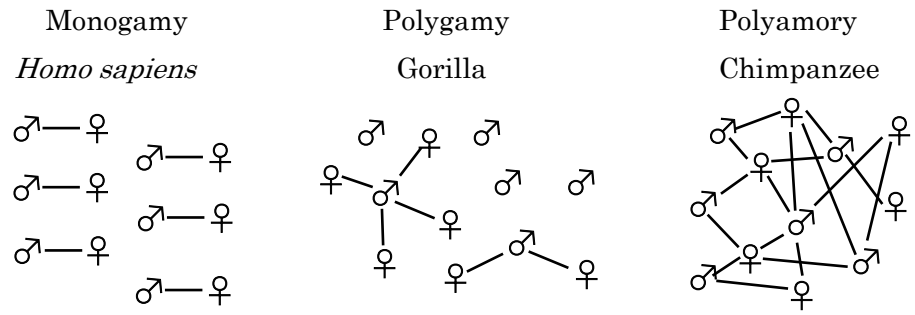


Figure 1 Schematic Diagram of Human, Gorilla, and Chimpanzee Male-Female Relationships. Male-female relationships differ according to the needs of their manner of living and cooperative nature.

It appears that our ancestors came to have monogamous relationships because birth became difficult after people's pelvis shape changed and their heads grew larger when they started walking bipedally. This led them to give birth earlier in the gestational cycle, which forced women to concentrate on raising children for a longer period of time after birth. Building monogamous relationships, then, in which male partners could help them was advantageous. I would like to present an interesting example. In order to maintain this monogamy, human female sexual characteristics became a defining feature of their womanliness. During ovulation, female chimpanzees' buttocks turn red, which shows to males that it is possible for them to become pregnant. Since they are polyamorous, this presents no societal problems. In the case of humans, ovulation is also periodic and influenced by female hormones. But if women openly displayed during the small period of time when it is possible for them to become pregnant, they would only be able to expect male cooperation during this time. For human females, who require male cooperation on a consistent basis, a camouflage indicating they could get pregnant at any time was necessary. Thus, women evolved to avoid showing when they were ovulating, consistently maintaining womanliness, or sexual characteristics that indicate it is possible for them to become pregnant, thus consistently acquiring male cooperation.

It is necessary to consider how the family structure of *Homo sapiens*, who became monogamous in this process of evolution, was formed (Chapter 4 "Family Ties"). More recently, President Obama stated that same-sex marriage should be recognized. While same-sex love and same-sex marriage is becoming a popular societal topic, I think it is necessary to think biologically about whether or not this is

appropriate for future generations, as well as its impact on family structures.

Humans, as well as other animals, have sexual desires. It is an important and basic desire in terms of creating offspring; however, people today fulfill their sexual desires in forms that are not related to the goal of reproduction. Indeed, this has become an industry and even the root of some social problems.

While this is a controversial topic, until rather recently, it has been difficult for women to be socially active. Women were tied up with housework and long period of time consumed in childrearing, leaving little time for being active in society. This, however, gradually improved. In the future, will women get complete freedom from this predicament? While aiming for an identical level of activity as men is not necessarily the goal, having taken into account male and female biological differences, it is important to reconsider society so that opportunities for suitable participation are offered to women.

Yamatō I agree. First of all, I can't understand the homosexual love that President Obama approves of.

Masuho However, in the world today, there are many homosexuals. But it is very hard to understand why people who have no way of leaving offspring emerged, because their genes will not be passed down in the form of children. Speaking in terms of evolution, organisms that do not leave offspring disappear.

Yamatō Right. Judging from organisms' inherent nature and human nature, I think there should be monogamous male-female families.

Masuho However, when one considers that, in the longer term, the minimal necessary condition for leaving offspring is women getting pregnant and giving birth, we can store sperm from the most desirable people and use artificial insemination to create offspring. This means that male partners, socially, are not necessary. Since a situation is arising in which society raises children, or at the very least women are able to adequately raise children on their own, in the future, a time might come when there will be no need for male partners. When I think about a family, however, in the end I would like to raise one with both a male and female parent. In Japan as well, there are day care centers, and some parents depend on these day care centers so that they really need not look after their children. In Israel, there are kibbutzim, where children live in groups. There is basically no individual possession of children, in other words, relationships are completely equal. I do not really understand the necessity that led to the rise of such a system.

Yamatō People have certainly evolved in a form that requires the cooperation of the family in the sense that children are born small, grow for a very long time, and become adults after being raised by everyone. Today, things are going in the direction of women being independent and working equally with men. It is said that society should raise children, and many are being raised at day care centers. I do not know much about kibbutzim, but it is likely that nothing that can be done about such a trend.

<The Origins of Sex>

Masuho Next, I'd like to focus on the origin and meaning of sex in living things.

Yamatō As a microbiologist, I would like to talk about sex occurs in the case of *E. coli* as well.

Masuho Before doing so, let us go back and talk about how the origin or birth of life on this planet was understood.

Stanley L. Miller showed that organic matter (amino acids, bases, etc.) could be created from the electric discharges of lightning in the atmosphere of early Earth. He said that, essentially, the basis of us (life) began in this early-Earth atmosphere.

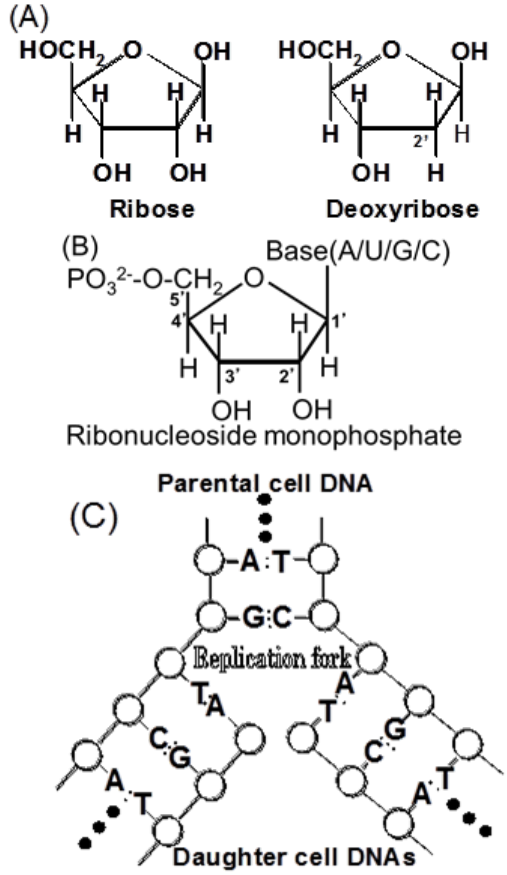


Figure 2A. Ribose and Deoxyribose. The OH of ribose becomes one H in deoxyribose. Since it has this OH, ribose has various catalytic properties. 2B. Nucleotides. Nucleosides have one of four types of bases (A/U/G/C). (In the case of DNA thymine [T] is used, and in the case of RNA uracil [U].) Phosphate combined with the 5' OH of ribose or deoxyribose of nucleosides is called a nucleotide. 2C. The Double Helix of Synthesizing DNA. The nucleotide sugar (○) and phosphate (—) form a long beaded chain. Hydrogen bonding between each of the nucleotide bases (cytosine [C], guanine [G], thymine [T], and adenine [A]) can occur. (The number of hydrogen bonds is shown with two or three dots between bases.) If this base sequence connects well with hydrogen bonding (when AT and GC pair), the two chains face each other and form a double helix. This is DNA, the main part of genes. This base sequence is preserved and synthesized when cellular division occurs.

Recently, bases and amino acids have been found on meteorites. Based on this, it is said that nucleic acid elements such as bases rained down on Earth from outer space. This appears to be what people think happened around the time right after the Earth was born.

It is also a mystery as to where the polymerizing chemical reactions occurred that changed the bases to RNA (ribonucleic acid) and DNA (deoxyribonucleic acid). The field of RNA studies has recently been established, and it appears that RNA can, on its own, cut and form covalent bonds. Thanks to these hydrogen bonds, it is able to create double strands, and via a chemical reaction, create offspring RNA that preserve information regarding its own base sequence. In this way, RNA is a chemical material

that can multiply on its own. DNA has the same properties, but it is stable and cannot cause chemical reactions. Primitive cells were DNA and RNA covered with a biological membrane. While the mechanism involved in the transformation of these cells remains unknown, it is thought that this is what happened (Figure 2). In this way, primitive or prokaryotic cells were born, and eukaryotic cells followed shortly thereafter. For organisms like these with genes made of nucleic acids, there was just the pressure to multiply, as they already had the nature to do so. In other words, they have continued to increase up to the present because of this very reproduction. There have come to be such a great diversity of organisms on the earth, and, eventually, humans emerged.

Yamatō Thank you for your explanation about the birth of life. Now, I'll talk about how there's sex even in the case of *E. coli*, a type of primitive prokaryotic cell. Normally, they clone themselves via binary fission; however, while the reason is unclear, some *E. coli* have an F plasmid, or a fertility factor. An *E. coli* with an F plasmid is a male, and can reproduce these F plasmids and pass them to the female *E. coli* that does not have them (Figure 3). Thus, females can be turned into males. Furthermore, if this F plasmid is inserted into an *E. coli* chromosome, the chromosome DNA of males can be transferred from male to female, indicating that a recombinant can be made. This is similar to the creation of a child from a man and woman who will then share certain characteristics of each parent. From an *E. coli* with an F plasmid and one without it, a recombinant (child) can be made.

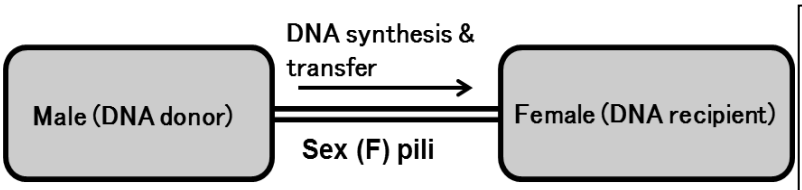


Figure 3 Schematic Diagram of *E. coli* Conjugation. Males with an F plasmid synthesize it and introduce it into females without one via their sex pili (the middle thin line).

Masuho They can exchange even their genome?

Yamatō Joshua Lederberg discovered this around 1945 and received the Nobel Prize for his study. It is very useful when creating a genetic map of *E. coli*. This led to the progress of molecular biology. In other words, *E. coli*, which is prokaryote cell close to the origin of life, can create offspring, thus introducing diversity.

＜The Diversity of the MHC＞

Yamatō Of course, humans can create offspring through sex between men and women. This leads to diversity, but how important is the rise of this diversity? It is important in a biological sense in that it is necessary to avoid extinction as a result of changes in the external environment. Furthermore, recently it has been said that diversity that arises from mammalian sex is related to developing immunities. One human generation spans to approximately 30 years. In contrast, in the case of pathogens (bacteria and viruses), *E. coli*, for example, can double in number in 30 minutes, and for every 10^8

bacillus produced in that time, one variant is born. In this way, they have a very fast mutation rate. Thus, while we might have sufficient immune system diversity to counter the mutation rate of pathogens, such as *E. coli*, if we lived for just 30 years, in the case that we were cloned (i.e., to continue living as a "next generation" of yourself), the clone's immune system would be the same as our own, and no more evolved to keep up with the mutation rate of other pathogens. Pathogens rapidly mutate, with many that resist our current immune system, which means that if we were all clones with the same immune system, we would go extinct. This is why diverse offspring are necessary.

Masuho Basically, the MHC (major histocompatibility complex) recombines, and a change occurs in the immunological function (or the ability to defend against infection) that relies upon the MHC. Since it is very important for immunity, its diversity is important for the survival of humankind.

Yamatō Right. It is said that having a diversity of immune systems is particularly important for resisting pathogens. And of course, it is also important from the perspective of biodiversity.

With regard to histocompatibility antigens, the issue of daughters rejecting their father as lovers is particularly interesting. Thanks to the MHC, based on smells or something like that, they recognize their father as their father, and are not attracted to them as potential sexual partners. Of course, if the father and daughter were to have sexual relations and offspring, since they have similar immune systems, the child will have low immunity against pathogens. Thus, in order to avoid this, daughters do not regard their fathers as potential mates. On a more general level, living beings are built so that incest will not occur. Children of immediate relatives will manifest recessive genes, and easily contract fatal diseases (the same goes for infection). This is why there is an inherent mechanism that prevents people from engaging in incest.

Masuho Here is another interesting example. Aphids, which are also known as plant louse, are all female from spring to summer. They produce children at a rapid pace in a short period of time by parthenogenesis. During autumn when it gets cold, males appear, and the genetic diversity is manifested via sexual reproduction. All living beings share common characteristics, namely, trying hard to reproduce when the environment is favorable. This can be seen in the division growth of *E. coli* . Then, when the environment becomes unfavorable, they seek diversity and produce offspring. That diversity aims to leave descendants that have the possibility of surviving in unfavorable environments. Furthermore, most living beings produce variants at a rapid pace in unfavorable environments, so that when faced with extinction, they create the seeds for diverse variations and offspring, adopting a strategy by which they can manage to adapt to the next new environment and survive (after undergoing natural selection).

Yamatō I think that in this way it is natural for genetically different men and women

to produce children. Monogamous male-female couples are also natural when considered from the cooperative nature with which humans are born.

<Analysis of Contemporary Problems Surrounding Sex>

Masuho I think that an era is not far away in which egg fertilization, pregnancy, and birth will be widely carried out by human hands based on science. Then, the sperm of an ideal male with outstanding physical abilities and intellect would be available, and these sperms could be used to produce offspring with such outstanding characteristics. It could also be possible to receive eggs from women with similar desirable characteristics. Relatedly, in ancient times, Genghis Khan conquered Central Asia (Figure 4), and genetic research has shown that his descendants are still found throughout the region.

Yamatō A vast number of children from one man have been made? That might not be a bad idea I suppose.

Figure 4 Ghenghis Khan. In one generation Ghenghis Khan created a vast Mongolian Empire that spread from Asia to the Middle East and Russia. There are 16 million people, or 8% of the world's population, who have inherited his specific Y-chromosome.

Masuho To use an older example: when *Homo sapiens* left Africa approximately 50,000 years ago, probably only a few people—maybe one man and one woman, called Adam & Eve according to the Christian religion—became the ancestors of all seven billion people on this planet.

Yamatō However, it has been a long time since then; therefore, many mutations were able to occur, thereby preserving the diversity. While it would not be a problem for the first few generations, when one strong and intelligent man or person—could be Genghis Khan or even Einstein—leaves his genes in the form of many descendants, as was said earlier, diversity will be lost. Therefore, if there are seven billion people, it is definitely better to maintain diversity by mixing the genes. In the case of any unfavorable situation and severe environmental changes, if the entire population of a certain type of organism has the same genetic background, there is the danger that they will die off; however, if they are diverse, there will probably some who can survive. In the same way, pathogens evolve and change daily, so the human species has a better chance of survival if they have an immune system to resist these pathogens. In this way, diversity is definitely advantageous, because each of the seven billion people on this planet are not clones, living as equally independent organisms, and are helping other humans to survive. Actually, as will be discussed later, it is clear that all living beings are significant in that they are equally and independently living in the present as

organisms that originated from nucleic acids that came from outer space (nucleic acid companions).

Masuho I am very aware of this. There was actually someone who held such views (Lee M. Silver, *Remaking Eden: How Genetic Engineering and Cloning Will Transform the American Family*, Avon Books, 1998). He says that developmental engineering can be used to create a man or woman that is both smart and good-looking, and the field is already pretty close to making this a possibility. He also notes that when this does occur, there will be a clear difference in status and class between the elites who have been modified in this way and those who have not. There is a very good chance that this will happen. Humanity might be ruined; however, the destruction of humanity is not something thought about on an individual basis, right? If this happens, what will be the outcome?

Yamatō From a selfish perspective, of course, it is beneficial to be superior compared to those around you. I think that many people act in this way. Developmental engineering, genetic engineering, and human cloning technology will be able to create men and women with both a desirable level of intellect and physical attractiveness. When this materializes, there is really nothing we can do about it, and there will be no way to prevent such people from behaving in a way that is beneficial for them. When this happens, the demerits of diversity loss and weakening due to cloning (discussed earlier) might become pronounced. This could ruin humanity. Also, based on the prisoner's dilemma game theory, one can also predict that people will become unhappy. We will talk more about this in Chapter 3 ("Desire for Cooperation"), but here I will provide a simplified explanation. (Please consult Figure 1 in Chapter 3) In a situation in which the Earth's resources and environment are severely restricted, it is beneficial in terms of survival for living beings to engage in selfish behavior (let us call this the "selfish strategy"). Thinking simply, if there is only a small amount of pie, it is beneficial to snap it up first. In contrast, in an unlimited environment that allows many organisms to exist and has plentiful resources, it is the opposite: people who do not act selfishly (generous people; let us call this the "good-natured" strategy) have an edge and increase as a group. This is because when the environment can provide everything an organism needs, if everyone cooperates, in the end, many people will benefit and the number of people can be increased as much as they desire. Even in unrestricted environments, however, there are selfish people. It's easy to swindle good-natured people, isn't it? However, if these selfish people come to occupy a large percentage of the whole, the environment will become competitive and they will be unable to continue to increase their numbers. Since at the end, such people are not that prosperous, good-natured people become predominant. (Since the nucleic acid elements that came from outer space and formed life are now prospering on the Earth and have created this diversity of living things, it is almost like nucleic acid aliens have conquered the Earth. One might be able to say that this was the principle of their

strategy.) In a restricted environment, while selfish strategists can probably live advantageously compared to good-natured people, if the overall strategy of people is selfish, at the end, everyone will die out. Today's Earth can be seen as a restricted environment. Selfish people who want to use eugenics might increase, but in an unrestricted environment, they will have a hard time prospering.

Masuho Why is that?

Yamatō If one thinks about it, it appears that even in the case of other living beings, since food and resources are infinitely abundant in an unrestricted environment, rather than selfishly betraying each other, it is better for them not to do so and cooperate so they can benefit and prosper as a whole. This is an important point of our dialogue that is related to human cooperativeness and happiness. We will talk more about this in Chapter 3 ("Desire for Cooperation") and Chapter 8 ("People's Dissatisfaction and Unease"). In the former, we will talk about how cooperativeness is a part of human nature. When people cooperate within a group of approximately 50 people and are recognized for doing so, they feel happy. However, selfish strategists can easily exploit good-natured people. If you are always a good-natured person (someone who is cooperative and does not betray others), then at some point you are likely to be "bled dry." Then comes the doubt, or at the very least non-cooperativeness with selfish strategists, and retaliation. A good-natured person who has been betrayed many times might become suspicious of others. I am concerned that in the contemporary society, which can be seen as a restricted environment, there are many such people. If people, who are cooperative in nature and have the desire to cooperate, are suspicious of others in their daily lives, they will feel a great contradiction in their hearts. This cannot be happiness. I would like to talk more about this in Chapter 8 ("People's Dissatisfaction and Unease").

Masuho Let us return to the main topic of this chapter: if such a situation emerges in society where, even though sex is originally for producing offspring, people engage in sex simply to enjoy it, the act will become separate from cooperativeness. While the selling and purchasing of sex is prohibited by law, in such a society, it might become legal. If it becomes even easier to prevent pregnancy, then the hurdles blocking this type of sexual exchange will be reduced even more. Since in the process of evolution, female *Homo sapiens* adopted a strategy of camouflaging their sexual availability, in today's society, such problems have arisen.

Yamatō I think that laws prohibiting prostitution and the like were made because people who had to do such jobs due to wealth disparities would be exploited. In today's world, there are cases of prostitution (including the so-called "compensated dating" or *enjo kōsai* in Japanese) in which both parties are wealthy. There would normally be no reason to ban such practices. If someone has a feeling of nostalgic attachment to monogamous male-female relationships, I think that it is inexcusable. If someone who wants to enjoy their sexual desire and their actions do not have other effects such as

the exploitation of the women selling sex, then there might be no reason to ban them. This is similar to what we talked about food. The environment-based restrictions that have existed since the emergence of humans have, in the contemporary society, been almost completely dissolved. Due to this, if people just eat according to their appetite, they will contract lifestyle-related diseases. Therefore, control with regard to food is necessary. In the same way, while in the past, the essential goal of sex was to increase the number of one's offspring, people today have the leeway to enjoy sex that does not result in offspring. Therefore, firm control might be needed with regard to this as well.

Masuho Something similar can be found in other primates. Female bonobos (also known as pygmy chimpanzees) present their buttocks to a male who has food. When they do so, the male will divide up the food among himself and the female. In the case of normal chimpanzees, the food they have in their hand is their own food. No matter how much another chimpanzee is starving, they do not divide it up; however, bonobos do. I wonder what *Homo sapiens* will be like in the future.

Birds are basically monogamous; however, 20% to 30% of chicks are extramarital. It is said that the percentage is the same in American society. If the percentage of extramarital human children increases as high as 50%, it will be difficult to predict the significance of the male-female monogamous system.

Yamatō People of my generation have a nostalgic attachment to monogamous male-female relationships. It is a cultural system that emerged when humans appeared, thanks to their group lifestyle. However, the limitations of this group lifestyle—in other words, the concept that if people don't cooperate on a scale of 50 people, they will not survive—is losing significance in today's society. Most people in today's society can live independently; for example, they can live as job-hopping part-time workers (*furītā* in Japanese), and leave child-raising to society, thanks to daycare centers and the like. In this situation, the circumstantial conditions that gave rise to male-female monogamy have changed; therefore, as you say, male-female monogamy might disappear in the future. It might turn into a situation where everyone is "free" and such. But that would be pretty unpleasant to me.

Masuho This brings to mind a certain television show, in which a child is suddenly told by the person who raised him for 20 years, "I'm actually not your parent." Of course, the child then starts seeking his biological parents. It is a question of choice. There are many situations where the child is drawn more to his birth parents rather than the parents who had raised him for a long time. Is this just the way the television show is set up, or is it natural biology of humans?

Yamatō Thinking theoretically, one possibility is that cooperativeness comes from human nature, and another is that it comes from the selfish gene of which Dawkins speaks (1976). In other words, people with the closest genes feel the closest to each other. There is nothing that can be done about this. In this sense, the parents who raise the child are important, as are the child's biological parents. However, since the

biological parents are genetically close to the child, the child probably feels closer to them.

In this sense, a wife and her husband are basically strangers to each other. However, since their child has half of each of their genes, from their perspective, he or she is seen as being superior to other children; one's "own flesh and blood." This has been in the newspapers as well—a child conceived overseas via artificial insemination wanting to know whose child he is. I think it is natural to want to know who your blood relatives are and feel close to them.

Masuho It cannot be confirmed whether or not a child feels closest to their true/biological parents. In order to do so, one would need to present research and evidence. A study could be conducted on humans or monkeys to investigate whether or not a child favors the parents who raised him or her, or the biological parents whose genes the child inherited.

Yamatō In the world of animals, or, more specifically, in the world of lower animals, naturally there are differences in the behavior depending on whether or not the organisms involved are genetically close. I think there were several examples of this in Dawkins' *The Selfish Gene.* When my grandchildren (especially the first one) were born, I thought they were so cute. While other people's babies are also cute, there is a difference in one's emotions toward children that share your lineage. A classic example can be found in groups of lions, monkeys, and so on. Among these species, it is well-known that males will kill other males' children. Since females are unable to get pregnant while still raising children, males will kill the children being raised by other females and take those females as their own to impregnate them. This is a classic example of selfish gene behavior that tries to increase only the number of beings who are genetically close to oneself.

When children compare their biological parents and the parents that raised them, I think they are influenced by the opinions of society and other people; they are being influenced by what they have learned and been exposed to, culturally. It is hard to tell which is more important. Which parents the children will be closer to probably changes based on the situation; or, perhaps humans are more on the universal love side of things. Living beings—particularly people—might feel that others' children are human companions, even if they are not one's own. If this is the case, in the future, monogamous male-female relationships and the concept of family might die out, and it might become ordinary for human children to be raised by society.

<Work and Sex>

Masuho Next, let us talk about sex and work. Historically, it has been difficult for women to work outside the home.

Yamatō My conclusion, based on what we have talked about up until now is, to put it

simply, that today's society is heading in a direction where single mothers alone can raise children and also they can be raised by society at daycare centers. Until recently, mothers had to manage the household and raise children, while fathers took on only a supporting role in childcare. However, today, women are steadily reaching a professionally equal level as men.

Thus, an environment is being created in which women can work in society equal to men even if they have children; people are working as hard as they can to move this type of society forward.

Masuho You mean there are no more problems? Is that really true? I thought that even now many women are bound to their household.

Yamatō While still today it is difficult for full-time housewives to advance in society, the situation has changed considerably, isn't it? Even our generation was often told by the Ministry of Education to increase the number of female teachers, and they may even make regulations dictating a certain percentage to be females. In the United States, there are definite laws that, for example, require 10% of minorities (such as women and people of color) to be hired.

Masuho But it is still really difficult for women to advance in society. This is the very reason why there are a lot of female students who enroll in the School of Pharmaceutical Sciences.

Yamatō Looking at the current trend, I think that people are aware that they need to move in the direction of improving things, and are in the process of fulfilling this. According to the *Yomiuri Shimbun* Morning Edition on October 10th, 2012, at the World Economic Forum meeting in Switzerland, countries were ranked by their levels of women's advancement in society (i.e., the level of male-female equality). Out of the world's 135 countries, Japan was 101st, the United States was 22nd, and China was 69th. At the top were the Northern European countries: Iceland, Finland, and Norway. Thus, although Japan lags behind in this aspect, I think that even here the social position of men and women will rapidly become more equal. Certainly, with humanity's current focus on science and technology, the limitations that formerly bound women to the household can be eliminated, and a degree of freedom and range of activity choices can be offered. I think that this itself is brilliant and will bring happiness among people.

Masuho But, on the contrary, I partially doubt whether or not this is appropriate. Women get pregnant, give birth, and nurse babies. Men do usually cooperate, but their level of contact with the children is different. Do women really not find a life worth living in child rearing and housework?

Yamatō Of course, I am concerned as well. This brings us back to the beginning of the conversation, though I repeat that we will talk about this in detail in Chapter 8 ("People's Dissatisfaction and Unease"). I really think that the Earth's environment is restricted today. On one hand, it is a world of free competition, but on the other hand,

there is humans' intrinsic desire for cooperation. I am worried that living amidst this contradiction, normal people, students, young people, and so on, have reduced their happiness in life. In this competitive society, people are working to promote the advancement of women in society. They say that women should be able to be active and compete in society equally with men. Will this actually connect to happiness?

What I truly hope is that all living people desire to live a happy life because they feel that living is meaningful and they are of use to the people around them. I feel that when such social organization and system emerges, it will be most joyful for women to return to how things were and raise children. That is what I hope.

In other words, the government (including the Ministry of Education) and the public are currently promoting the advancement of women in society and strongly advocating for women to be able to work equally in society with men. However, this takes place in a competitive, global society; these are movements happening amidst these competitive conditions, where, since men and women should be equal as humans, women should also be equally able to engage in competitive activities. However, cooperation is human nature; the desire for competition is not an intrinsic desire of humans. In the future, I really look forward to this to change. After all, the bodies of men and women differ, so rather than men and women trying too hard to engage in the same activities and behavior, I think that their happiness is defined in being able to naturally engage in activities appropriate for each of their nature.

<View into the Future >

Masuho Next, I would like to talk about our image of the future regarding contemporary problems that we have discussed in relation to sex. Let us offer a proposal for the future regarding two major issues: (1) changes in sexuality, such as the collapse of the male-female monogamy system and emergence of social acceptance of homosexuals, and human manipulations such as human cloning and development engineering, and (2) women's status and the way of being for men and women. As we discussed above, sex originally developed with the goal of creating diverse offspring so that the species could survive. Humans created 50-person scale societies with a cooperative nature. From this mode of society, the monogamous male-female model emerged. However, today there is no need to engage in hunting and gathering, and individuals can live independently. In addition, the idea of society raising children has emerged, and the limitations that existed when humans first appeared have almost all gone away. Therefore, just as we saw with food, the level of freedom regarding sex has increased, and people are able to choose from various forms of sexuality. Since, normally, it is indispensable for living beings to leave a diverse set of offspring, it has become an era in which people must, having understood this, choose from an abundance of sexual behavior options while maintaining a certain level of control over

themselves. Of course, with contemporary society's competitive principle throwing a shadow over people's judgment, consciousness, and desire, people are apt to engage in selfish behavior. However, we hope that people rely primarily upon their intrinsic cooperative human nature, and that everyone can engage in activities that do not contradict their desire for fair cooperation, and live happy lives. Furthermore, I think that, thanks to today's focus on science and technology that enables men and women to be equal, unequal attitudes can be eliminated, and a natural and happy society will emerge that clearly follows the respective characteristics of men and women. Even if one does not particularly emphasize gender equality or the advancement of women in society, I feel that our society will naturally become one that fully allows the inherent differences between men and women. Thus, our proposal is self-sufficiency on a worldwide scale with restrictions on free competition within the context of restricted conditions (e.g., environment, resources). For more on this, please read the conclusion.

Chapter 3　Desire for Cooperation: An Era without Group Membership

Lions, a carnivorous species, have evolved into pack animals with designated territories, which helps them survive on the savannah. When hunting, they cooperate to attack their prey. (From Wikipedia: "Seven lions in the Maasai Mara National Reserve," provided by The Lilac Breasted Roller)

<The Weakening of the Heart's Ties: Contemporary Problems>

Masuho Living beings basically have three desires: food, sex, and to avoid or deal with the various dangers that threaten their lives. One can easily imagine that if there were an animal that did not have this innate desire to avoid danger, they would probably not survive very long as a species. Even *E.coli* exhibits behavior like this (See the beginning of Chapter 1, "Appetite"). Since ancient times, people have run away from wild animals; learned to differentiate between poisonous and non-poisonous plants; prayed and taken medicine to cure illness; and developed flood controls, earthquake-resistant designs, and forecasting technology to deal with natural disasters. Ultimately, however, the danger posed by other humans has remained one of the biggest problems. Humans handle such problems by establishing police structures to deal with murder and theft, holding international discussions to deal with war (which have not always been completely successful), and so on. It is fair to say that in modern times, the situation has improved to the point that the desire to avoid danger is largely fulfilled.

For this reason, we are not going to talk about this desire, but rather focus on cooperativeness, an additional desire that is characteristic of humans. Recently, neighborhood ties are being lost; for example, one frequently hears news in the media of people dying alone. There have been multiple reports of people being left completely undiscovered for weeks or months until someone just happened to pay them a visit.

Yamatō While it may be true that, in the past, people in neighborhoods kept watch over each other, they were also watching *out* for each other, a communal way to avoid danger. Recently, why have these "neighborhood ties" been lost?

There is also the issue of neighborhood associations, which one does not really hear about much anymore. Even if an association does exist where someone lives, an increasing number of residents show no interest. So there is this kind of problem as well.

On the other hand, when something like the Great East Japan Earthquake occurs, those affected have a very hard time, and everyone cooperates with each other to cope with the effects of such a natural disaster. At the time, even though some of us were far away in places like Tokyo and not suffering directly, we felt the need to do something for the people in Northeast Japan.

A classic example of this kind of mentality was the 2001 Shin-Ōkubo Station (Yamate Line, Tokyo) incident, in which a drunken man fell onto the train tracks from the platform, and a young person from South Korea as well as a Japanese photographer jumped on the tracks in an attempt to save him. Unfortunately, they could not reach the man in time, and they all died after being hit by the oncoming train.

Why did these people put themselves at risk to try to save this man? While

recently there has been a thinning of ties between people, people naturally are moved to help those who have encountered difficulties and are in trouble. Why does such a dichotomy exist? Why do people risk their lives to help others?

Masuho First, let us start by talking about why people die alone with no one there to help them. When talking about this contemporary issue, one must take into consideration the era and cultural environment. When I was young, people helped each other, so things like this were very rare. In neighborhoods when I was little, people would borrow rice from the person next door when they ran out of it, mothers in the neighborhood would scold others' children who were behaving badly, and so on. Today, such relationships scarcely exist.

One of the reasons for this is that the ties between humans have grown thin; people have the ability to be financially independent, which is likely the biggest cause, and people nowadays do not want to be involved in another household's troubles. Today, people are incredibly estranged. There are many families in my neighborhood that I do not know the name of.

<The Prisoner's Dilemma Game Theory>

Masuho This issue of trusting relationships is related to the "Prisoner's Dilemma." In other words, when people try to engage in cooperative relationships with others, their success depends upon whether or not the relationship is based on helping the other side because the other side has done the same for them.

Yamatō I feel that it is a little different, but since you've brought us to the topic, I'd like to explain it. By the way, the Nobel Prize for Economics was given to a game theorist in 2012. Such game theory is now frequently used in the world of economics as well. An example of this theory being applied to the evolution of living things and ecology can be found in the 12th chapter of Richard Dawkins' *The Selfish Gene*.

Basically, genes naturally are selfish in the sense that they want to increase their numbers. According to one view, this follows the prisoner's dilemma game theory. I would like to present an easy-to-understand, simplified version of my own interpretation of this theory.

In Figure 1 below, I explain how the prisoner's dilemma game is carried out. Basically, "good-natured" people are defined as those who help others and pass on their genes to the next generation by sacrificing themselves. Dawkins defines the good-natured strategy as reciprocal altruism. On the other hand, ill-natured or "selfish" people are those who do not try to help others but rather behave in a way that only benefits themselves. There are, of course, various levels of each of these types of people.

In this way, it appears to be true that even if people do not help others in their own neighborhood, such a group can develop just by people not acting selfishly toward

each other. This would be a situation that occurs in a plentiful environment on Earth where everyone has been able to benefit from a good-natured strategy.

Partner

	Cooperation	Betrayal
Cooperation	Reward (For Mutual Cooperation) ¥2000	Money Cheated Out Of ¥500 Payment
Betrayal	Gain (Skillful Deception) ¥3000	Fine (For Mutual Betrayal) ¥100 Payment

Me

Figure 1. Remuneration & Payment Based on Results of Prisoner's Dilemma Game (Seen from the Perspective of "Me"). Here, I (Yamatō) will explain the prisoner's dilemma wager game in a simplified fashion. Imagine there is a bookie that judges two players and pays them their winnings. The two players each have two cards: "cooperate" and "betray." In silence, they simultaneously present one at a time to each other. When both present their "cooperate" card, the bookie gives them a large reward (¥2000 each). When both present their "betrayal" card, the bookie takes money (¥100 each) as a fine. In the case that one person presents their "cooperate" card and the other presents their "betrayal" card, the former is judged to have been tricked because he or she is too good-natured, and made to pay ¥500. However, the latter, who announced that they were going to behave selfishly, is given a large reward (¥3000). If this game is played repeatedly, the players come to understand that a way of playing in which both benefit and the bookie loses—in other words, both present their "cooperate" card—is the most beneficial. They build a trusting relationship, and continue to present their "cooperate" card. In practice, this strategy is the best. Similarly, when living beings are surviving and evolving in an ecosystem, they generally increase in number with this kind of "cooperative" (or "good-natured") strategy. In other words, when the Earth (bookie) has in its environment a lot of unrestricted resources (money), insofar as the various living beings (players) adopt a "good-natured" modus operandi in which they cooperate with each other, or do not interfere and act selfishly with regard to one another, everyone benefits. I think that as a result of this, living beings have diversified through evolution and been able to prosper.

On the other hand, if in a restricted environment an established wager game is carried out multiple times, since it is of course uncertain whether players will cooperate with each other, they will grow suspicious and avoid presenting their "cooperate" card. When this happens, the tendency to present the "betray" card ("selfish" strategy) will grow stronger. In other words, a lot of selfish people tend to appear. This is why when the game is under restricted conditions (in other words, when the bookie does not have a lot of money) and only played a limited number of times, the players end up operating in a way that benefits only themselves; the "selfish strategy" becomes predominant. In such a situation, "good-natured" people are betrayed and therefore end stop trusting each other.

There are various degrees to this behavior, including how "good-natured" companions end up acting. In practice, people adopt various strategies. Furthermore, the game's conditions can vary; for example, the reward and fine amounts can be higher or lower. Depending on these conditions, the results of the game can vary greatly. Here, I have presented in a simple fashion the way players typically behave.

However, these days, there is a strong tendency for people to act selfishly. People sense the recent depletion of the Earth's resources, and as in the prisoner's dilemma, which is carried out in a restricted environment, people adopt a selfish strategy, feeling that snapping up limited resources before others get them is indispensable for survival. When this happens, the suspicion of "good-natured" strategists will grow deeper because they have been betrayed, and trusting relationships are hard to rebuild. That is the atmosphere of the world recently. I wonder what would happen if society as a whole became like this.

Masuho As is the case in the prisoner's dilemma, there is the issue that information about the type of play occurring between the two players or between other players is not shared with the surrounding people. In the case of a small town or village, information is shared about people's character. However, in a city full of people, many of whom are strangers, this is not the case. In old hamlets of the past, people were punished and suffered losses if they behaved unfairly. This maintained fairness. In the prisoner's dilemma game as well, if it is carried out hundreds or thousands of times, mutual reciprocity is ensured. So, if things continue as they are in city centers, reciprocity will truly disappear, and the number of people dying alone will increase. Also, domestic violence and bullying among children will also likely increase. In the end, neighborhood associations that share information are necessary.

Yamatō The sharing of information amongst small groups is certainly an important condition. The early *Homo sapiens* (400,000 to 10,000 years ago) lived in small groups comprised of dozens of people. In these small groups, if someone lied or squandered food, that person would either be driven out of the group or not given any food the next time some was obtained. In this way, it was beneficial for people to not do such things.

Masuho When one thinks about this kind of reciprocity, it can be seen that it is necessary for humans to share information.

<Human Cooperativeness and the Origins of Male-Female Monogamy>

Yamatō However, city dwellers have become pretty heartless regarding other people, even those in their own neighborhood. Yet even so, people engaged in volunteer activities after the Great East Japan Earthquake, and two people at a train station almost sacrificed their lives to help someone. Are people who do such things just especially warm-hearted? I don't think that is the case.

Masuho By nature, *Homo sapiens* want to engage in altruistic behavior, and feel joy when doing so.

There is no doubt that was innate to early humans even seven million years ago. From the time *Australopithecine* evolved into *Homo sapiens* 400,000 years ago, and when they came to behave like modern humans 50,000 years ago, if someone did not help another person, those persons would die. If a human species with a

significantly cooperative nature had not arisen, then they would have certainly not survived until the present. Today, humans exist because they evolved as living beings with a desire for cooperation, unlike chimpanzees.

Let us talk about the origins of this. Chimpanzees first lived as gatherers in African jungles in groups of about 50, gathering and eating fruits and such. Since the jungle was a pretty safe place with an abundance of food, in chimpanzee society, "social behavior" or "sociality" did not developed.

However, due to climate change, forests grew smaller and turned into savannah. While Chimpanzees also probably moved into the savannah, they were unable to survive as well as in the jungle, because the amount of food available to gather was now scarce.

This led to them evolving into a new species, called *Australopithecine* approximately six or seven million years ago. In the savannah, it is pretty hard to survive just by gathering. Since the group size in which each member is aware of the others is approximately 50 people, *Australopithecine* made groups of this size in which to engage in hunting on the savannah. Of course, in order to hunt, it is necessary for people to cooperate.

Furthermore, as is written in the book *Hyūman naze hito ha ningen ni nareta no ka* ("Human: Why Were Humans Able to Become People?"; See reference materials at back of book), these early humans walked together and collectively watched out for enemies on the savannah. Since they started walking bipedally, in the case of females, pelvis shape and the birth canal changed. As a result, labor became difficult.

Additionally, the brains of human infants are much larger than those of other monkeys. For this reason, our ancestors had no choice but to give birth to small offspring and raise them until they got bigger. Back when they were quadrupedal animals, they could give birth more easily, and offspring could be born in a form closer to that of an adult body, and could stand immediately after birth. However, since humans began walking upright and babies were born small and immature, the amount of time devoted to child rearing grew longer, and here as well the cooperation of group members became necessary.

As was the case with childbirth and looking out for enemies, it became necessary for groups of about 50 *Homo sapiens* to combine their powers to catch prey, since *they were* unable to catch fast-moving deer or giant mammoths on their own. This is when humans evolved as living beings with a desire for cooperation. Furthermore, at this time, male-female monogamy was born out of necessity. This cooperativeness is similar to how lions form packs on the savannah that cooperate when hunting and for increased chances of survival (See the image of first page of this chapter). Humans often feel happy when they are recognized for cooperating with their companions. One could say that, in addition to their desires for food, avoiding danger, and sex, humans particularly have a fourth desire for cooperation. A schematic

representation of the structure of human cooperativeness can be found in Figure 2, which also shows how, as a result of societal function and organization, humans developed utilitarian mutual reciprocity—exemplified by the phrase "charity is a good investment"—that was very dependent on information. Similarly, today, there are people who volunteer to help those affected by disasters; however, the social situation has changed, as there is generally no need to watch out for external enemies or lead a hunting-gathering life style, and there is plenty of food.

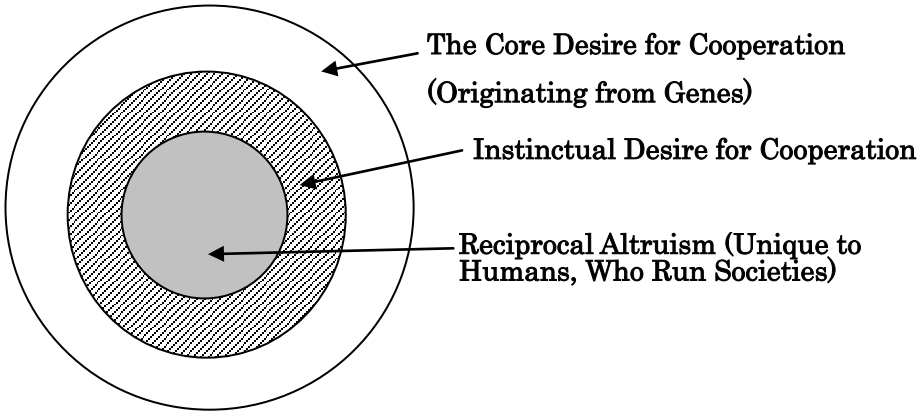


Figure 2. Schematic Diagram of the Structure of Human Cooperation. The core is the part that comes from selfish genes, wherein the genes try to multiply themselves. Therefore, people try to protect those who are close to them, like parents and their children. Enemies are “other” species that may try to compromise one's lineage and might destroy other members of your own species. Mantis males, for example, offer their bodies as nourishment to females that are giving birth to children, and when a bird of prey comes close to the nest of small chicks, the parent will offer its body to fight or lead the bird away in order to protect the children. This cooperative nature is certainly held by all kinds of living beings; it could be called passive cooperativeness in the sense that it is a characteristic manipulated by pressure from selfish genes to multiply. However, thanks to this, living beings have survived for multiple generations. Then the next layer originates in the active desire for cooperation. An example of this is cooperation between lions, which create blood-based (i.e., familial) packs, and stake out their territory near watering holes. These groups to which they belong are created based on the behavior principle/desire of selfish genes. In order to engage in efficient hunting on the savannah, lions must cooperate as a group. In other words, the species of lion was born with cooperativeness built into their genes as an instinct. I will call this the "desire for cooperation." Similarly, when humans evolved from chimpanzees, they obtained this instinctual desire for cooperation. If the group to which humans belong is clear—even if it is not comprised of blood relatives—then the enemy is clear as well. The next layer symbolizes the cooperativeness that probably originates in culture and is unique to humans. It appears that they came to have families and lead social lives, resulting in utilitarian reciprocal altruism based on information-based learning. Here, information is an important factor. In addition to members of other species, non-reciprocal groups and groups comprised of others than one's own are also be counted as enemies. If one were to add even another layer of cooperativeness to this circle, it might be social rules—in other words, religion, law, and penal regulations—for the general public, which exceeds 50 people in the group. These categories are generally arbitrary, and many of them contradict the logic of living beings. People have suffered due to the contradictions between these rules of society and the individual desire for cooperation.

Yamatō Right. Additionally, while it does require a lot of work to raise children, the idea has recently emerged that society (not only families) should contribute to raising children, and it is becoming questionable as to whether the male-female monogamy-based family should be protected and whether or not it can be protected. In this sense, cooperativeness is becoming unnecessary for the survival of individual beings. I think that this is happiness in its own way. Since the various limitations that existed when humans emerged due to evolution have gone away as described above, it is turning into a very confusing and unpleasant issue. Even though, of course I want cooperativeness and male-female monogamy to continue.

Masuho When humans emerged due to evolution, their concrete form as living beings with a desire for cooperation was set within male-female couples and families. However, in the world today, troubles have resulted when families are not formed by one man and one woman. Maybe there is a chance, then, that families in the future will no longer be based on male-female monogamy. If this happens, will the need for husband, wife, and children living together as a family go away? Will cooperativeness become a dead word?

Yamatō While it doesn't have to be a family in the traditional sense, there is something important about a group or unit's genes being the same. As is written in Dawkins' *The Selfish Gene,* one feels close to people with genes similar to one's own. I feel really close to my parents and children. In this way, family is one important core of survival. I think that, therefore, families are important on a level different from cooperativeness, namely, that genes will reproduce.

Masuho This means that when forming a family as a small group unit, it is most natural to have as its basis a male-female monogamous relationship that is sexual. In the past, the family was probably the most basic unit; however, if a group of a few dozen people suffered from famine and did not rely upon other groups of the same size, humans would not have survived as a species. So there is no doubt that this general sympathy or cooperativeness was created as a "circuit" in the human brain in the form of an instinct. This is why, insofar as people are human, they have continued to have an inherent desire for cooperation. And owing to this inherent desire, they want to help when they find out a crisis situation like the Great East Japan Earthquake. Since selfish behavior has increased in the context of societies' free competition, however, there are more cases in which people become estranged from each other, heighten the walls in their heart, and their connections to others disappear. Furthermore, due to the progress of science and emergence of big government, very harsh or limited environment in which people could not survive unless they cooperated in small groups of about 50 people has gone away. In such a context, it is easier to leave much of child rearing to the greater society. As sharing information and so on becomes impossible, people's wariness of each other increases, and this all leads to the destruction of ties between people, which we could call the pathology of contemporary times.

<The Necessity of Cooperativeness and Its Obstacles>

Yamatō What should be done in the future? Despite *Homo sapiens'* nature to have compassion for one another and the inherent desire to cooperate, people in cities have become more cold-hearted and isolated. Do people become cold-hearted because of a lack of information? If that was the case, it might get slightly better if sharing information was more popular, and even required.

Masuho Yeah. Is it not because of mass media like national newspapers and television present a lot of information when disasters like the Great East Japan Earthquake happen that people have actively engaged in volunteer activities?

Yamatō The difference between humans' altruistic behavior and that of other animals such as lions is that it functions the same way for those who are not related by blood. For example, the two people who tried to save someone who was going to be run over by a train.

Masuho Generally speaking, altruistic behavior toward one's blood relatives is stronger, though.

Yamatō That is right. I would like to add a little bit about this. Of course, around the time when *Homo sapiens* emerged, there were groups of about 30 to 50 people. I think that this created a strong sense of belonging, and these people felt animosity toward other groups and wild animals that could hurt them. In this way, groups with a strong sense of belonging emerged as an expression of the desire for cooperation. Thus, people felt happy when they were able to contribute to their groups.

These groups of about 50 people progressed to about 200 people as villages emerged. These then grew even larger and became powerful family clans, feudal domains, and finally countries like Japan. Until the end of World War II, people fought wars for Japan under the notion that this was patriotism. People used phrases like "English and American devils" to fan this patriotism. In order to make people aware of the group to which they belonged (the Japanese nation), intense animosity was created. Recently, as a result of education and globalization, people are now more aware that all people are, at their core, the same species. I think that this is why people feel that, in general, strangers are companions that want to help them. Conversely, it could also be said that the groups to which one strongly feels a sense of belonging have become ambiguous. Another important factor is of course that people have become affluent to the extent that they are able to live their lives as separate individuals. People can live without relying on a group that they belong to. This is one favorable aspect of contemporary times.

Masuho While you have a positive opinion about this, I think there is another side to it as well. Because Japan is an island country, it is a group that has a good sense of unity, allowing it to act in a way that saw foreign countries as the enemy (e.g., "English

and American devils"). However, the island country framework has gone away: today people can easily go to Europe and the United States whenever they want, goods come into Japan from these countries, and people can communicate with others throughout the world thanks to the development of the Internet. In this way, the physical distance between individual people's hearts is growing larger, especially in cities. I think that this can be both negative and positive, but it is important to go in a positive direction.

Yamatō Under globalization, an awareness that everyone is the same has spread. So the barriers to an expanded awareness have decreased. However, as you said, as we talked about in regard to the prisoner's dilemma, due to this freely competitive society in a restricted environment, people have become selfish toward each other. In addition, due to frequent betrayals, people—including "good-natured" people and those in neighborhood community associations—have closed themselves up in their own box. Barriers between people have grown higher.

Masuho In actuality, walls between houses are high, and even within one house there is a trend toward creating barriers, with parents and children all having individual rooms. If we were to say that people are connected, they take impersonal forms, such as cell phones, anonymous Internet identities, and so on.

Yamatō While globalization saw people develop a feeling that everyone is their companion, why is it that if one looks at it from an individual perspective, people feel that everyone else is an enemy? How can this be eradicated? Is it because humans have increased their companions too much and there are no enemies?

Masuho Put simply, people can unite if there is a common enemy to face. If this goes away, and people live together as one big group on this Earth, then the enemy becomes unclear. This is also because humans can only be aware of about 50 other people, and are only able to share information within this range. An essential problem is that it is hard for people to handle a global consciousness based on the contemporary knowledge that everyone is your companion. This is a big problem. Furthermore, the world's resource environment is severely restricted and the predominant characteristic of global society is free competition. For this reason, if a "selfish strategy" dominates large groups (or companies) and goes unchallenged, "good-natured" people who have been betrayed will become deeply suspicious, and the barriers in their hearts will grow higher. I think that, due to people's isolation and loneliness and the reality that this goes against the innate desire for cooperation, the balance in their hearts has been broken and they have become uneasy. We will talk more about this in detail in Chapter 8 ("People's Dissatisfaction and Unease").

<Future Image>

Masuho I would like to summarize our discussion up to this point. As a result of education and the spread of globalization, out of awareness that humanity is

comprised of companions, people want to cooperate and help others. However, some people and social organizations have been forced to adopt a selfish strategy in this restricted environment, and they do not find a group to belong to where they can feel assured that they are contributing, and thus are unable to see any goals toward which to cooperate. Individual people feel very stressed with regard to the conflicts, contradictions, and discrepancies in their hearts. Their hearts might be mangled; therefore, not only dying alone but also things like bullying, abuse, and the Akihabara massacre can occur. After Chapter 5 ("Stratification"), Chapter 6 ("The Merits and Demerits of Money"), and Chapter 7 ("Globalization"), I would like to discuss this more in Chapter 8 ("People's Dissatisfaction and Unease"). We propose that in order to restrict freely competitive activities to some extent, self-sufficient and self-supporting spheres should be established throughout the Earth as a social organization system. If this happens, even if groups of about 50 people would not work, the world might become one in which bonds between people are restored, resulting in feelings of happiness. Sharing information in this restricted environment (which is becoming depleted) can keep in check "selfish strategies," leading to the adoption of a "good-natured strategy" to satisfy people's desire for cooperation. I would like to think about whether this is a measure that can solve our problems.

Chapter 4　Family Ties: Can People Restore the Warm and Happy Family of Old?

A spot-billed duck parent watches over its children, and the children follow their parent.

<Contemporary Issues Surrounding Family>

Masuho Where do family ties come from? To what extent will the male-female monogamy system continue in the future? Being asked these questions, what is your gut feeling? If I were told to say something about this, it would be related to the phrase "A child is a bond between husband and wife" (*ko ha kasugai nari*). Recently, family ties have been collapsing and the male-female monogamy system is facing a crisis. Despite the fact that 40 or 50 years ago it was common for two, three, or four generations to live together and it was a social norm to respect the elderly, today, just husbands and wives live together as a nuclear family. In addition, there is no end to the news about parents abusing or killing their children, or children killing their parents, as well as the elderly dying alone. Furthermore, the number of children born outside of wedlock and to single mothers is increasing. In this way, it appears that familial ties are weakening. As is expressed by the phrase "A child is a bond between husband and wife," in the past, it seems that parents were connected by the responsibility of child rearing, but what is the case today?

Yamatō I think about things from the perspective of human nature. According to Dawkins' *The Selfish Gene,* one takes the best care of one's own genes. Since your children are the ones who have inherited the greatest number of your genes, you treat them more importantly than other children. Grandchildren inherit a portion of your genes, so in this sense, one's grandchildren are important as well. Each person naturally takes care of their family and tries to spread their own genes, and this effort becomes the family ties. Spouses are the most important part of a family because, within the family, they are the ones that create the children. But still while one might be sad if one's spouse dies, the damage is not to the same extent as when one's child dies.

Masuho The sense of intimacy with one's family and desire to cherish and protect them is determined based on shared genes. There is not even any logical judgment involved; one just naturally feels this way, right?

Yamatō This is what is written in Dawkins' book, and I think it is convincing. But as living organisms, the ties of families must have been originally like this. Why are these ties collapsing in contemporary society in Japan? Some parents kill their children while others simply do not look after them. They just leave them alone.

Also, as can be seen in newspaper reports, there are also people who die alone, having been abandoned by their families. If there is a blood connection that extends from grandparents to grandchildren, there should be no way that people should become deserted and die alone.

Masuho Recently there appears to be various kinds of young people, some who say they do not want to marry, do not want to have kids, and do not want to be part of a family. While there might be some people who say that it is fine if everyone diversifies,

it has generally been believed that, on a basic level, complex organisms do not simply engage in the act of sex for reproduction, but also feel joy in carefully raising the children born as a result of this act, and feel happiness in forming a family. Therefore, I predict that in the future, even if social systems change, families will probably be necessary, or rather that people will seek happiness in families. I think that the influence of society and culture, however, makes people not be able to see this, resulting in unhappiness.

Yamatō Of course, by nature, humans as organisms keenly feel the closest connection to those who are the closest to them by blood. But why in recent years is such information like not having children easily entering people's heads? The Internet? Television? There is also little information shared regarding the family that is celebratory.

Masuho A little bit different viewpoint I would like to ask. I think that when foster children or adoptees are raised without knowing they are from another family, they will have the same connection to the people who raised them as they do to their biological parents.

Following Dawkins, even if the child is not aware of their blood relationship, that child's selfish genes will call out to their bodies. But such children feel connected to the parent that raised them despite this because of their daily lives. Thus, I wonder if blood relation is always so essential for children.

Yamatō Recently, people have been saying that raising children is the responsibility of society. Will things go even further in this direction? If this happens, at day care centers or through foster parents, will people raise children out of their responsibility as members of society even though they are not related by blood?

Masuho At kibbutzim in Israel, children are raised in this way, no? Children are brought together and raised in groups of 100 and sometimes 1,000. What influence does this have on children's emotions and parent-child ties? Even if it is not as extreme as the example in Israel, recently in Japan, society's child-raising system has become very well-developed. There are many nursery schools and day care centers that have removed women's need to demonstrate self-sacrifice and full devotion to raising their children. Have not politics or society gone overboard with teaching people that women will be happy if they leave their children at day care centers and work outside the home? It is because we have become economically affluent. If a population is majoratively poor, people work as hard as they can to help each other and bonds among them are born; for example, older brothers work to pay for their younger brother's school tuition. However, the more economically affluent people are and the more information and movement there is within world, the easier it is to become individualist or live in a way that only serves one's own interests. This is a problem, and at some point we have to return to the basics and reconstruct things.

<The Origins of Families and Male-Female Monogamy>

Masuho While the basis of family ties must have been male-female monogamy, this convention is in danger. For how long can it be maintained? If one is attached to this kind of relationship and raising a child with one's partner, then it is hard to think about adoption. However, if one wants to give precedence to having outstanding offspring, then it is possible that someone else's genes are better (laughter).

Yamatō In Chapter 3 ("Desire for Cooperation"), we discussed the origins of male-female monogamy; however, when seen from today's society, this convention might not be necessary. However, isn't male-female monogamy our basis as *Homo sapiens*? Will this really disappear?

Masuho The reason that there is male-female monogamy is that it was absolutely necessary for *Homo sapien* women to choose one man in order to raise a child. If a woman and her child did not have one chosen and dedicated man to provide food and keep away predators, there would have been problems. Men also wanted to leave their descendants to a certain partner. This is why male-female monogamy emerged. In developed countries such as the United States and those in Europe, there is little danger of predators, and generally no issues with regard to securing food. If this level of stability and security is the case, is there a need for male-female monogamy?

Yamatō Following Dawkins' theory of "selfish genes," families became the basic unit of groups since they are related the closest by blood. In today's world there is no need for hunting, and women can enter society and live on their own, making male-female monogamy irrelevant. As you said, in the current social situation, the need for male-female monogamy has gone away. The level of behavioral freedom has increased greatly for both men and women.

However, it is my concern that when male-female monogamy goes away there will be incompatibilities regarding human instincts, ways of thinking, and hormonal functions that had previously been innate in order to support their way of being. People may no longer feel human, increasingly becoming uneasy, and causing disorder. Therefore, it is my worry that even if it is no longer necessary for male-female monogamy in this modern world, insofar as humans do not experience gene mutation and evolve into a new race, they will become uneasy and want to just run away.

Masuho Even estimating on the high side, the past 100 years has revealed a situation in which people can use the life sciences to change their own lives. In the next 100 or even 1,000 years, a significant and sudden mutation will probably not occur. But I do think that the way people think about things will change. According to Nicholas Wade's *Before the Dawn* (2006), it appears that male-female monogamy emerged about 1.7 million years ago, in the age of *Homo habilis.* If this is the case, male-female monogamy may be a mode of behavior that emerged as a cultural aspect (what Dawkins called a "meme") for human groups of about 50 people to maintain

cooperativeness and enable them to lead social lives.

Yamatō Is that so? So did Dawkins call culture/civilization a "meme"? Basically, I think that such Lamarckian “acquired evolution” can occur and change easily (i.e., Lamarck advocated the use-and-disuse theory, which stated that in evolution acquired traits are inherited by the next generation). Are male-female monogamy and the family form actually acquired memes that emerged during human evolution? If this is the case, it might be okay if they change in accordance with the era (culture). I always thought that it was a behavior pattern close to humans' inherent nature (and instincts) since emerging as a species, and was therefore concerned that recent trends cause unease in people.

Masuho As I discussed in the previous chapter, without the desire for cooperation, humans could not have survived on the savannah. I talked about how cooperativeness is human nature in the sense that it enabled them to evolutionarily become established as a species; therefore, I think that in order for people to feel happy, there is a need for them to fulfill this desire for cooperation. Since humans only have the ability to be aware of 50 people at once, however, belonging to a group of this size is at the very least essential. Furthermore, since the only choice for cooperative groups was to be founded on blood ties, maybe the group form of male-female monogamy and families emerged as the predominant culture at the time. Therefore, male-female monogamy and family forms can change depending on the era and fluctuations in culture.

<An Analysis of Contemporary Issues Surrounding Family Forms & Human Happiness>

Masuho In the past few decades, there are more and more people who do not marry even after turning 30, say that do not need children, and so on. As such, one cannot necessarily say that they are not happy. This is not a genome issue but rather a cultural one. If this culture spreads, there will be truly big social changes. For example, female *Homo sapiens* might biologically eliminate their periods; this kind of natural evolution does not happen in a short period of time; rather, it might take 10,000 years. However, there is the possibility that biological forms and functions continue as they are, but that as a result of society and people's changed way of thinking, family bonds might break down. When this happens, what kind of ties could take their place? Religious ties? Social ties? Family ties are basic, so even if male-female monogamy goes away, if there are still connections between people that are equivalent to family ties, they might be able to continue to exist without feeling uneasiness. This is an important problem, but it is hard to make predictions about it. While there are people who work for themselves and do not marry their entire lives, many people live while thinking, "This is for my children," or "I hope that this child sees his father and grows into a wonderful person." While this is a very emotional way of putting it, considering

this, it appears that if there are not bonds between a family that is genetically connected, unity cannot be achieved between groups of 50 people based only on the ties of society, religion, and the community.

Yamatō While male-female monogamy may have been a cultural latecomer in terms of our cultural evolution, it is my understanding that families based on selfish genes were necessary, and that this is why humans favor their family and have lived in this way up until the present day. Very recently, the era has allowed each individual (i.e., each family member) to become independent and live on their own. In this sense, people may be happy; but, while families connected by blood might not be necessary, it is my worry that if families collapse, people will feel unhappy.

Masuho Since society has become economically affluent, there is a reduced need for parents and children to work as hard as they can to support each other. This is why the time has passed in which three generations of family (e.g., grandparents, parents, and children) have had to support each other to live. People's grandfathers and grandmothers can live on their pensions or other retirement. Furthermore, from when they are still relatively young, children can subsist as job-hopping part-time workers (*furiitā* in Japanese). Since it has become this kind of era, the need for families to, at minimum, be economically connected has gone away.

Ever since *Homo sapiens* emerged, they have been in male-female monogamous relationships and their familial ties were strong. Their emotions, thoughts, and efforts for survival were based on this. This has been the case for about 400,000 years. It is said that until 10,000 years ago at the latest, *Homo sapiens'* lifespan was only 30 years. If it is this short, there would be only two living generations at any given time: children and parents. Grandparents' rich knowledge and wisdom, then, would not be about to be put to use in daily life. Only after people's lifespan came to exceed 30 years were *Homo sapiens'* wisdom, civilization, culture, and writing passed on to future generations. Until approximately 100 years ago, the lifespan of people was 50 years at most; however, the average lifespan in Japan is now 80 years or longer. This is primarily due to the advancements of medicine and medical treatment. It bears repeating that only when senior citizens' wisdom was put to use was humanity able to, in one giant leap, develop complex civilization and culture. In this way, until fairly recently, blood-connected families were indispensable for the development of humanity. Thanks to the more recent idea that children should be raised by society, the need for seniors in the family has been reduced, and education in the social system has come to replace them. However, with the necessity for male-female monogamy and families that share genes decreasing, in terms of people's happiness, it might be fine to just have "a chosen family or a kind of family," comprised of a husband and wife who share common values and their children (whether or not all the children in this family are biologically related to one or both parents). Male-female monogamy will probably continue to some extent, but it is clear that extramarital relationships will increase. If

they increase, one does not know if the father's genes have actually been passed down to the children. In the United States, 25% of children are born outside of marriage. I read in the newspaper the other day that in France it is 50%. Birds also have male-female monogamous relationships, but approximately 25% of chicks are extramarital. Looking at the words and actions of today's young people, sooner or later this statistic might increase. If it exceeds 50%, one wonders if husbands will be able to recognize children who are born as their own.

Yamatō Today, people certainly can live freely on their own outside of the family context. This might mean that people might feel happier this way. If this is the case, why is it that despite organisms feeling closer to those who are genetically similar to them due to "selfish genes" (Dawkins), when it comes to humans, there is evidence of the number 50 as the maximum group size for the “chosen family or a kind of family” whose members may not be all blood-related?

Masuho Basically, it seems that it is like this. Chimpanzees engaged in gathering lifestyles in groups of approximately 50 members. When they evolved into humans, the desire for cooperation became innate, but their abilities of awareness remained the same as that of chimpanzees: 50 people. Therefore, humans felt joy when they were able to contribute to their own 50-person group, even if its members were not related to them by blood. When seen from the perspective of selfish genes, blood relatives might be ideal because they are genetically closer, due to humans’ cultural development and advanced form of civilization, they might be undergoing a sublation process that results in a wider sense of community—what you call “nucleic acid companions.” After all, as you say often (and in Chapter 2 “Sexual Desire: An Era of Loveless Sex and Sexless Love”), we are organisms that originated in nucleic acid that came from outer space. At the very least, thanks to the recent spread of education, humanity has come to see each other as fellow *Homo sapiens*. Truly, this could be called ultimate universal love.

In the end, empathy really leads to greater happiness. At the very least, people are made to feel joy as a result. No matter how hard they try, the scale on which they can feel empathy appears to be still limited to 50 people. For example, the smallest unit in most military groups is 50 people. School classes are also, at most, 50 people. It appears this is a suitable number because it is how many people a group leader, no matter their discipline, can keep tabs on.

Yamatō So there is a high chance that no matter how much a society progresses, the 50-person limit to human awareness and the empathy to “a kind of family” will not disappear. Male-female monogamy and families might disappear, though.

Masuho I do not think it is a good thing if genetically connected families disappear. While this is not the most eloquent way to state it, what you are saying is that even if extramarital relations increase, the style of ”chosen families (or a kind of family)” will not simply go away due (or owing) to the human’s fourth desire, cooperativeness. With

that said, what I am concerned about are the relationships not only within families but also between neighborhood households, which existed when I was little. Now they really do not. If someone suddenly got sick, someone from a nearby household would rush to attend to them, even if only for the night. That kind of thing does not happen as much anymore, at least in cities. Is this really happiness for people? (See Chapter 3, "Desire for Cooperation.")

The reason I say this is that when my family was in Boston, people of Irish descent lived across the street and their family ties were strong. For example, their cousins lived in the same neighborhood and their younger brother lived next door. On special holidays, they would all get together at a relative's house. I again realized that those kinds of ties have gone away in Japan.

Yamatō Is this due to each country's background, each country's history? Ireland was pretty oppressed by England, or should I say Great Britain. In this way, maybe the existence of outside pressure is the very thing that leads people to value their circle; if Irish people had not done so, they might have been eradicated. Japan, for example, is an island country that has lived relatively in peace.

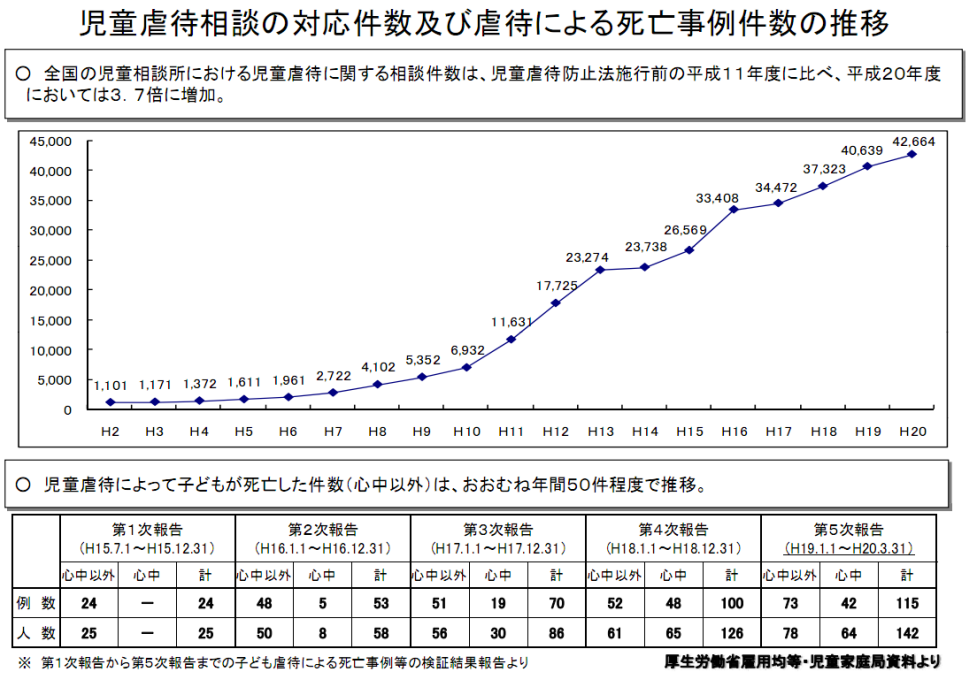
Masuho Right. In this sense, the 60 years of peace—of "too much peace"—has thinned out both family and community ties. Because people have become affluent and their range of choices has increased, the past necessity of male-female monogamy and being with one's family has decreased. People might be happy in the sense that their degree of freedom has increased, but this isolation may have created an unhappy situation: people have lost sight of even belonging to 50-person groups and, as such, the desire for cooperation, which is inherent in humans.

<Factors Obstructing Contemporary 50-Person "Chosen Families">

Yamatō In the world today, the joy of cooperation (i.e., the inherent nature of *Homo sapiens)* and the desire in a freely competitive society to defeat one's opponent (which is valued by the world) battle with each other. I think that this is the very reason that people today feel unhappy. The world today values becoming rich. In response to this perceived value, we think that we want to be like that. Furthermore, if one continues in this direction, there are times when one thinks that people should throw away things like the innate desire for cooperation in order to succeed.

Of course when this happens, people are alienated from their sense of belonging to groups of 50 people (which in the past were mainly family and blood relations), and each individual becomes isolated in a competitive and nameless society. In a sense, it is a situation in which everyone is an enemy. It appears that since this is the current situation, so people's sense of belonging has grown weaker, and both social and familial ties are disappearing. This might be why individuals today feel stressed and have no choice but to live lives of unease. It is my understanding that this is why

the number of incidents of child abuse (Figure 1), children killing their parents, and people dying alone are increasing. We will discuss this in detail later in Chapter 8 ("People's Dissatisfaction and Unease"). I am concerned that in Japan's current social system, even "chosen families" are heading in the direction of breaking up. In other words, I really think that a global society of free competition—particularly one in a restricted environment—is a fundamental cause of people's stress and unease.



	第1次報告 (H15.7.1～H15.12.31)			第2次報告 (H16.1.1～H16.12.31)			第3次報告 (H17.1.1～H17.12.31)			第4次報告 (H18.1.1～H18.12.31)			第5次報告 (H19.1.1～H20.3.31)		
	心中以外	心中	計	心中以外	心中	計	心中以外	心中	計	心中以外	心中	計	心中以外	心中	計
例 数	24	―	24	48	5	53	51	19	70	52	48	100	73	42	115
人 数	25	―	25	50	8	58	56	30	86	61	65	126	78	64	142

Figure 1. Recently, the number of child abuse cases has been greatly increasing. (From press materials provided by the Japanese Ministry of Health, Labor and Welfare. Only Japanese language version was available.)

Masuho I think that this means the concept of family shall be fundamentally rethought. As such, community shall be reconsidered as well. Community ties have been almost completely lost too, no?

Yamatō But today, a situation in which people need to unify as a region or community has gone away. I think that this is a happy thing. During the Warring States Period, for example, even Mikawa and Owari—neighboring areas—fought against each other as enemies, and whole families and clans were killed. In this kind of situation, regions become naturally unified. It is the same as the Irish societies and families I mentioned. However, today things are peaceful in Japan, and there are few situations in which communities or regions must unify against a common enemy. There are also few situations in which people must unify as families. Despite past circumstances in which people could not live without everyone's cooperation, society has become affluent to the extent that even alone people can live safely. I think that this is happiness as well. How can a system be made that can appreciate both this affluent situation and the unified consciousness of a family or 50-person group for satisfying the fourth desire, cooperativeness?

<Clones and Contemporary Life Science>

Masuho While this is a rather different topic, because sperm is able to be frozen and preserved, they can be used to fertilize vast numbers of people, no? If this happens, a lot of children will appear who do not know what their genetic parents are like. There has also been speculation that obstetricians may soon be able to clone babies. In 2012, Shinya Yamanaka was awarded the Nobel Prize in Physiology or Medicine for his research on induced pluripotent stem cell (iPS) cell generation. Prior to this there was news that eggs and sperm were successfully created from only iPS cells. If we try to act like magicians, we might find ourselves in an era in which clones of us are being replicated in great numbers.

Yamatō If this happens, people will follow their "selfish genes" (Dawkins) and make many clones of themselves. Is such a society really okay? Will we be able to live as humans?

Masuhō Someone who believes that his and his wife's genes are wonderful might preserve and ultimately clone their genomes to raise children of “royalty” (like Cleopatra and Caesar). If this happens, the world will be filled with cloned people. Furthermore, they might improve their genes, and try to make it so that children even more wonderful than themselves appear in the next generation.

Yamatō Do we want that kind of society? Rather, I am worried that it might actually come to be. Based on what we talked about in Chapter 2 ("Sexual Desire"), I pray the world does not go in this direction because it might lead to a loss of biodiversity and could put humanity in danger of extinction. However, if one follows a selfish strategy in a restricted environment, it is more advantageous, and so such an approach might increase in the future. If this happens, based on what we discussed in the previous chapter about cooperativeness, it can be predicted that people's feeling of unhappiness will increase and decline will be the only option for humanity.

<Future Image>

Masuho Even if there are children born outside of marriage or it becomes mainstream to clone people, since children feel connected to the parent(s) that raised them, I think the ties of "chosen families" will remain. In the United States, actually a lot of people are raising children as foster parents.

Yamatō Even though such parents are raising offspring that have not directly inherited their genes, their actions probably come from a mindset that wants to protect, raise, and connect to the next generation of human species genes. They are practicing ultimate universal love. With regard to this, it appears that Japanese people's feelings and Americans' feelings are different.

Masuho When I was in the United States, a neighborhood elderly lady brought an

assortment of jam to my youngest child as a Christmas present. I had never met her before. She said, "My husband and I actually raised a baby from Korea, who is now an adult and left the house. Seeing your little child, I remembered old times." At that time I thought, "Oh, there are warm-hearted people like this here." This is the sensibility of Americans. Therefore in the future, I hope that the world will not get caught up in race or religion and ….

Yamatō Will that happen? I would like to have such world, too. I think that it would be good if people could develop a sensibility like Americans—an awareness that they are part of a family of humans rather than only those who are genetically close.

Masuho My family includes four kids and we barely stayed afloat. If we did not have kids, I might not have been so devoted to my research. I feel that my children gave me power. But if they had not been children who inherited half of my genes, would I have not been devoted? Surprisingly, I think would have. People might feel the same as I did when they care for foster children. The cuteness of babies tugs on our emotions, making one see that they are our all of our human children.

Yamatō This is certainly the case. If this happens, do you think that future society will end up raising children, even if it does not turn into kibbutzim?

Masuho I think so. But, while it does depend on the society, will race and religion really go away?

Yamatō They likely will not; however, in a sense, people's awareness of racial difference is decreasing because they see we are all humans. If society does begin to play a larger role in raising children, it would have to raise a very large number of them. The ties of a chosen family can be made with a few children, different from in a kibbutz, where children are raised in groups of 100, because people can have the view that foster children are their own children, and intend to take good care of their children and parents. Instead, if it is said that “the chosen families or a kind of family” raise children in groups of 100, conventional "family" ties might disappear.

Masuho It is hard to see 100 children as one's own. One's feeling toward them would ultimately be diluted; therefore, I think if you have to use the phrase "chosen family," at most it can refer to 10 members. But it would be hard to have even 10 kids (laughter).

Yamatō Right. If there are four or five children, then families can be formed by family ties and, in the true sense of the phrase, preserved. In such a case, at some point, people would be able to see others as having the same human genes as themselves without being held captive by their "selfish genes" (Dawkins). This would be wonderful if it happened.

Masuho While 50 people is a necessary and clear unit, within it I would like to see smaller units of the family. Since people cannot keep tabs on more than 50 people all at once, if the smaller units formed various “islands” in 50 people then various groups of the smaller units could come together. If one looks at things this way, it does not

appear that family households will readily go away, no? For example, children share genes with their parents, but how will husband and wife be connected in the family? The relationship between parents and children is easy to understand. But maybe people will not need partners?

Yamatō As I said in the beginning, it is because husband and wife are genetically complete strangers. Affairs and the birth of extramarital children will increase, so will people try out spouses one after another (laughter)? Of course it is best to have one fixed spouse, right? If today's atmosphere is maintained then there is nothing to worry about if one has a fixed spouse (laughter).

Masuho This can be talked about in terms of personal preference, but what about from a biological perspective? Biologically speaking, *Homo sapiens* feel secure in male-female monogamous relationships. This cannot easily be changed then, right? While it might appear that I am saying the opposite of what I said earlier, such relationships are not economically necessary, but they are mentally necessary. For a fulfilling life, a partner is necessary. Even if I enjoy friendly conversation with you, you could not become my partner in daily life.

Yamatō That is because partners are a male and a female, and there would be a problem if people go through them one after another.

Masuho A partner understands you, and understands the way you think—that kind of partner is certainly necessary.

Yamatō While this might be just an ideal, I feel that, nowadays, rather than seeking this in a spouse, there is really nothing one can do but seek close friends within groups of 50 people (laughter).

Following your conclusion, there is a chance that male-female monogamy will eventually go away. With regard to family ties as well, there is a high chance that families will move toward a collapse. Of course, it is better if both of these exist, though. It will definitely not change that the groups to which people would like to belong are 50 members in size. As part of humans' inherent nature, a 50-person scale is an indispensable condition. When people lead lives in groups of about 50 people and receive empathy, they feel happiness and a purpose for living. This is why groups such as neighborhood associations cannot be abandoned; however, it is best to have families and male-female monogamy because they strengthen these groups. I guess this is my conclusion.

Masuho Regardless, it appears that the inherent nature of selfish gene-holding humans is families based on blood relations (parents, children, grandchildren, etc.) as the basis for happiness and joy. Despite this, the necessity to maintain these ties has decreased, and since today people can live autonomously, the collapse of family ties and the aforementioned sexual behavior (i.e., sexual joy that does not lead to children) have become pronounced. This is because choice, or the degree of freedom, has increased considerably, and this itself is probably desirable. Conversely, people feel that this

deviates from human happiness, probably because of stress that arises from inner emotional discord and conflict, which originates in the contemporary social system that is based on free competition. I would like to touch upon this in Chapter 8 ("People's Dissatisfaction and Unease"). Furthermore, while it is probably difficult to do in today's society of free competition in a limited resource environment, I would like to propose in this conversation a social organizational system in which individuals do not become isolated, belong to groups of about 50 people that can satisfy their desire for cooperation, and can live happily (See “Conclusion”).

While this is somewhat beside the point, people today are very negative with regard to euphenics; it is banned in most countries' laws. For example, it is illegal to genetically modify a human; however, is there not the possibility that if a large worldwide war occurs, these rules will be abandoned in pursuit of victory? For example, what about during the Cuban Missile Crisis?

Yamatō That was dangerous; however, in some ways, today's institutions have reached a deadlock. In the past, wars occurred every 60 to 70 years, and so when systems became deadlocked and had nothing but harmful effects, they would be recast through war. After war, there is a completely new start, new energy emerges, and new eras are born; however, from now on, I do not think there will be much war. I think it would be difficult for a war to happen like World War I or World War II, which turned the world social system and institutions into a blank slate. Thus, I think it would be hard to make, for example, the financial system (which is reaching a deadlock) into a blank slate. What kind of reform is necessary, then, to live through the next 50 or even 20 years? Reform methods are a really difficult topic. But I think that the system should be the self-sufficient and self-sustaining system that we mentioned earlier.

Chapter 5　Stratification: A Society Troubled by Wealth Disparity

Guernica. Painted by Pablo Picasso (1881–1973) to symbolize the people tragically harmed in Guernica (Northern Spain), an area that suffered air raids in 1937 during the Spanish Civil War. Even today, there are people throughout the world who are exposed to similar situations.

<Issues Surrounding Wealth Disparity Today and the Desire for Money, Power, and Fame>

Yamatō News regarding wealth disparity, power, and money flood the newspapers. A typical reaction to wealth disparity was Occupy Wall Street, which began in 2011, as poor young Americans argued that those on Wall Street were monopolizing wealth, and that the monetary distribution system of the world should be made more equal. Examples of individuals who personify skewed wealth distribution include developer Mark Zuckerberg, who received 1.5 trillion yen when the stock of Facebook went public, and Bill Gates, whose fortune is now worth 6 trillion yen.

In the United States, there are many other examples like this, such as steel magnate Andrew Carnegie and oil magnate John Rockefeller (Figure 1), who also became incredibly wealthy. However, these two individuals established Carnegie Hall, Rockefeller University, and the Rockefeller Foundation. In this way, the American Dream allowed them to make money by setting up industries and technologies, but also enabled them to establish philanthropy in the service of others. In the past, however, people who worked under the steel and oil magnates were made to labor under incredibly severe conditions, and some thought that they were being exploited. People like Bill Gates and Mark Zuckerberg, on the other hand, made money by developing technology. One could say that this shift is due to the increase in finance capitalism of recent years. The desire for wealth, money, and so on were seen as positive attributes of the American Dream. As a reward for behaving in accordance with the public's opinion of the desire to obtain money, power, and fame, people like Carnegie and Rockefeller—at the expense of other humans—became very wealthy, and have been recognized by society.

Figure 1. The Rockefeller Estate

There was also Nazi Germany's Adolf Hitler, who embroiled the German people (who had been defeated in war) in a fanatical maelstrom, obtaining power but ultimately driving them into a horrible war. During the recent United States presidential election, I was amazed at how the fever of the electoral battle was a product of the desire for power; in other words, the desire to become President, as the public recognizes and reveres those who gain this office. While of course as President one has immense responsibilities, must work hard, and possess certain abilities, the desire to become President and receive public recognition does arise in people. Recently, the desire for power, money, and so on has become pronounced and is emerging as a

global problem.

Wealth disparity, one of the manifestations of such desire, became an issue in the form of Occupy Wall Street as well as the severe unemployment of youth in Greece. Why do wealth disparities arise? Finding measures that can eliminate or solve wealth disparity in some form would be very welcome. What do you think?

For example, before *Homo sapiens* appeared, what kind of lives did *Australopithecines* lead after they emerged and started engaging in hunting and gathering on the Savannah? Was there wealth disparity, stratification, power, and so on?

Masuho There is a statistic that 50% of the United States' wealth is held by just a small percent of its population. In fact, 35 of the 80 richest people in the world are US citizens. This relates to the Occupy Wall Street issue. In Japan, while the degree of severity might not be identical, during Prime Minister Koizumi's administration (2001-2006), the misdistribution of wealth became greater and greater.

I think this arose from the opinion that disparities are fine if the country comes out ahead in competition. But if competition becomes fierce, laborers may be forced to engage in severe work while receiving a disproportionately low income. If this situation is driven to its limit, events can occur that overturn the foundations of civil society.

Yamatō That's right. This is not only true with regard to the United States and Japan, but, looking at the world, it is also the case with regard to problems between countries. While not only the case of the Arab Spring in 2010, certainly in the case of tensions in Africa and the Middle East, and so on.

Masuho In North Korea as well, despite the fact that the people are forced to live in tough conditions, if the government launches a missile aimed at the United States in an all-or-nothing shot, something horrible could happen on a global scale. It seems that, recently, the North Korean government has been making statements that they are going to do something like this.

<The Origin of Stratification>

Yamatō When did the stratification of people—which is characterized by wealth disparity, power, fame, and so on—start, and how did it evolve into what it is today?

Masuho I think it's really deeply rooted, and we'll talk about it later when discussing capitalist and monetary economies, but let's recall how groups were created when *Homo sapiens* began to settle in one place. When these groups were only about 50 people in size, members were unable to do things like compete with each other and lie; however, when the groups grew larger than 100, and then even 1,000 people, it became necessary for people in positions of power to exist.

Yamatō When groups were comprised of between 50 and 150 people, since people

could be more aware of each group member and keep an eye on each other, things were equal, is that right?

Masuho That was an important factor. If someone did something like take the entirety of a hunt's catch for himself, he would eventually be discovered and surely punished. The group size in which such relations can be maintained is between 50 and 150 people, but no more than that.

It was surely not the case that in groups of approximately 50 people certain people were seen as consistent power holders. There were days in which several deer were caught thanks to actions of the entire group, and other days in which a big mammoth would be taken down with everyone's cooperation. In each case, different people would excel. People's individual share of the catch might have changed a little bit each time in accordance with their accomplishments, but things wouldn't work out if only a few power holders had privilege and always got a big share.

As I said before, when groups grew larger and had several hundred members, they exceeded the upper limit of humans' ability to recognize each person, which is 150 people. These larger groups, then, could not be unified if someone like an "alpha male" (the highest male in the order) did not emerge to lead. It appears that this is why power holders emerged and religions appeared to justify this power distribution.

What happens when the size of human groups reach the high hundreds or even 1,000? We must examine this specifically in the current world. When groups first became this large, division of labor arose: some people were very skilled at hunting, others were very good at creating hunting strategies, and others excelled at making bows and arrows. It seems that after different types of labor were divided, priests ended up having a lot of power. Those closest to the gods or God would, for example, predict what should be done in order to have a good harvest, decide people's social status, determine where their groups should move, and so on. In this way, it seems that the stratification of people progressed with priests at the top.

Yamatō When human lineage first emerged, people were able to successfully live in groups of 50 across a wide expanse of land. This allowed the groups to move around as much as required. What was the cause or origin, then, for groups to grow to include hundreds or even 1,000 people, as we discussed earlier?

Masuho It would be because about 10,000 years ago people became able to engage in agriculture. Many people can be supported with grain, and it also can be stored. Furthermore, permanent settlements gradually took root (Table 1).

Table 1. Changes in the World's Population (Based on data from the Japanese Ministry of Environment)

Time period	Event	Global population
60,000 Years Ago	Leaving Africa*	<One Hundred
10,000 Years Ago		Four Million
5,000 Years Ago	Spread of Agriculture	30 to 100 Million
2,000 Years Ago	Height of the Roman Empire	200 to 400 Million
17th Century		Approx. 500 Million
19th Century		1.1 to 1.4 Billion
1950		2.5 Billion
2000		6.1 Billion
2010		6.9 Billion
2050		(9.2 Billion)

* *Homo sapiens*, who emerged 400,000 years ago in Africa, journeyed off the continent, expanding into the Middle East and then other parts of the world. They first left Africa between 50,000 and 60,000 years ago, which we have termed "leaving Africa." (See Figure 3 in Chapter 1, "Appetite.")

Yamatō With the invention of agriculture, of course, people were forced to settle in one place. Thanks to this, yields increased and the human population was able to grow. With this increase in population and stability of settlements, people were able to start accumulating wealth. This is the very reason that even groups of 1,000 people were able to succeed. When this happened, however, the cooperativeness of 50-person groups that existed during hunting and gathering times weakened somewhat, as a small group size became less necessary. When division of labor in these large groups—one could even call them anonymous groups filled with strangers—began, how was morality, or should we say control, maintained? Was this done by religion and priests, like you said earlier?

Masuho If a priest, as the representative of a particular religion, says that a guy is deceiving people, it is accepted as absolutely correct. Since priests are people working in the name of religions that generally started thousands of years ago, they surely had considerable power. Priests' wealth accumulated, and they were able to buy slaves. It appears that during the time that pyramids were built in Egypt, there were many slaves in popular society.

Yamatō That's right. Thinking about it today, we can see that despite people being of the same human race, there have been times throughout history of considerable stratification: from slaves to everyday citizens, and priests to leaders, those in power, and so on.

Masuho You are saying this arose after religion had come into existence, but surely there must have already been stratification 10,000 years ago, correct?

Yamatō Likely, at the time that religion came about, things like the desire for power and money were already clearly appearing. Maybe this was because the necessity of cooperation between approximately 50 people had grown weaker. It's the same today.

Masuho Japanese people have only a very weak awareness of other Japanese people

as compatriots. This is because it's a peaceful era where there is no clear external enemy.

<The Origin of the Negative Image Surrounding the Desire for Money, Power, and Fame>

Yamatō Since the necessity of cooperativeness has decreased, perhaps the people's awareness that they have to be cooperative has lessened. Why, despite inherently having a desire to be cooperative, do people instead have a greater desire for money, power, fame, and so on?

Masuho This can be understood if one reflects upon one's inner self. For example, in order to raise a family, one must engage in undesirable tasks. However, if one suddenly wins the lottery and receives 200 million yen, one would only engage in jobs that one likes and pay someone else to do the undesirable tasks necessary for raising a family. Since the desire for power and money is related to the security of one's life and family, everyone has it hidden within them. The conditions for fulfilling the three biological instincts of (1) eating, (2) not being eaten, and (3) leaving offspring are fully provided by power and money.

Yamatō However, even today the words "power" and "money" sound kind of ignoble. Where does this come from? As I said previously, starting between 5 million and 7 million years ago, a situation arose in which there was no choice on the Savannah but to try to survive in groups of approximately 50. At the very least, from when *Homo sapiens* emerged 400,000 years ago, they couldn't survive without cooperating. This is the very reason how and why humans are made to feel happiness when cooperating. Still today there remains an innate desire for cooperation. We feel that cooperating is fair, and not cooperating is unfair.

Masuho In what situations do people today feel the joy of cooperating? In my case, I really feel it when I'm with the group that is my family. In families, cooperative relationships are fostered; for example, I know that if I don't provide financial support, my family won't be able to carry out its daily life, and my children know that if they fail to pass on to the next grade at school they will be ill-prepared for life and disappoint their parents, and so on. However, a big framework that goes beyond the family is very weak in today's world, in terms of providing joy through cooperation.

It just occurred to me that our conversation has come together nicely. Our discussion has primarily focused on the cooperative nature of humans, wherein people have a desire to cooperate with others and are happy when others recognize that they have done so. In groups that are approximately 50 people in size, people are directly told that they are good people when they are recognized for cooperating. This makes them happy. This happiness leads them to want to cooperate again. Since the advent of settled agriculture (approximately 10,000 years ago), however, anonymous and large

1,000-person groups appeared, and this type of information no longer spread easily. Thus, measures that substitute for direct recognition became necessary. Surely these were power, money, and fame, provided as rewards when everyone recognized that someone cooperated. Is this recognition not why people feel happy when they obtain them? In an unrestricted environment, a "good-natured" strategy predominates, and everyone is cooperative and can be trusted, which is probably why people generally did not become attached so much to the likes of power, money, and fame. This is because everyone is recognized as a "good person"; however, in the case of a restricted environment, a "selfish" strategy reigns supreme. Even so, when the groups people belonged to were clear (even though the size of the people was far beyond 50 people), was not the level of one's cooperation apparent to everyone? For example, consider Caesar (who in Roman times wrote *Commentaries on the Gallic War*), Oda Nobunaga (who advocated bringing all of Japan under one sword during the Warring States period), and Genghis Khan (whom we discussed in Chapter 2, "Sexual Desire"), all of whom were considered heroic leaders by the groups to which they belonged. Everyone probably recognized them, and they seem to have been able to obtain power, money, and fame. It can be imagined that everyone accepted this, and contributed to the groups under these leaders to fulfill their desire for cooperation. However, now we have entered an era in which there is an awareness that all humans are part of the same group as human beings (*Homo sapiens*) on our earth; in addition, it is easy for people to live on their own thanks to increased productivity. The necessity of having a group to belong to has become weaker and unclear. Put the opposite way, in a society of free competition, everyone is (in a sense) an enemy. However, people still have a desire to cooperate and, as a result, to be recognized by everyone. Is it not the case that in the absence of trusting relationships, people want to obtain power, money, and fame (measures that show one's approval by others) to confirm that they have been recognized by everyone? In other words, it appears that the pursuit of power, money, and fame has turned into an end in and of itself. Particularly in this era of free competition in which "selfish" strategies are predominant, behavior to obtain power, money, and fame through selfish or unfair strategies that may harm surrounding people has become commonplace. When this happens, the general population does not see these individuals as “good people,” which leads to negative feelings such as anger or envy (see Figure 3 in Chapter 8, "People's Dissatisfaction and Unease").

Yamatō That makes sense. Thus, today, it's impossible for heroes and such to appear. If a hero does appear who can be recognized by everyone, at best it might be someone like a leader of an army at an emergency situation of space war, such as movies we often watch and novels we read as SF.

Masuho Of course, even today there are many people who, while not reaching the level of heroes, individually merit recognition as being truly wonderful for cooperating with others and contributing to society. While it is hard to make a judgment about

power holders, when it comes to rich people, for example, there are modern-day examples such as Thomas Edison, John D. Rockefeller, and, even more recently, Steve Jobs and Japan's Konosuke Matsushita. Based on their own efforts and ideas and backed by a company or organization, they created things that were useful for everyone and, as a result, made money. While they are rich, I think that surely many people see their wealth as valid, and that they are worthy of their positions and wealth. Though people might get upset with regard to the extent of their wealth, seeing it as too extreme. With regard to famous people, there's probably no one who would be against praising Newton and Einstein as remarkable natural scientists; similarly, in the world of politics, Chiune Sugihara extended a saving hand to Jewish people who were persecuted by the Nazis. There are truly many examples in general society also, including the behavior of the Korean person and cameraman at Shin-Ōkubo Station (discussed in Chapter 3, "Desire for Cooperation"). In the arts there are too many examples to mention, along the likes of musicians Beethoven and Mozart, painters Renoir and Picasso, and so on. In various fields of thought, such as philosophy, social sciences, and humanities (to which this discussion belongs), many examples of famous people can be named.

Yamatō I'm convinced. However, recently, in the context of the current restricted environment, selfish strategies are becoming more and more predominant, resulting in rich people who are the object of anger and envy; for example, with regard to power, this can be seen in various active politicians. I think there are many awful people amongst the rich lot, particularly those who manage large companies: Tokyo Electric, which ran the Fukushima Nuclear Plant; JR Hokkaido, which was implicated in the famous derailment accident in 2013; Enron and Lehman Brothers, which sent the world into a panic due to their bankruptcies; fund managers who, for a period, enjoyed themselves in Japan, making lots of money while harming society by manipulating the economy. These people and companies have become targets of public anger. In contemporary times, however, this kind of unfairness has become allowed. In the world of the natural sciences as well, competition has become cutthroat; for example, it seems there were dishonest practices regarding the 1953 article written by Watson and Crick that is seen as having started molecular biology with the proposal of a double helix-structure model of DNA. It's possible that Watson might have written *The Double Helix* in 1968 because he felt guilty.

Masuho It appears that recently in all fields—politics, society, science, and so on—the restricted environment has cast its shadow, and terribly selfish and unfair practices and events are occurring. While paradoxical, this is because it has become almost expected for people, even if they (for example) selfishly push someone else down the stairs, to try to snatch recognition for having cooperated to do so. This is due to the influence of power, money, and fame—which were originally supposed to be rewards for one's cooperation—having become ends unto themselves.

Yamatō It thus becomes ridiculous, because to obtain power, money, and fame (which are equivalent to being recognized for helping everyone and being a good person) in this society of free competition in a restricted environment, one must compete, deceive, and push others aside.

I think that humans are born with a sense of fairness. Despite this, the contemporary need to belong to and cooperate within a 50-person group has gone away or become unclear. Now, in the context of this intensely competitive society, people are competing against a nameless mass of 7 billion people. In this way, the dichotomy exists for people to have a sense of fairness and desire to cooperate while at the same time be encouraged and recognized for differentiating themselves with power and fame.

Masuho If one thinks about cases in which one has been subject to selfish acts based on others' desire for power and money, it appears to be unfair, no? However, if a company president wants to encourage high performance of his or her employees, the president might establish something like an award in an effort to create a power order amongst them, or change how bonuses are assessed to motivate them. In most any organization, sometimes people are appalled at the standards used to differentiate people, but one way or another, this arises as an approach by the people in charge who are trying to enact change within their organizations.

In this way, power, fame, and money are, in the end, connected to differentiation. The aim is to create differences between people and encourage them to compete. However, the desire for cooperation is fundamentally supposed to be a voluntary feeling of contribution to the group one belongs to, and competitiveness is supposed to be reserved for rival groups.

Yamatō That's right. In this restricted environment, in which selfish strategies reign supreme, one must compete even if that means betraying people within the same group. This leads to actions appearing motivated by an attempt to gain just public recognition, and people often feel guilty about them. In other words, the competitive principle in contemporary times is opposed to the desire for cooperation; thus, it is accompanied by guilt. I think the guilt and sense of injustice that go against people's innate sense of fairness weigh down their hearts. This is probably the cause of people having a negative image of power, money, fame, and so on, as a way to differentiate oneself.

<Future Image>

Yamatō It appears that this kind of desire, aimed at differentiating oneself, goes against the joy of cooperation that appeared as part of human nature during evolution. In the end, I'm most concerned about this feeling of happiness; therefore, I hope the causes of the contemporary desire for fame, power, and money can be changed. It

would be ideal if 7 billion people could lead lives that encourage and sustain the joy that follows the inherent nature of cooperation within humans.

Masuho Looking at the history of humankind up until the present, I think this problem has been difficult to avoid. We need to once again create a way of recognizing people's contributions that does not take the form of power, money, or fame. Furthermore, on a more fundamental level, is there nothing we can do to change today's free competition society system into something else?

When groups first grew large, power became synonymous with religion. Anecdotally, if an alien looked at Earth from above during this early period and saw various large buildings, almost all would have been structures of religious groups. I think that religion is still a significant source of authority. There's Buddhism, Christianity, Islam, Hinduism, and so on. When religions are divided in this way, there are always seeds of conflict among them. The English word for religion comes from the Latin word "religãre," or to reconnect. This can be seen within a particular religious organization, but it is difficult to connect different religions to one another. Instead of religion serving to connect people, it seems as if there is nothing fundamental that everyone in the world can share. With regard to this, sociobiology might be necessary, which we'll touch upon in Chapter 10 ("The Fusion of Academic Fields").

In this sense, having understood the evolution of *Homo sapiens* and the behavior of animals, people would seek a direction that utilizes the human nature we're born with, which can't be changed in a short period of time. I think that if this happens, a communal empathy will arise that is unrelated to religion, race, or country. This kind of natural sciences-based humanities, or the orienting of intellectual thought in one direction, is an approach that can stand up to the desire for power, money, and fame.

Yamatō I completely agree. Religions today are mutually antagonistic; they're narrow, and only count a select group of people as followers. I think that religions today should each rework themselves and unify into something that widely encompass all people. With regard to this, in some form (a prime example being this book), a kind of religion should be spread based on humans as organisms. It could be the nucleic acid circle or nucleic acid religion that I sometimes speak of, or perhaps it would be best not to use the term "religion" and instead call it scientific knowledge. I think that the future will be the creation of rules based on knowledge that can be shared.

Masuho A kind of principle or concept that does not change every 10 or 100 years, appears the same to all races, and can be shared even by those who speak different languages will ultimately become one of our universal foundations. This is one of the big themes of our discussion.

Yamatō Exactly. I hope to be able to present to everyone a scientific basis or foundation upon which to rely. While it would be best if we were able to describe a future in which everyone can become truly happy, it does appear to be an extremely

large job, so I would like to at the very least present some suggestions for people to think about.

Masuho I'd like to now summarize this future image. It is necessary for individuals in contemporary times to rationally and firmly control their desire for cooperation as well as their desire for power, money, and fame (which were originally supposed to be rewards for cooperation). This is similar to what I said in our discussion regarding appetite and sexual desire. This control leads to an awareness of fairness and morality, and even in the contemporary world becomes a source that supports cooperation. It also appears that within the context of a restricted environment, a social organizational system that can limit free competition is ultimately desirable. This book proposes self-sufficient and self-supporting spheres.

<Regarding Religion>

Yamatō One big problem in society today is the issue of religion. On September 11, 2001, Islamic fundamentalists crashed airplanes into the United States' World Trade Center buildings in New York City. In response, US President Bush said that Saddam Hussein was the bad guy and went to war with Iraq. This is just like the Crusades in 1095. But when did religion arise in human history?

Masuho Since it is hard for religion to remain in a solid form such as fossils, people infer and surmise the existence of religion based on murals, tomb furnishings such as flowers next to buried corpses, and so on. This makes it difficult to answer the question of when religion officially arose. Since religion is abstract, it requires some form of language through which to disseminate its teachings. Taking this into account, could we not say that religion in a comparatively clear form emerged between 10,000 and 5,000 years ago? Christianity and Islam are both religions that emerged approximately 2,000 years ago in desert-like environments, where there were intense conflicts between tribes. In this context, it was necessary to create some sort of rules in order to achieve unity. Religion was unavoidably exclusive and an important set of rules for unifying a group.

Yamatō So religion was born as something that brought together one's group; however, it also encouraged groups to fight and counter other groups that it labeled as enemies. This sense of differentiation heightened unity and gave people a feeling of exaltation.

Masuho In comparison, Buddhism, which was born in India, is not that exclusive, and while some sects in Japan do have strict rules, in general they are fairly relaxed.

Yamatō Buddhism is particularly concerned with why people suffer and die, and how to avoid the conventional sense of death. In a sense it's like a philosophy.

Masuho What religions share is the belief in a God who saves living beings from their unavoidable death and leads people to a paradise in the next life. Priests and sheiks

are given a bit of this same type of authority. While religions are followed by some portion of the world's population, what kind of meaning do these religions have for today's society, for people today? They are not all filled with goodness.

But people, like other animals, all will die. With regard to this death, religions preach, "There is a paradise, God will guide you. Therefore, live properly." This is very persuasive.

Yamatō However, I think that people these days who are properly educated don't believe in things like God and heaven.

Masuho Really? I think that for maintaining one's peace of mind, it's better to believe in religion and God. But it might be good if there was another thing that could take the place of this belief in intangible reward and support people's hearts.

Yamatō I think that people who believe in religion and God are at ease in the world today; however, a considerable number of people are realizing that, in the end, there is no God or heaven. They are anxious because they're educated. In this way, there is a need for a fundamental principle that can lead the next era, as we discussed in our above summary.

Masuho The difference between religion and this new concept will be that the latter will not erect a God and highlight the premise of a world after death, no?

Yamatō That's exactly right. While I'm not sure if it's okay to say this, in this sense, as a life scientist, I think the next era will be guided by a nucleic acid religion. Around when the Earth was created, bases (elements that make up nucleic acid) and amino acids (the materials that create proteins) fell from outer space. They polymerized and self-propagated. They came to have membranes, then cells were created, and cells came together to form organisms, of which we were the eventual descendants. Of course, you learned biochemistry in the same way, no? Because of this, I have come to think that the rebirth of which the Buddha speaks is correct. We take in nourishment, then metabolize and excrete it. This becomes fertilizer for plants, and then we eat these plants. In this way, elements like carbon, nitrogen, hydrogen, and oxygen that constitute our bodies go around and around. They're being reborn.

Masuho That's the food chain, whereas the "rebirth" spoken of in religion refers to the kind of thing where a person dies, is reborn as a horse, the horse dies, becomes a persimmon tree, and so on, no? Personally, I see it differently than you. While I do not speak about this often, I think that on the one hand there is the organism ("me") that can be looked at from the perspectives of biology, evolution, ethology, and so on. It's the "me" that can be explained from a material science perspective. However, not everything can be explained by this. There is also the "me" that can only be understood by positing it within a perspective that one cannot fully grasp. I feel like it would be conceited to try to explain things only with material science.

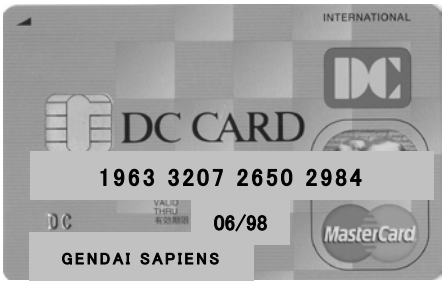
Yamatō Ah, really? However, if one looks at the currently existing religions after having learned biology, one ends up wanting to denounce their answers as overly

simplistic. I believe that there's absolutely no way that hell and heaven exist.

Masuho There is a definite gap between religion/the existence of God and material science; however, I feel like there's something arrogant about declaring that there is no way this kind of thing could exist, about saying that everything can be explained by the science that one knows. In the future, there may be things that become clearer through new ideas that do not exist yet, so I don't think an answer can be provided as to whether this kind of biology will elucidate everything.

Though we're both life science researchers, the two of us have differing opinions about religion; however, it is appropriate to respect each person's thought with regard to religion. Due to the development of science in the future and changes in society, religions themselves will probably change in tandem.

Chapter 6　The Merits and Demerits of Money: An Economy at Its Mercy



On the left is a four-drachma silver coin (depicting the female god Athens) that was used around 490 BC in Greece. On the right is a credit card, one of the representative forms of modern money.

<Contemporary Issues Related to Money>

Yamatō Contemporary society is described as and criticized for being a money-based society, financed by capitalism, and so on. I would like to talk about how this monetary economy was born, its historical and current problems, and what could be the best way to reform it. As a life scientist, I don't claim to be an expert in the economy, so bear in mind that I will be discussing the topic based solely on the limited knowledge I possess.

When did today's monetary economy—particularly its finance capitalism—begin, and what are its problems? As can be seen by the Greek financial crisis (which has been a hot topic in the news since 2010), bad loans, and the Argentinian currency crisis we have reached a situation in which the world's money (such as oft-mentioned derivatives) has internationally shifted to economically weak places and, on a country-level, scaled to be worth hundreds of times these countries' own funds. This creates a "bubble" that often results in a country's economic bankruptcy. Furthermore, there will always be people who get rich by gathering a certain percent of interest off of this capital. In general, today's finance capitalism has created a society in which money gives birth to more money. The Euro remains problematic and the US dollar is weak against most other global currencies. The negative result is that the monetary economy—particularly finance capitalism—is not kept in check (Figure 1). Due to this, youth in many countries suffer from unemployment, and developing countries such as nations in Africa find it difficult to break free from harsh situations. The problem today is in the system wherein money gives birth to more money, as it is not able to be controlled. When did this money-based economy (and, actually, money itself) begin and where is it trying to go? Also, what can we do to ensure that humans can attain happiness?

Figure 1. Children who lost their houses and became drifters due to The Great Depression (c.1929). After the Great Depression, the modified capitalism of Keynes began to emerge. (From Wikipedia. Photograph by Dorothea Lange.)

<The Origins and Nature of Money>

Masuho In hunter-gatherer times, people exchanged items as currency; for example, a fishing village would trade with a large-game hunting village. However, there were probably various difficulties with this system: it is strenuous to carry things around to be exchanged and it is hard to know the ratio at which fish and large game should be traded. Eventually, in Ancient Greece (i.e., the BC 5th or 7th centuries), silver coins were invented. People would decide that fish is worth X

amount of silver coins, a currency that could be brought anywhere. As such, silver coin-based trade (i.e., credit) came into existence. During the powerful Roman Empire, people began to use diluted silver coins as money rather than coins made out of pure silver. Because of the perceived power of the Roman Empire, lots of goods could be circulated even if the physical money itself did not have a very high value.

Today we have adopted paper money as one of the primary forms of credit, and it has come to be used in massive amounts throughout the world. Before long, however, people will stop using even paper currency, as there are individuals today who pay for things only with a credit card, manage their assets in the form of company stock, and so on. This leads to people who essentially do not own tangible things and engage in transactions based only on credit-based money. As mentioned above, money gives birth to more money and things are taken care of solely through the exchange of it. As a result, it can be no longer seen whether or not physical goods or currency are truly being made. I think that this is a problem.

Yamatō Of course, before people exchanged things, they were self-sufficient and self-supporting. In groups of approximately 50, society was more self-sufficient and self-supporting; however, when the number of villages on Earth increased and they began to neighbor each other, labor could then be divided between them. This was probably the beginning of fixed settlements that were comprised of multiple groups.

In this era, when crops such as wheat and rice were exchanged, they would go bad. (This is called depreciation. As time passes, common products go bad or expire, rust, corrode, and so on, which causes their value to decrease. This means that they cannot continue to be sold at their original price; hence, this decrease is called depreciation.) When silver coin money was invented in Ancient Greece, it was very convenient. Why did this precious metal come to be used as a shared resource for exchange?

Masuho I also don't know the circumstances that led to the birth of silver coins as a common currency, but in Ancient Greece there were vast deposits of silver ores. They were able to develop technology to smelt pure silver from this raw material; however, this resulted in the deforestation of trees surrounding what are now Greek ruins. These trees still do not grow today.

Yamatō Did people think to use silver as currency because it shines brightly and is pretty?

Masuho Its value is in its rarity, and it is also easy to mint. Also, it was notable at the time for not rusting. This meant that it does not quickly depreciate, causing traders to lower their prices. Not only did it not rust (go bad), but silver coins were light and could be brought along on trips to neighboring villages. This convenience was also important.

Yamatō Money is certainly convenient. But I wonder *why* it's good because it doesn't go bad? In the future do we have to use something else that doesn't go bad or

depreciate as our common currency? Precious metals indeed don't go bad, so if this is the very reason that they are used as money, it might be impossible to introduce something new. No matter what, money will continue to be more advantageous than commodities or goods.

But back to the previous question: Why did silver coins take root as currency in Ancient Greece? Is there anyone who has figured this out?

Masuho I don't know the historical circumstances, but one can easily image how this happened. As I mentioned earlier, they are easy to carry, and if the value of things is decided—for example, this tomato is three silver coins, this fish is four silver coins, etc.—then people can easily engage in trade anywhere. It's convenient.

Yamatō In that sense it is very convenient; however, conversely, this convenience surely arises out of the coins' nature as something with a value that does not change in relation to time (it does not depreciate). Say that today tomatoes are bought and sold for a certain price. It would be very inconvenient if tomorrow or a week later when I go to another shop to buy tomatoes and the value of my money has changed. Does that mean that it is impossible to create a system in which the value of money changes in relation to time, or the depreciation or reduction in the value of money?

Masuho That is surely not the case. When people have paper money or coins, it is hard to change their value. For example, in the case of the latter, it would be impossible to, as depreciation, require people to cut off part of a coin they obtained a week ago and give it to a public agency. But if one truly wants to depreciate money, then, one can establish a system nowadays that, for example, uses a computer or algorithm to automatically decrease the value of money by a certain percentage.

Yamatō In Ancient Greece, precious metals like silver and gold were used as coins because they were easy to carry and could be used for anything, such as trade, influence, and so on. This means that their intrinsic nature had a basically unchangeable value. People couldn't do stuff like shave off parts of gold coins.

Masuho In Ancient Greece they always used pure silver, no? Then, in Ancient Rome, coins changed: Even though their silver coins had a low degree of purity, the Roman Emperor personally insured them.

Yamatō So there is a little hope. When using things like silver and gold coins, it is virtually impossible to change the value of money in accordance with time; however, if things are bought with credit cards or representations of money, it is possible to automatically depreciate money through the use of information technology.

<The Origins of Capitalism: Freedom, Equality, and Fraternity within a Freely Competitive Civil Society (Humanism)>

Yamatō Wonderful. So, money existed from the time of Ancient Greece, when cities were born; however, capitalism emerged much later. I think that this capitalist era

can be understood as free competition.

Masuho The problem in a monetary economy is that "it takes money to make money." Since money gives birth to money, in the end, those with money rule over the workers who don't have it. This works only while people are willing to put up with this system, but people throughout the world today might no longer be so tolerant.

Yamatō Exactly. I think that competition has grown fierce in this capitalist society because all people are more or less members of the same civil society. In past societies that contained slavery or a feudal system, humankind was divided into clear and disparate classes. In Japan during the Edo period (1603–1868), there was the four-class system, comprised of warriors, farmers, craftsmen, and tradesmen. Antagonism between classes could be kept considerably in check due to the strict class framework, and people acknowledged and accepted it, with some published works citing a general feeling of happiness when people carried out their lives within their class. This enabled a fairly stable economy.

However, in Europe, when a capitalist civil society began in tandem with the idea that everyone is equal, of course people were feeling unhappy with the fact that classes were different, and rebellions occurred. There were even social revolutions. Capitalist society eventually emerged victorious and, eventually, everyone became equal in principle, and civil society appeared. This was a wonderful thing; however, when everyone became equal in capitalist society and began to freely compete with each other, this competition became very fierce. As a result, inequality that arises from competition has become problematic.

Masuho So out of this historical background, monetary economy-based free competition grew intense.

Yamatō In Chapter 3 ("Desire for Cooperation"), I talked about how, in the "prisoner's dilemma," people are likely to adopt a selfish strategy under restricted

Figure 2. During the French Revolution between 1789 and 1799, which followed the Age of Discovery, people ascribed to a form of humanism characterized by freedom, equality, and fraternity. On the left is a painting of the French Revolution by Delacroix entitled *Liberty Leading the People.* On the right is the French flag.

conditions. I think that if one studies the life sciences and evolution and understands this principle, one can use it to explain both economic situations and human activities. For example, it's useful for explaining general social science phenomena such as

competition within capitalism and a monetary economy. It is my hope that by taking another look at a finance capitalism-based society with this principle in mind, we'll be able to see what kind of future measures can be taken to fix problematic situations. Classic examples are found in countries' economic activities and systems during the Age of Discovery, which are described in more detail in the footnote at the end of this book. In an effort to escape the rut that medieval European feudal society found itself in (characterized by a population increase and the solidification of classes), people started taking an interest in the teachings of Ancient Greece and Rome, which is why this period is called the Renaissance, or "rebirth" of this learning. Eventually, due to the discovery of the New World, the Age of Discovery began. It appears that this brought about an unlimited resource environment (albeit temporary) for people in the Old World, and they began to enjoy economic growth and a "good-natured" distribution system for wealth (See Chapter 3, "Desire for Cooperation") in their economic activities. Of course people in the New World, Asia, and Africa were in many cases forced to lead tragic and unhappy lives, but with the spread of a good-natured strategy in the Old World, the French Revolution's principles of freedom, equality, and fraternity appeared (Figure 2). This was an epoch-making event for the following reason. Organisms had, following the fundamental principle of selfish genes' pressure to reproduce, basically lived freely, reproduced, evolved, and diversified based on natural selection and their ability to reproduce in an unrestricted environment. In order to liberate humans from the fetters of slavery and feudalism, the French Revolution reconfirmed and declared that people are all essentially the same type of organism and, as such, are free and equal. In economic activities as well, free competition or capitalism spread in accordance with this principle. The most straightforward example of this is probably the economy lead by what Adam Smith called the "invisible hand" in 1776. One could describe it as a principle that values freedom in the context of an unrestricted environment; however, a significant part of history was surely characterized by competition in a restricted environment, in which a selfish strategy reigned supreme. In Egypt, Ancient Greece, and Ancient Rome, there was slavery. Subsequently, in medieval Europe there was a feudal society with a class of serfs. Then, as I stated previously, in Europe there was the French Revolution (a people's revolution) after the Renaissance. And it now appears that on a worldwide scale, a harsh restricted environment has already emerged.

Masuho From the Age of Discovery onwards was an era of colonialism in which countries competed with one another. People in so-called underdeveloped countries were truly exploited; in addition, the bourgeois class rose thanks to mercantilism, the French Revolution occurred, and the industrial revolution spread, kicking capitalism into full swing. Then, there was the Age of Empire, in which countries went to war with each other over competition for resources. At the same time, economies developed thanks to multiple epoch-making technological innovations that created temporary

economic situations that resembled unrestricted environments. Each time this happened, countries would scramble for and then subsequently deplete various types of Earth's riches, leading to economic activities within severely restricted conditions. For this reason, over the course of time, selfish behavior came to be pronounced.

This directly connects to the era of finance capitalism in which we find ourselves today. Until recently, information-related goods and services lead industry as a new field (thanks to an IT revolution) and allowed people to move money incredibly quickly on a large scale. However, Earth today is considered a restricted environment; for example, consider the rare metals issue in China, the drying up of oil, and the CO_2/GHG problem. On the other hand, due to the IT revolution, only money is able to behave freely. Earth's various resources—which really should be divided up or bought by exchange with the money—are almost depleted, while money (tangible and intangible) is rapidly increasing. That's the current situation. I'm talking about this in the hopes that when understanding our current state from this perspective, ideas for how to address this monetary and capitalist economy in the future might appear. My point is as follows. In unrestricted conditions, everyone talked about "freedom," and free competition advanced; however, today there are restricted conditions on a worldwide scale. Is this "free competition" really okay? Today, should we not put some breaks on this "freedom"? That's my point.

<Money's Harm and What Comes After Finance Capitalism: The Possibilities of Free Money>

Yamatō I am afraid that creating a shared currency that can be used throughout the world might be impossible. It's also kind of disappointing that, despite European countries' attempt to develop an economic community in the form of the Euro, it is about to blow up in their faces. In a way, this leads to a pessimistic sense of crisis; however, I think humankind will go—I would like it to go—toward unifying the world's currency in a form similar to the Euro.

Masuho If the world shared a single currency, would workers no longer be exploited, and would money stop giving birth to money?

Figure 3. The cover of NHK Publishing's *Ende no Yuigon* ("Ende's Last Message"). Michael Ende thought highly of Gesell's idea of "free land and free money." According to this book, some small villages (in Austria and many countries in the world) are experimenting with free money.

Yamatō No, that wouldn't happen. Even if a shared currency was created, of course people with a great deal of money and workers (without much money) would be different. In this sense, it would be the same as the current situation. Rather, I think that the depreciating currency that you

spoke of earlier is the key factor.

Here, I'd like to introduce Silvio Gesell who lived at the same time as Marx. Unlike communism, he thought that even in a freely competitive society, the existence of workers exploited by capitalists should be eradicated. One of his ideas was free land. He argued that all land belongs to the Earth, and that it is inconceivable that it could, for example, belong to individuals as private property. I think that this is reasonable. Rather than outright ownership, land would be leased to individuals. Who would lease it, you ask? It's a complicated issue, but basically Gesell proposed that it would be the government ruling the society upon the land in question. Water and mineral resources such as oil might also fall into the same category. By its nature, Earth is everyone's. Water is today recognized as being everyone's, and our water bill is for the labor required to make it drinkable not the water itself. This is how the free land that Gesell spoke of could be handled. He also talked about free currency (Figure 3). At the beginning of this chapter we talked about the origins, characteristics, and benefits of money. In fact, the current advantage that money and forms of credit have is that they do not depreciate when exchanged for goods. No matter how long one waits, their value will not change. On the other hand, things that were created to be sold start depreciating from the time they were created. In the past, people exchanged goods, but since they would rot, rust, and so on, their value decreased if they were not sold quickly. In fact, people took this into account when engaging in business. However, money does not go bad. It's convenient. That's why it can bear interest when given to a bank. Today this is called unearned income. Capitalists later appeared, who wanted to become rich, thus growing the desire for money. Despite many countries' inheritance tax, some families stay rich for generations. Thus, Gesell proposed the idea of money's depreciation. He thought that if a system is created in which money depreciates like ordinary goods, in all likelihood, money and goods would become equal and workers and capitalists would be placed on the same footing. However, as I do not fully understand economics, if one of money's benefits is that it does not depreciate, I do wonder whether or not creating a system that depreciates money would, in the future, lead to precious metals such as gold, silver, and jewels—which were the starting point of non-depreciating money—to once again become recognized as money. However, while money and credit can be issued to no end, if we return to the gold standard (which was abandoned by most countries during the 20th century), the scale of the economy will shrink. With the scale of the current world economy, in the end, paper money and credit might be indispensable, so it would then be impossible to return to precious metals.

Masuho Money that depreciates. As it says in *Ende no yuigon* ("Ende's Last Message"), some small villages throughout the world are experimenting with the idea of "free money." Since it seems successful in small villages, if the lack of a special status for money is successfully admitted in a large economic system (such as on a

global or national scale), it would be great and have extreme consequences. There is also the same problem with the issue of private property. Around where I live, a lot of the large houses are those of landowners. I don't know the extent to which these landowners themselves have had to work to obtain and maintain their land, but in many cases they inherited it from their parents or grandparents. Shouldn't land's public nature be valued a bit more?

Yamatō I agree. Land is the Earth's, not individuals'.

Masuho No matter how one looks at it, considering the landowners in Japan today, if this doesn't change, they will have no desire to work at all (*laughter*).

Yamatō That's right. This is why Gesell proposed the idea of free land and free money. What he wanted to say is that the world should become a place in which everyone feels the joy of other people using the things they produce. He hoped to change the situation in which only money is given a special status, and that people who have a lot of it can do anything they want. Therefore, he proposed the idea of "free land" that is not any one individual's property, and that the money people possess should depreciate just like things people produce. One does wonder, however, if things will really change in accordance with this idea.

Masuho The modus operandi of banks and securities companies is truly a problem. While money giving birth to money is a problem relating to individuals, this phenomenon is being led by these institutions. If money that depreciates was actually adopted, would bank and securities companies continue to exist?

Yamatō At present, those who entrust banks and securities companies with money also gain interest; however, this would mean that, in the future, people wouldn't get interest if there was no depreciation/appreciation of money. They would just be letting banks hold onto their money, and would pay service charges for the bank's work involved in doing so.

Also, since banks are required to hold 8% of their own net worth, its own fluid money (or liquid assets) would decrease yearly. That's pretty scary; therefore, if this kind of system were created, would banks and securities companies really continue to exist? I feel like even if they did survive, things like derivatives would be impossible.

While discussing this, I realized something. Although I am quite uninformed when it comes to economics, it appears to me that today's monetary economy has fundamental system flaws. Goods that are produced as well as Earth's resources decrease in value, but the monetary currency that one exchanges for them (liquidity) does not. Another atrocious aspect of this system is the worldwide construction of illusory liquidity in the form of deficit government bonds and the like. Of course, thanks to technological innovation, value is being created by making better products which heightens their individual added value, rather than being completely dependent on market factors. This makes it possible for the economy to grow and expand, and perhaps, then, these things (heighten values owing to the innovations)

will have equal value to the non-depreciating value of the money. But let's think about, for example, energy input and output. Most of the energy on Earth today basically comes from the past and present energy of the sun; however, only a small percent of this energy is being harnessed for general use by society. It might be possible for the economy to grow if this percentage were increased through technological innovation, but even then there is a limit to doing so. It appears that today, by relying on future technological innovation, the foundation of society is being chipped away by deficit government bonds and the like.

By the way, in scientific fields, people often think of an extreme case of a phenomenon to simplify it in order to reach the essential nature of the phenomena. If one images the limit of this on a macroeconomic scale, it appears that a truly awful thing is likely to occur. In order words, since money is the only thing with a non-depreciating value, even if people pick Earth's resources down to the bones and make it difficult to produce a variety of goods, money will continue to exist as the dominant currency. Is this not outrageous hyperinflation? Amidst all of this, money will give birth to money, and the worldwide spread of an unequal society will be unavoidable. The basis of today's economic system is the creation of a surplus money situation. I think that people who live in this kind of world are very unhappy. Are there any mistakes in my reasoning? If not, that is pretty scary. Are the ideas proposed by some economists (such as inflation targets) really correct and making sense?

At the end of 2014, a reader of this book (1st version) introduced to us Kōjin Karatani's *Transcritique* (MIT Press), which focuses on Immanuel Kant and Karl Marx. In his *Capital*, Marx formulizes commercial capitalism as the pressure of capital to self-multiply using time and space difference in multiple value sets. He says that, in capitalism, when the amount of uncollected money and credit becomes too large, economic crisis occurs in order to make selling and buying consistent. From the life science perspective that we have been using, the cause of the failure of this collection postponement can be pinpointed as a restricted environment. This is just like we discussed in relation to the prisoner's dilemma game. In an unrestricted environment, one can anticipate that postponed credit will be collectable at any point (time); it appears that there is no way an economic crisis can occur. However, in our society that is already a restricted environment, if one does not collect postponed credit while one is able to do so, an unfavorable situation could arise in which one suffers considerable loss. That's why an economic crisis occurs when everyone is caught up in such selfish thoughts.

Interestingly, the appearance and development of capitalism was initially seen during the Age of Discovery, when people in the Old World thought that Earth's riches were unlimited. Since free competition enabled everyone to expect that they would be able to enjoy freedom, equality, and fraternity as they did in the

evolutionary process, a type of capitalism (production) that required economic development through technological innovation was born. This is the same as the relationship between nucleic acid organisms' pressure to self-multiply and survival/evolution; for both organisms and the capitalist system, the principle by which the system survives is the pressure to self-replicate. In other words, to exist as a system that is not characterized by shrinkage or self-annihilation. However, while the evolution of organisms happens in response to a struggle over environmental fitness, the reproduction of capital occurs by exploiting multiple value sets such as differences in environmental time and space. (Of course, due to changes in their environments, organisms experienced eras of selfish strategy in a restricted environment, extinction, and so on. However, even if they were at the mercy of spatial and temporal environmental differences, they did not adopt the strategy of using them to flourish.)

Marx believed that what is created by capital's self-reproduction (surplus value) is equivalent to the exploitation of workers; the word “exploitation” may be applicable since *his* analysis seems correct in a sense that workers are always governed or controlled by capitalists utilizing the advantageous power of money (money alone is exchangeable with anything one wants at any time). But today, *his* analysis seems unsatisfactory because we see that the capitalism causes the depletion (or exploitation) of Earth resources on global scale rather than the exploitation of workers. All countries, political and economic systems, and business entities—no matter how honestly they are run—are incorporated in a system of World's total capitalism exploiting our Earth including workers through its activity toward the pursuit of a high average rate of profit.

If this is the case, what kind of economic and monetary system is best? Rather than the depreciating money idea proposed by Gesell, Karatani praises the Local Exchange Trading System (LETS) proposed by Michael Linton in 1982. It might appear that if, based on John Maynard Keynes' modified capitalism, the state or the future "world country" would redistribute the surplus value of the world's total capital, exploitation of workers would be eradicated due to this surplus value being returned to workers and consumers. However, it appears that insofar as there is capitalism it will be impossible to eliminate its tendency of pursuit of the surplus value, which is the nature and behavior of capital. This is because the only thing that could happen if surplus value were to be eliminated is the shrinking of capital. In *Transcritique*, Karatani says that the single country-based modified capitalism of today (redistribution by the state) is caught in the traps of capital, state, and nation. He argues that, in the end such modified capitalism only contributes to the acquisition of the surplus value of the world's total capital, and that it is at the mercy of nationalism in the form of the nation-state. And even if a single “world country” runs the monetary system, the continuation of the same capital-based surplus value exploitation of

workers should be unavoidable. Furthermore, even if the redistribution of the surplus value turned to be successful and eliminated the exploitation of workers, anything other than money in our capitalism system (materials/labor and their products/services) depreciate their values to zero at the end, which is the situation of super-hyperinflation with money alone remaining, as I worried just above. Thus, in the end, this brings me back to depreciating money. If the ratio of depreciation can be made to correspond to the surplus value (rate of profit), then exploitation might be eliminated. If this happens, it seems like there will no longer be an incentive to engage in technological innovation; however, I might be worrying about this because even my way of thinking has been already deeply eroded by the current capitalist system. As has become clear in this book, competition-based incentives lead to unfairness. What is real and true is actually the incentive based on the desire for cooperation that leads people to feel happy for being useful to society at large. In summary, I suppose that we should (1) create the aforementioned unified situation of various value sets in the form of a world country, (2) spread information to eliminate the desire for power, money, and fame (the substitute measures for reward; see Chapter 5, “Stratification: A Society Troubled by Wealth Disparity), and (3) eliminate the pressure for economic growth that arises due to the pressure on capital to self-reproduce by introducing a system in which money depreciates in proportion to the depreciation of the value produced by workers (including services). This is the very thing that will ensure that money is in balance with Earth's restricted resource environment, eliminate economic crisis, and restore happiness to people’s daily lives in return for producing something that serves everyone. As we will discuss in Chapter 9 (“Developing the Universe: Mars Explorers, Seeking New Frontiers”), is there nothing we can do but hope for outward expansion, for the emergence of an unrestricted environment? I pray that by further developing this book and with the cooperation of scholars in the human and social sciences, we will be able to propose a concrete social organizational system that can be implemented in the future. For example, when environmental restrictions like those discussed in Chapter 11 (“Seeking Happiness: Mankind and Society”) reach their limit, such as the problem of climate change due to CO_2 and so on, humanity might go extinct, or a great change or revolution might occur. Karatani proposes an "association of associations," and we suggest the establishment of self-sufficient and self-supporting spheres. I feel that we're all aiming for the same kind of system. It's interesting, no? However, regardless of which is chosen, the environmental conditions of people's cognitive abilities as animals (approximately 50-person groups) will always exist. How can a social organizational system that comes to terms with this be realized? More research is necessary on what kind of system is preferable, but I'm looking forward to finding it out.

<Future Image>

Yamatō Money appeared as a special thing that does not depreciate, while “credit,” its extension, has conquered the world in the context of today's finance capitalism. Not only does finance capital dominate workers, but it also controls the world's business conditions and economy, and gives birth to the problem of unemployment. Seeing how Earth's resources, within a restricted environment, are drying up, we might be living in an era in which free competition (which is seen as a "good-natured strategy" in an unrestricted environment) should be restricted to some extent because it leads to wealth disparity and stratification. It also promotes globalization in the context of finance capitalism. One proposal in this economic context might be Gesell’s free land and free money. Also, with regard to the world's social organizational system, it might be necessary to establish self-sufficient and self-supporting spheres. We'll discuss this in the book’s conclusion.

Chapter 7　Globalization: A World Washed by the Waves of Efficiency

In pursuit of efficiency, the international division of labor has recently been widely spread. Global companies are dominating the world's markets as international giant capital, and small companies are being swallowed up.

<The Merits and Demerits of Globalization>

Yamatō So far, we have discussed various contemporary problems from the perspective of biological principles. Today, globalization is a concern because the entire world is becoming one in terms of business, culture, and the movement of people.

Drawing from your experience in the business world, could you talk about the merits and demerits of economic and cultural globalization, and any issues that have arisen as a result?

Masuho When I was working for a company, there was a period of time in which I would go to the United States five or six times per year. One hundred years ago, it probably took a month by boat to reach to the West Coast of the US, but now it only takes about 12 hours by plane. Several hundred years ago, only a handful of people were able to leave Japan. You can see that the development of transportation has exerted a huge influence on globalization (Table 1).

Table 1. Train Time Required Between Tokyo and Osaka

Time Period	Time Required	Chief Event in Japan
1897	15 hours 35 minutes	Takeo Hirose et al. as the first in Meiji study abroad
1912	11 hours 54 minutes	Automobile first appears
1930	9 hours	The first traffic light (Hibiya)
1934	8 hours	Tanna tunnel opens to traffic
1956	7 hours 30 minutes	All train lines electrified
1964	3 hours 10 minutes	Shinkansen (bullet train) appears
Today	2 hours 30 minutes	Shinkansen Nozomi

(From the Japanese Ministry of Culture 2012 white paper on science and technology)

Yamatō Also, thanks to the IT revolution of the past 10 years, information now instantaneously can travel around the world.

Masuho Yeah. In the past 20 years, we've become able to quickly transmit a vast amount of information. This is because of the launch of the world wide web in 1991 as well as the considerable improvement of transportation services, making it possible to attend events and interact with people from all over the world. It's quite amazing.

Also, the ease at which goods are now easily exported and imported throughout the world is also important; for example, the majority of the shrimp we eat are not caught in Japan. People move, goods are imported and exported, and information is shared around the world at an incredibly rapid pace (Figure 1). To put it simply, the world has truly become smaller.

Yamatō What do you think are the good and bad aspects of this?

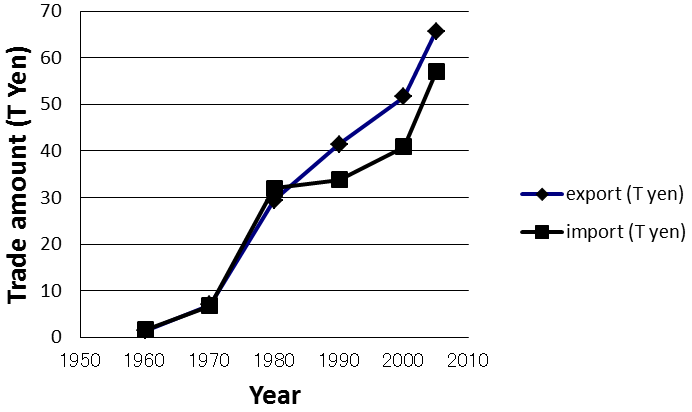


Figure 1. Changes in Japan's amount of trade (by year). This figure shows that Japan's imports and exports, as well as the world's, have expanded along with the times. (Graph based on data from the Japanese Ministry of Economy, Trade and Industry.)

Masuho When Earth (Figure 2) becomes smaller, information, culture, and food become homogeneous on a global scale. For example, sushi, a traditional Japanese food, is now eaten not only in Japan but in the United States and Europe as well. Also, in the comfort of their own homes, people can see information that has been transmitted from places throughout the world as well as transmit information themselves. Furthermore, if one uses a search engine, one can quickly locate personal information about strangers. In this way, both food and information have become global and homogeneous.

Figure 2. The Earth from Outer Space (Shot from Apollo 17. From Wikipedia.)

This is not to say that all food and information has been become the same, as one can enjoy a diverse set of cultures (food, information, etc.) from around the world. For example, in Japan, one can eat not only Japanese food but also Korean kimchi, Chinese food like swallow's nest, and Mexican food like tacos. One hundred years ago this was not possible.

Yamatō Globalization is beneficial in the sense that people throughout the world can enjoy a diverse set of things; however, while food won't become just one cuisine, certain kinds of food might disappear to some extent (including that which we enjoy today), leaving us with only a few kinds. There is the danger of the world becoming homogeneous, likely because people like efficiency.

Masuho There's efficiency, and also that people's palate is, by nature, fairly similar. For example, in the past, only Japanese people liked tuna, but now it is commonplace for people throughout the world to enjoy tuna, and Japan's generous consumption of it has become problematic for supply and demand. It is as if they're saying that Japanese people shouldn't be the only ones allowed to eat it. In the same way, when everyone throughout the world tries to eat the same thing, problems arise regarding exhausted supply.

Yamatō This is true not only with food. In the business world, processes and culture

become homogenized because people naturally seek efficiency by dividing labor.

Masuho Right. Recently, it has become an issue that rare metals are primarily found in China, as the global areas that produce rare metals are found only in the People's Republic of China (90%) and countries in Africa, Russia, and South America. South Africa, China, and Russia hold 98% of the world's vanadium. It is expected that, due to these countries' policies, economic conditions, political instability, and so on, in the future it will be even more difficult to obtain these elements. There is a need to secure both a stable supply of rare earth minerals and technology that can be used to recycle them. The production of electronic products that require these elements entirely depends on China's intentions. Problems like this are surfacing in various places.

Yamatō If one thinks about this closely, has not the history of living beings (such as selfish genes being pressured to multiply) or the history of humans not basically been heading in the direction of worldwide globalization? When humans' ancestors appeared five million years ago, they lived in groups of approximately 50 blood-related people; however, people eventually became able to mingle with neighboring groups, which became villages. Since goods produced in other villages were slightly different, the division of labor began. Villages then expanded into cities. In the case of Japan, there were domains (*han*), and domains that were far away from each other likely had completely different cultures. Ultimately, however, they converged into the one culture of the current Japanese nation by our Meiji Ishin from Edo-era.

Figure 3. The flag of the United Nations (UN). The UN is an international organization formed in 1945. Its primary activities include maintaining international peace (security), and facilitating international cooperation relating to the economy and society.

I think that, while until recently, countries each bore unique cultures and built specific industries, today something like a single worldwide country is trying to emerge. Things have globalized on economic, informational, and human movement levels. In the end, will not a sort of parliament emerge in a form similar to the United Nations (Figure 3)?

Masuho I also think that would be desirable. However, if it did happen, Japan may be able to just make cars rather than also having to grow rice, and the Middle Eat could just produce oil. If this division of labor continues, could this singular nation be able to ensure the happiness and welfare of its people's daily lives? I am somewhat skeptical.

I think that this can be seen from history. Earlier you pointed out how domains were converged into one nation, Japan. This lead to greater efficiency based on the division of labor, cultural homogenization, and, in 1980's, people gleefully exclaiming that everyone in the nation was middle class and that Japan was number one. Looking at Japan today, this seems to have brought about a situation

characterized by provinces' downfall and the concentration of everything in large cities. The gap between rich and poor is also expanding, likely a result of the firm division of labor that occurred when Japan was unified after the Tokugawa shogunate in 1868 (Meiji Ishin). Has this really led to the happiness of the people in the country? This is very doubtful, no? Now there are efforts to efficiently divide labor on a worldwide scale, such as in the form of the Trans-Pacific Partnership and so on. If Japan emerges as a dominant country or region, it might be enjoyable; however, I'm worried that this will lead to the appearance of many outlying areas (regions, countries) that lack vitality. If we don't today pause to properly analyze, judge, and make responsible choices, it will be hard to go back, and we might contribute to the downfall of mankind.

There are a lot of people starving in places such as African countries. I've heard that hunger affects 600 million people worldwide—approximately 10% of the world's population. It would be ideal if the proposed "world country" is able to end starvation, but could it ever really do so? To put it in terms of the current domestic situation in Japan, within the context of a future world country, will different regions be left lacking in some way, like some provinces in Japan today?

Yamatō Of course, today the UN, World Health Organization, and so on are providing some assistance to regions and countries in need; however, this aid is purely voluntary, based on societal norms of kindness. I think that if a world country government were created, it would be possible to end this starvation by redistributing wealth based on rules and policies. But, I propose that in today's political situation, self-sufficiency/self-support is the healthiest option.

One big problem with globalization today is that we're entering an era in which Earth's resources, which are limited, are becoming insufficient to globally sustain humankind. As such, people seek efficiency amidst free competition. One often reads in the newspaper about how efficiency of consumption of energy and things will increase with the advancement of the division of labor due to the creation of worldwide rules.

If one uses several indicators to calculate energy consumption per person in developed countries, and then computes how much of Earth's resources would be used if everyone on the planet lived such a lifestyle, the figure is 150%, meaning that already exceeding much beyond what our Earth can supply. If a world country was created, labor was divided even more in the pursuit of efficiency, and large companies merged into monopolies and oligopolies, would intense competition not emerge over Earth's resources? In other words, Earth's environment and resources would be severely restricted and people would compete for access to these resources. If this happens, following the logic of living beings (such as in the prisoner's dilemma game), a selfish strategy would undoubtedly become predominant. First, internal conflict in mind would arise, as humans generally have a desire to cooperate. I'm afraid that people would be torn apart, and would become deeply suspicious and isolated, unable

to trust others.

Another problem that could arise from increased efficiency is as follows. As I mentioned earlier, due to increased efficiency, Earth's resources are becoming more and more limited; they dry up. Furthermore, the gap between the rich and poor is expanding, resulting in increased stratification. Also, you pointed out that it looks like Japan would go in the direction of becoming more homogenized by, for example, only making cars. I completely agree. If this happens, qualitative diversity of business and culture will be lost. According to the logic of living beings, a natural disaster that occurs following the loss of diversity leads to extinction.

Masuho That's the very reason I said that it is healthiest to establish a minimal level of self-sufficiency or self-support! (*Laughter*)

Yamatō However, most farm products from China can be cheaply imported. If they were made in Japan (to enable self-sufficiency) it would cost more money.

Masuho It would be fine if, regardless of world prices, the government administration in Japan decides in advance to import a certain amount of farm products worth a certain amount of money into the country, no?

I think that, in the end, the issue with globalization is homogenization. Since you, on the other hand, think that various interests would emerge in the context of free competition, you're proposing that a "world country" creates rules. There's probably a high chance that things will go in this direction in the future; however, in the aforementioned case of Japan now after Edo era (Meiji Ishin), while it may have flourished for a time thanks to the country being unified under the establishment of rules, the division of labor firmly taking root, and the homogenization of culture due to the harsh external economic situation (in other words, its surrounding environment), the country now has problems such as an increased gap between rich and poor. There is now impoverishment of the provinces and a concentration of activity in metropolitan areas, so people can't help but feel isolated due to daily lives that contradict their desire to cooperate, and so on. I'm apprehensive that if, in a future world country, people try to divide labor in order to increase efficiency in the context of free competition, it would be troubled by the same problems that Japan faces today. Will people be happy? Furthermore, with regard to the other big problem of homogenization, I actually think that if all countries fail to make use of their strengths after having partially become self-sufficient and self-supporting, it won't be solved. The sharing of information will progress, and food and cultures on a global scale will rapidly become the same. If this happens, there is the chance that our fate will be the same as dinosaurs, who went extinct.

Yamatō I agree. I also see this as a problem and was thinking that there could be a way to solve it. If people seek efficiency, then diversity is lost and things become homogeneous. Then, if a disaster occurs, we would become extinct. To prevent this, I think that self-sufficiency and self-support is best.

Masuho Based on this, I also think that we should not only seek efficiency but that regions, their residents, and races each should celebrate their characteristic abilities and cultures. By maintaining and sustaining this diversity, extinction will not occur and crises can be avoided before they happen.

Yamatō One answer to this might certainly be each country protecting its self-sufficiency and cultural diversity. Another solution could be finding some sort of regime in which people do not seek only efficiency, but rather other methods of attaining self-sustainability.

Masuho I forgot to mention that, within the context of globalization, one strategy that companies sometimes adopt is absorbing and merging with another company to make themselves larger. For example, Japan's pharmaceutical companies are rapidly consolidating to grow bigger. Takeda Pharmaceutical—the biggest in Japan—has grown so much that it is on track to become one of the 10 largest pharmaceutical companies in the world. I think that companies in other industries are doing the same. When business is conducted and movement in the economy is based on the sheer size of companies, they can compete through technological innovation; for example, developing robots that can do in one-week screen for 100,000 drug compounds. This is why it is no longer an era in which large investment is made in superior research groups and the like, but one in which company size determines success rates in developing new medicines due to the scale of possible innovation. That's the policy of companies today. Personal interests and the fun of science disappear, and things become solely an issue of scale and profit.

If a researcher says that they've come up with an epoch-making idea and would like to work on it, their company will say, "What about if you use your own funds and work on it with 10 or so other people? Have fun!" In the end, they have no choice but to do their research in the style of an American venture company. Venture companies implement individual ideas, taking risks and attempting to turn them into businesses. If they succeed, they are often bought by a larger company that then works on developing the project on a larger scale; however, the success rate of most venture companies is not good.

In this way, people have to either become part of a larger company through a merger, or create a venture company and assume a great deal of risk. That is the way of doing things in Europe and the United States, which are positioned on large continents. In the small island country such as Japan, however, there are only mid-sized pharmaceutical companies (apart from Takeda). This same principal is seen in the world of animals as well; for example, on continents, there are big monkeys such as gorillas and baboons, as well as small ones such as Pigmy marmosets. However, all of the monkeys that live in Japan are Japanese macaques, which are only between 8 and 11 kilograms. If Japan was no longer an island country—in other words, transportation services became more convenient, and the world become one—Japanese

companies could strive to become big like gorillas.

Yamatō If that's true, then if the world became one, there would be several large companies and many small venture companies, which would thereby preserve diversity. Is that not better than having too many mid-sized companies on an island country like Japan?

Masuho Today we're taking the path of globalization. Since Japan will no longer be limited to existing as an island country, industry structure like that seen in Europe and the United States will be sought. Thinking about this in terms of evolution, I'm reminded of dinosaurs and small mammals. Dinosaurs gradually evolved to have larger bodies, and then all of a sudden went extinct. It's said that, at the time, small mammals like rats survived this period of extinction (O'Leary et al., 2013, *Science*, 339:662–7). It could be pretty scary if globalization produced a social situation in which giant companies could not survive. While it is fine to maintain diversity with venture companies, is there not a risk, especially for the workers, when large companies go extinct on a worldwide scale due to globalization?

Yamatō While there is probably that kind of risk, it's also possible that things will cycle in the right way. Thanks to people's wisdom, we might continuously discover new things, create new products, and then new people would master them. This is the wonderful thing about people. When you were talking about dinosaurs and small mammals, I realized that it might be due to the fact that the pharmaceutical industry is forced to exist in an environment in which things decline after becoming fully mature. One could understand this situation in the following way: when companies expand in a fight for their survival, they worsen their living environment and bring about an even harsher situation. As was the case in the example of aphids discussed in Chapter 2 ("Sexual Desire") when this happens, diversity is increased by offspring or sudden mutations being created—in the form of venture companies, when discussing this in the corporate sector. Hence, they are prepared for an extinction crisis, which makes sense as a strategy for the industry to survive, no?

Masuho I'm concerned whether, when there are rapid social changes, researchers or—speaking more broadly—working people in general will be able to happily do their jobs.

Yamatō Yeah. It's like the enclosure of the sheep farming industry in England, which started the industrial revolution. Workers who raised sheep were booted off their land, and they flowed into cities. Forced to do unskilled labor for low pay, they were the backbone of the industrial revolution. It's the same kind of thing. When something like the structure of industry quickly changes, people who are laid off are unable to participate in the next new industry, and are forced to lead less fulfilling and more difficult daily lives. This is another inequality problem brought about by the pursuit of efficiency through the division of labor.

Masuho When there is a society, like today, in which the presidents of big companies

get a yearly salary of hundreds of millions of yen while normal company workers only receive a fraction of that, the gap between the rich and poor becomes too large, which leads to social problems.

Yamatō To address this in the future, we should maintain a minimal level of self-sufficiency when it comes to clothing, food, and shelter, no? I think that it is possible to establish a world country; however, there is the concern that it would lead to a loss of diversity. Earlier you expressed your opinion that if the logic of living beings (such as big gorillas and small monkeys on large continents) applies to the world of industry, it should be the case that many small venture companies will appear and diversity can be preserved. If society is able to, in some way, skillfully regulate and mediate the selfish strategies of venture companies, a tragic situation might not emerge in the economic realm. This makes me think that globalization might not be so bad after all.

Masuho As a strategy to increase diversity when one is on the verge of extinction, it is a reasonable change; however, this is only acceptable as a strategy in the context of a harsh, restricted environment. The issue is the path taken to get there. In other words, in a globalization that seeks division of labor-based efficiency, a restricted environment arrives sooner than it would otherwise due to companies' increased size and inter-company competition based on a selfish strategy, which is rapidly intensified. Moreover, when an economic situation arises in which large companies—or the gorillas—go bankrupt, their employees are laid off. I think that in order to secure stable lives for ourselves, globalization should be avoided to some extent and we should at least be partially self-sufficient and self-supporting. France, England, and Germany produce a considerable portion of the farm products they consume, but people have to think about energy as well. It would be desirable to adopt a system characterized by division of labor, but the limitation (to some extent) of free competition. This is so countries can be economically active in a way that is based on a cooperative spirit that seeks to share the technologies and products at which they excel with people in other countries.

Yamatō In recent years, society has been horribly competitive. Today, people scramble over Earth's resources, one of the most typical examples being rare metals. This encourages people to adopt selfish strategies. Moreover, the world has become a rough place also because of money having a special status (monetary capitalism). In order to keep this in check, one option might be a depreciating money economy, as we discussed in Chapter 6 ("The Merits and Demerits of Money"). With regard to resources and distribution as well, not only has globalization spread and the diversity of living beings is becoming lost, but cultures and economies are becoming homogenized. From an evolutionary perspective, we're coming close to facing a dangerous extinction crisis. In the future, will people be able to live happy lives?

<Future Image>

Masuho Since I'm not knowledgeable about economics, I don't know if this is a suitable answer, but in free competition that takes place in the context of globalization on a worldwide scale, the countries of the world each come to specialize in certain kinds of labor, which leads to homogenization in these countries, rather than industrial diversification.

Furthermore, countries that produce lumber in Southeast Asia rapidly harvest diverse plant resources in order to compete in the market. When this happens, a rapid decrease in plant diversity occurs. This kind of loss of the diversity of organisms is also a huge problem.

Today, in developed countries like the United States and those in Europe (as well as Japan), a monetary economy has given rise to comparatively affluent societies. Even in such societies, however, people are pursued and pressured relentlessly due to free competition. I'm also concerned that when this happens, people might be unable to exercise the societal cooperativeness with which they are naturally equipped.

One method for solving this is, as you just said, is an economy based on depreciating money; however, this alone won't solve everything. Japan would become a country that only produces cars. In my personal opinion, I think we should take advantage of our unique abilities while adopting a larger system that at least partially enables self-sufficiency regarding the necessities of life. Should we not aim for industry to be like this? In fact, many European countries are self-sufficient and self-supporting. I think that, having done so, each country is able to exercise the strengths of its particular industries.

Looking at the world as a whole, in Africa there are countries that are almost entirely deserts, and in the Middle East there are ones that contain vast oil resources but cannot produce any farm products. Taking these characteristics of land into account, I think that in a more ideal "world country," society must realistically consider self-sufficiency, as not all countries can grow food.

However, what should be done about the gap between rich and poor? It's really big today.

Yamatō It's true. However, according to Michael Ende in *Ende no yuigon* (Ende's Last Message), at the very least, small communities today in many countries world-wide are experimenting with using depreciating money. If this strategy appears to succeed and is ultimately spread throughout the world, ideally an organization like the UN would become the world country's government, and the amount of depreciation would be given to this government as a tax. This could be used as funds for redistributing wealth. Even so, it is possible that local municipalities would freely compete with each other anyway, similar to the situation today in Japan in which there are disparities between cities and provinces. If this happens, the gap between rich and poor will not go away.

Masuho As I've said, to address the issue of the gap between rich and poor, it would also be the best to adopt a system in which each region is self-sufficient and self-supporting to some extent. If this happens, even if this ideal world country emerges, loose restrictions could be put on free competition to some extent by establishing self-sufficient and self-supporting spheres. Of course, I think that a free money system should also be introduced. People who are playing the money game are almost daily buying and selling government bonds and such. They do things that aren't beneficial for Japan, even things that are beneficial for other countries, such as the US, if they are beneficial for themselves as well. Despite the fact that they are not working in a traditional labor field or creating products, they have high incomes. Is this really okay?

Yamatō With regard to this, Silvio Gesell's way of thinking is really useful. First, he said that since Earth is allowing us live on it, there's something strange about people being able to have private property. Then there's the problem of currency, or money. The invention of money that doesn't go bad for use in buying and selling—which originated with the necessary exchange of goods—was very convenient. Therefore, from the beginning, money had a more convenient nature than produced goods (unlike things which depreciate, money always has the same value). In other words, this created a situation in which producing goods and having money were not equally valued in society.

Masuho Basically, money should depreciate, and people should pay for land as something they have leased.

Yamatō Because there's only one world; only one Earth that could essentially be a single country.

Masuho If things don't change so that the perceived loftiness of money and possessed land goes away by the time of one's grandchildren, people will lose their drive to work.

Chapter 8　People's Dissatisfaction and Unease: Suffering in the Narrow Space Between Human Nature and Society

The movie poster for *Botchan* (http://www.botchan-movie.com/), a story based on the criminal who committed the 2008 Akihabara massacre, which occurred against the backdrop of contemporary Japan's temporary worker problem. The movie's director and script writer, Tatsushi Ōmori, examines Japanese society from the perspective of the socially vulnerable people in this movie and others, such as *The Whispering of the Gods* (2005), *A Crowd of Three* (2010), and *Tada's Do-It-All House* (2011). He decided to write this movie to depict "why Tomohiro Katō came to commit murder." Katō's state of mind that led him to kill seven people and injure ten was found to be similar to the unease and dissatisfaction of contemporary people in society today.

<The Unease and Dissatisfaction of People Living in Contemporary Society>

Yamatō I would like to discuss the various anxieties and dissatisfied state of mind experienced by people in contemporary society.

Recently, media outlets have been broadcasting a lot of unpleasant news. This is how I came to be curious about and then aware of people's current psychological states. The 2008 massacre in Akihabara, in which 17 pedestrians were either killed or injured, left a strong impression on me. Recently, one also has seen incidents related to synthetic cannabis in the news. While the harm done to smokers' own bodies is reflective of individuals reaping what they sow, there was a case in which someone who was high from smoking drove a car and killed multiple people in 2012. There was also a recent case of a drug user who, after a failed suicide attempt, decided to kill two people in the hopes of receiving the death penalty. As we mentioned in Chapter 4 ("Family Ties"), things like children killing parents, parents killing children, and child abuse have been occurring with greater frequency. Even if they don't go so far as to commit crimes, are there not many people throughout the world who, in their hearts and minds, are uneasy about the future, are filled with dissatisfaction about their lives, and so on? There are the youth that occupied Wall Street (which we discussed in Chapter 5, “Stratification: A Society Troubled by Wealth Disparity”), and the demonstrations in Europe, such as Spain, regarding the Euro crisis.

Masuho I think it was about two years ago, in July 2011, when 90 people were massacred in Norway.

Yamatō That's right. At any rate, I think that, due to the globalization that we discussed earlier, there are people throughout the world tormented by dissatisfaction and unease. I'd like to talk about why these contemporary problems have arisen, why they didn't (or did) exist in the past, and so on.

Why have these mental states started to become more common? My personal opinion is that, in the past, people were happy when they were able to get enough to eat, protect themselves from enemies, reproducing, and cooperate with groups comprised of approximately 50 people (mainly family). Of course, there were many natural enemies hundreds of years ago, and people probably often killed each other when there was friction between neighboring villages when groups began to get larger; yet, I imagine that people probably did not experience things like dissatisfaction and unease in their daily lives. At least, not in the way that people do today.

Family groups of up to 50 people grew into villages, domains (*han* in Japanese), and countries; then, after going through an era in which enemies of the group to which one belonged were clear, now everyone is being told that "people are all equal and are companions as members of humankind." A little while ago, the United States was Japan's enemy. I think that since this enemy was clear, people's desire to contribute to the group to which they belonged (Japan) was strong, and a reason for

living, such as protecting one's family and protecting the nation of Japan, was clear.

Masuho If there's an enemy—even an imaginary one—people naturally want to unite against it.

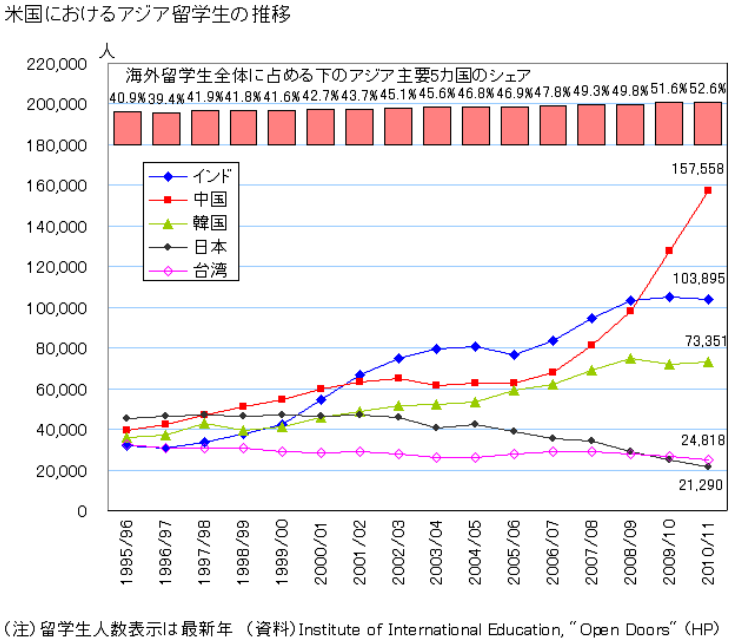
Yamatō That's right; however, now we are being told that everyone is an ally. While even today there might be problems between religions such as Christianity and Islam, Japanese people basically have no enemy groups comprised of people set on destroying their way of life. However, there is a global societal norm of free competition that has taken the form of capitalism and globalization. It's not that people have no companions, but rather that we live in a world in which everyone is someone with which we must compete; in other words, an enemy. So everyone has become more individual, rather than thinking about enemies in terms of one large group conflicting with another. When there was an unrestricted environment, even if people freely competed with each other, a "good-natured strategy" was predominant (because it was beneficial for everyone), and people trusted each other. In other words, it was an era in which everyone believed in the (forthcoming) French Revolution's spirit of freedom, equality, and fraternity. People became members of groups comprised of families and social companions, freely engaged in activities (including competition), and satisfied their desire for cooperation in a fair fashion, leading lives filled with joy. People, for example, a president in a company, received money, fame, and power as the recognition of their contribution to the group; the group members felt happy by being recognized to have been cooperative to the group they belonged in order to win the competition with other groups. But in today's restricted environment, a "selfish strategy" is certainly advantageous, and many people adopt this approach in order to survive. Moreover, today's world is mostly affluent and individualized. When this happens, as I discussed previously, the "good-natured people" who get harmed by a selfish strategy tend not to trust others, and refuse to cooperate with others. This is because if they continued to use a "good-natured" strategy, they would be sucked dry. In other words, a world emerges in which people don't trust each other. A typical manifestation of this is people in cities who try to put as much metaphorical distance as possible between themselves and their neighbors; they do not willingly engage in relationship building and are cutting down on their personal relationships. Today, even though such a situation has arisen and even though the groups to which people belong to are ill-defined, people still have an inflated desire for money, fame, and power (which have been admitted as the substitutions of the social recognition to have been cooperative) in the hope that by obtaining them society will recognize them. Of course, acts based on such desires will often appear to be unfair from the perspective of others.

<A Biology-based Analysis of the Abnormal Psychological Background and Mental State of Child Murders and Abusers>

Masuho The unease and dissatisfaction experienced by contemporary people is due to various factors, and is giving rise to numerous social phenomena, which I mentioned earlier. Here, using family issues and child abuse as examples, we would like to discuss the abnormality of engaging in such acts, as well as the psychological state of contemporary people that can form the background to these problems.

In Chapter 2 ("Sexual Desire") and Chapter 3 ("Desire for Cooperation"), we talked about how the cooperative nature of humans and the effects of "selfish genes" (Dawkins) combine to make blood relations and families the basic groups to which people belong, thereby serving as a form of protection. Since living beings naturally give precedence to the continuation of their own genes, parents are driven to protect their children and even sacrifice themselves if necessary. For example, it is well-known that if a bird of prey comes near a nest, in order to protect their children, parent birds will fly away from the nest and make a lot of noise to catch the predator's attention. This is a selfless and sacrificial act that a parent bird does to protect its children; however, as we discussed in Chapter 4 ("Family Ties"), recently, the destruction of family ties has become pronounced. Extreme examples of this include parents neglecting to care for their children, abusing them, and so on. This abuse might be due to parents' lack of love for their children. Is it that this parent-child affection is becoming weaker in society today for some reason?

Yamatō Here is what I think regarding the cause of this. In Japan and developed countries in general, the birth rate is pretty low. Relatedly, things like child abuse, massacres, and inner-orientation and languor in students are all more common today. The Japanese government also sees as a problem with the considerable decrease in the amount of students who want to study abroad (Figure 1). While this might be simplifying it, is this not because people's goals have disappeared, or at least been diluted? I think this loss of goals has arisen from the fact that, despite actually wanting to experience joy when helping others, humans (who are born as organisms with a cooperative nature), exist within a capitalist society that is based on the principle of competition, which is incompatible with their inherent desire to cooperate. I often hear people praising others for being "one of a kind" or "number one," having excellent grades or exam scores, becoming an administrative vice minister, and so on. Also, it is seen as wonderful when someone becomes a rich like Bill Gates. A situation spreads in which, in order to gain this type of reputation, people suppress their desire to cooperate and instead compete, sabotage others' plans, and try to become famous and rich at the expense of others. This has become pronounced in the restricted environment of contemporary society, where selfish strategies are predominant.



（注）留学生人数表示は最新年 （資料）Institute of International Education, "Open Doors" (HP)

Figure 1. Changes in the Number of Asian Study-Abroad Students in the United States. The number of Japanese study-abroad students is decreasing. In 1995, it was the peak. In 2010, the number decreased by the following factors: 1/8 of China, 1/5 of India, and 1/3.5 of South Korea. (From Honkawa's homepage: http://www2.ttcn.ne.jp/honkawa/6150.html; only Japanese language version was available.)

When these contradictions exist, people are unable to understand what they should do to be their true self and feel happy. —In other words, when, even though people know they will be happy if they're useful to others, the public recognizes individuals for emerging victorious in competition (the opposite).— This is what people mean when they say they have no goals.

Since young people vaguely feel that the social system today is contradictory, they tend to not really want to give birth to children. These conflicts in their hearts, combined with stress, leads to the pathological phenomena of society today: they abuse their children, massacre people, and so on (Figure 2).

How old is this person?

Figure 2. An Illusion. Does this look like a young woman or an old lady to you? The discrepancy between (1) the pressure to emerge victorious in free competition within a mass of anonymous strangers and (2) cooperation, is expressed in this picture as two sides of the same coin (youth and age).

Masuho One can think about it in this way. As we also discussed in Chapter 4, these days, people's awareness of family is collapsing due to the lack of necessity to create groups to fight against a shared enemy. This is a result of society becoming affluent to the extent that people can live their lives on their own. This is, in a sense, a happy thing, but when this happens, there is less of a need to belong to groups, which people originally contributed to in order to fulfill their desire for cooperation and, thereby, feel joy. In the past, it was necessary to belong to a group with which one would fight against enemies (such as other groups). In this context, even if group members killed members of other groups, their hearts were at peace because they had

contributed to the group's survival; they felt that they had a reason to live, satisfied their desire to cooperate, and experienced joy. However, now, to put it simply, group enemies have more or less gone away, within the context of people's daily lives. Rather, individuals are enemies in that they are the ones against whom an individual competes against. In other words, individuals are forced to be isolated, which goes against our nature, and thereby feel intense loneliness. I think that it might be better to, forgetting fairness (a "good-natured strategy") and such, live selfishly while satisfying one's desire for power, money, and so on insofar as it does not break the law. Humans originally evolved so that they could find happiness in cooperating within a group of approximately 50 people. Many people today feel stress and are being crushed into a narrow space of isolation due to competition. As such, people who can forget fairness and such might be happier in today's world. However, this is not the case for many people.

In a similar way, in the past—particularly in a freely competitive society in an unrestricted environment such as the Age of Discovery—activities that contributed to society must have led to happiness; for example, people forming groups like a company (even if it was greater than 50 people) and manufacturing, distributing, and selling a product. Recently, however, inter-group competition has grown harsh (because of a freely competitive society in a restricted environment). There is also intense intra-group competition—particularly in big companies—because individuals' accomplishments are unforgivingly evaluated within the current culture that emphasizes performance. Of course, since groups, companies, and so on must compete within the economic environment, they have to improve their track record or value proposition. In order to do so, it is most efficient to emphasize employees' performance and make them compete with each other, no? However, when this happens, there is a tendency for individuals to become isolated. I think that's the biggest problem.

Yamatō I completely agree. Since there was no globalization or capitalist freely competitive societies hundreds of years ago, I think people were actually happy with the requirement to cooperate with their hunter-gatherer groups of approximately 50 people. Individuals were able to understand and know each person within their group, no? When we talk about this, people might say, "This is why things were better in the olden days," but that is not the case in many contexts. Thanks to science and technology, people's ability to seek and find happiness has increased; moreover, while the world is probably a happier place for humankind, since productivity has increased to the extent that seven billion people can live on it at the same time, I'm concerned that the happiness of each individual has grown thinner.

As I said in the beginning, is it not the case that the unease and dissatisfaction of individuals appeared as a result of this? Is there another way to understand this?

Masuho It's a little hard for me to understand exactly what people are uneasy about.

The media often reports that young people are uneasy about the future and, as a result, have difficulty in defining their goals making plans for their future. While the content of this uneasiness is generally similar to what we have been discussing, I also think that it is slightly but fundamentally different. According to media reports, people may often think, “Living in the future, will I be able to be happy?” “What kind of job can I do?” “Will I be able to have a family?” and so on. These are big factors, yes?

In the sense of media reports, when we were young, we were more confident about the future. It's more comforting to have some confidence than none at all. We knew that if we went to a certain kind of university and worked at a certain kind of company, our salaries would be secure to some extent, and that if we weren't too ambitious or greedy we could have a normal life (with a family, etc.) and lead honest lives. It might be pretty hard for young people today to picture their futures, probably because society changes so quickly now. I also think that the unease experienced by contemporary people that many have analyzed, such as through media reports, is a vague sense of unease regarding this kind of change. This reasoning seems apparently similar to our analysis of unease, though there are fundamental differences.

Yamatō That's right. The unease that is often talked about by people or media is that people can't picture their future goals or other ambitions for their lives.

Certainly. I was an elementary school student in late 1950s and early 1960s. After being defeated in the war, Japan sought to supersede the United States and Europe, both economically and socially. The public in Japan could clearly see this goal before them; for example, the country worked as hard as it could to pursue cutting-edge science and technology fields, and people felt joy—and, yes, perhaps self-satisfaction—of having contributed to this endeavor as a member of the Japanese nation. There were transparent goals like this. Recently, though, it is hard to see goals such as this, or, relatedly, such reasons for living. This is true on a worldwide scale as well.

Masuho Furthermore, ideologies are also disappearing. When we were young, there were struggles at universities that involved people in heated debate about various ideologies. Today, this rarely exists at all. I've never seen political signboards and such at a university. When this happens, it's hard for people to identify a foundational basis for their lives. I think that this leads to a considerable amount of unease, particularly about the future.

Yamatō I don't mean to nitpick, but not having a catch-phrase ideology that can fit on a signboard isn't the reason there are no goals. I think you have it backward. Since goals are disappearing throughout the world, people don’t have a reason to put up such signboards.

Masuho Exactly. One hundred years ago, a war would decimate society. Then, a new societal framework would be constructed and new goals would be put in place.

To digress, in the history of evolution of living beings, after an environment

became too harsh and there was great extinction, there was an explosion of evolution, and various new life forms emerged, including *Homo sapiens*. The process by which social systems have changed throughout the history of humankind can be understood in the same way. We might have already reached the stage that used to precede war; however, education today enforces that everyone is of the same "human family" and not an enemy. When people are saying war is horrible but the world system still continues, it's pretty hard to figure out how people can get rid of their unease.

Yamatō I think so, too; however, I would just like to confirm our points. While a big cause of things like the Akihabara massacre may be certainly—as many have analyzed—unease that arises from economic difficulty, drifting from one part-time job to another, and losing one's plan for the future—people may probably think that one way to solve this issue is to again aim to grow the economy. This is something that Prime Minister Abe now talks about. However, this kind of goal is overly simplified and based on the idea that everyone will be happy if they simply contribute to Japan's economic growth. In the same way, President Obama and other global leaders advocate TPP, economic growth, and so on. However we would like to say that this is a mistake! The analysis including media reports is too superficial. Are they thinking about what would happen in the future to Earth's resources if everyone experienced economic growth in this way? There would be increased (and intensified) restricted environmental conditions and a selfish strategy would become even more predominant. If globalization advances, efficiency would increase and inequality and stratification would be unable to be halted, no? I'm against this. The unease we talked about based on the life sciences arises from the contradiction between the desire for cooperation and the globally accepted principle of competition. According to the analysis of media reports, young people may have lost their goals and hopes for the futures, but instead and on the contrary to this, we analyze that they *can* see their futures clearly and that this is the true cause of the unease. Since people—especially youth—are able to visualize their futures of severely restricted environment of Earth but to have to face to severe competition without any chance of cooperation with others under this capitalism in the world, it becomes hard for them to understand the meaning of living. In the end, some of them explode, saying that the world is horrible. This is what we were talking about when we said "unease." We're the Japanese nation that lived simply but happily during the Edo period—when, between 1603 and 1868, Japan closed itself off to the outside world—and we should have been understanding this contradiction between the true nature of humans and the current social system. Despite this, during the Representatives election of Japanese Diet at the end of 2012, almost all political parties were advocating economic growth, and the Liberal Democratic Party secured a massive sweeping victory. Are there lots of people who are only thinking about selfishly benefiting themselves and those that agree with them? Perhaps they believe in the analysis of unease by people or media we talked about

earlier. Maybe this is why people supported Japanese Prime Minister Abe, who emphasizes economic growth and escaping the business slump by resurrecting (on a massive scale) public works projects. However, I think that this will only further worsen the current contradictory situation. It would mean that the Japanese people have been deceived by the government, media, and so on, just like it was during World War II. I wish I published this book earlier and had everyone use it as a reference material when making judgments. It is my hope that, in the future, everyone will know that there is this kind of view and, with a widened perspective, be able to make their own judgments; however, with people seeking economic growth in the current global situation, this path will be very steep; to reach their end will probably be difficult.

Masuho While it might be repetitive, I would like to once again summarize the difference between the unease spoken about in the media and the contemporary "unease" that we are analyzing from a life sciences perspective. It appears that the unease discussed in society and the media stems from people not having a clear vision of their own futures due to the disappearance of goals based on ideologies or demands of the era—in other words, outwardly bestowed expectations regarding how people should be. In fact, most of the unease experienced by people all over the world might fall into this category. But I would like to emphasize again, it is on the contrary, as we presented in our analysis at the beginning of this book when we were discussing the origins of humans and so on, we think it is caused by the gap between human nature (specifically cooperativeness) and the modus operandi of—or the fact that we have to live in—contemporary society. People can actually see what the future will be like, where the group they belong to will be vague and each person will compete against everyone else, where they become isolated and have few things they can cooperatively contribute to society, and where they can see little chance that they will be able to find joy. Because they see all of this, they can't find a reason or meaning in living. We think that this is the cause of people's "unease".

I think that the basis of this unease is actually a buildup of the issues that we have talked about. In other words, a restricted environment is advancing and a selfish strategy amidst free competition is considered valid. This intensely clashes with humans' innate desire to cooperate, leading to discord. This causes individuals to become isolated and, in some extreme cases, lose sight of even the meaning of living as a human. I think that the sense of unease that the majority of people in developed nations feel comes from this isolation. For sure, television pundits often point out that we are entering an era in which we need to come up with a completely new way of as about how we should exist and interact; however, they never reveal a firm answer. We are proud that we are analyzing this issue so deeply based on the logic of living beings. Can we come up with a solution? I want to. It would be nice if we could come up with an image of the future (institutions, a way of thinking, a system, etc.) on a worldwide scale that does not contradict humans' original way of being. About 100 years ago

Buddhist priests may have pointed to one. They would preach to their parishioners or people on the street about Buddha's teachings. People were convinced and relieved to hear it; however, even if a priest (or politician, or lawmaker) says something, it doesn't mean that it's right. Who can convince society? This lack of influence is only natural if one considers the present situation that a selfish strategy based on free competition in the context of a restricted environment has become too universal.

Yamatō That's certainly the case. It would be wonderful if we could, as life scientists, imagine a future based on knowledge from biology.

Masuho Humankind was seeking philosophies even 2,000 years ago. Socrates said, "I know that I know nothing," and the three great monotheistic religions of the world (Judaism, Christianity and Islam) have also talked about ideal ways for people to live. Much later, ideologies like communism pointed to a way of being for society. Today, however, these kinds of things could not become as powerful, at least in Japan, maybe because we are educated and know that we humans are evolved from apes rather than made by God, and because we are in an "information era," able to access many kinds of philosophical theories and information and need not be influenced by only a few theories to reach our own conclusions. If this is the case, what can be our basis upon which we construct the next generation's way of being, for both society as a whole and as individual people? You and I are clearly concerned about this issue. Don't you think that if we consider these issues from the perspective that people are fundamentally *Homo sapiens*—completely the same as other living things like dogs, cats, and monkeys, and certainly not a special being that can be called, for example, the "lords of creation"—that we'll come across some sort of hint?

Because philosophy is an individual pursuit based on one's own wisdom, sometimes it is believable and sometimes it is not. Not everyone will believe in the same thing, no? Ideologies seem to be something that many scholars develop, though they are magnets for conflict. Religions, too, each contain tribal or other kinds of conflicts, so they are similar.

Yamatō If one thinks like this, as you said, it seems that the most realistic answer to use is the starting point of humans as one type of animal, that is, *Homo sapiens*. Judging from the level of science and technology today, this is basic knowledge that can be recognized by everyone. With regard to the inherent nature of people as well, because various things have developed (such as cerebral physiology), we've come, to some extent, to be able to understand our consciousness in a way that can be scientifically recognized.

It's what we are always talking about: The evolution of living beings, competition between organisms, cooperativeness, and so on. We've come to understand which activities in the economic sphere tend to make humans happy, and identify the activities they tend to engage in, and so on. Some books being frequently published these days, like the ones we're consulting, talk about this frequently. As you say, based

on this kind of scientific knowledge that everyone can consent to, such as the fundamental principles of human behavior should play a role in the next social system, social order, etc.

Masuho I agree. There's a book about how Freud, the person who first constructed psychology, read Darwin (L.B. Ritvo, *Darwin's Influence on Freud: A Tale of Two Sciences,* Yale University Press, 1991). In order to clear a new path for psychology that he was researching, Freud actually used the theory of evolution as his foundation, because there was no one who had done what he was planning to do. Freud tried to solve the various troubles found in his contemporaries' works by first addressing how people had evolved.

So, if more unease is rapidly increasing in modern society, the best and most feasible way to handle this is to look toward science for an answer, such as the evolution of living beings and ethology. If we don't do this, we will not be able to locate an effective answer.

However, what was the original form of people? How did *Homo sapiens* think about things when they lived tens of thousands of years ago? In other words, how are we going to construct a future image that has little unease based on the lives of *Homo sapiens* that lived thousands of years ago? How is the unease of people today at all relatable to those early people?

Yamatō If this becomes clear, the world will probably move in that direction. I want an answer with regard to this as well, but it's really difficult.

Of course, within this conversation, I would like it if we could ultimately come up with a future image based on the knowledge that humans are living beings. An answer will not come immediately.

Masuho While this goes against the logic we've been using, it appears that humans are always creating unease somewhere. Thus, in the end, it might be hard to completely eliminate unease and dissatisfaction. Maybe this is part of what some philosophers call "the human condition." It might be better to think about going in the direction of not eliminating things but rather increasing one's happiness or sense of stability. In this sense, it is important to construct a society in which people are happy while cooperating in groups of about 50 people. If this happens, will unease not go away a little bit?

Yamatō It's more like a reason to live—I think people will come to be able to obtain the joy of living, and therefore be able to affirm themselves ("It's good that I'm alive.")

<For the Happiness of Humans>

Yamatō Starting with the issue of how we should think about human happiness, I would like to summarize what we've talked about regarding unease and dissatisfaction.

Of course, since we are animals, there are basic factors related to animal happiness: Eating so that you can live, avoiding danger or evading enemies, and reproducing in order to leave offspring. I think that we, as humans, have these basic desires. In this sense, if we are able to satisfy these biological desires, one would think that we'd be happy.

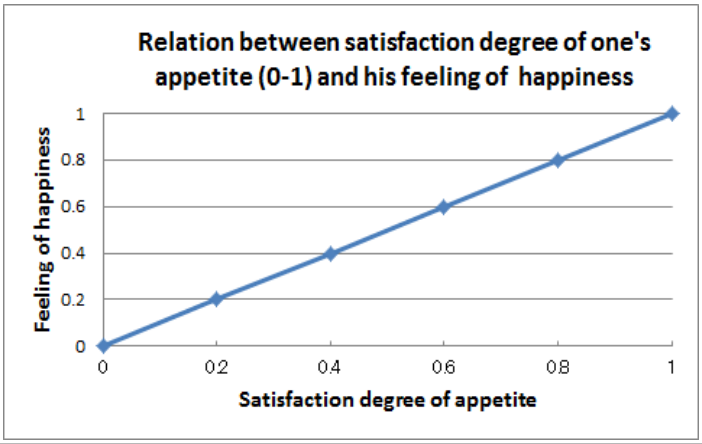


Figure 3. Happiness Evaluation Graph. As an example, this figure shows a graphed relationship between appetite satisfaction and the feeling of happiness. —— We understand happiness as the sum of the levels of satisfaction regarding four basic desires (0~1; see the summary at the end of this book). We suppose that the fourth desire (cooperation) is, in the context of a selfish strategy in a restricted environment, inversely proportional to the strength of the desires for honor (fame), rights (power), and money (1～∞). On the other hand, while it may not be inversely proportional in the context of a good-natured strategy in an unrestricted environment, it is at the very least probably correlated. That's why we also assume that it is 1 in this context.

The horizontal axis is the level of satisfaction (0~1) with regard to appetite, escape (danger avoidance), sex (reproduction), and cooperation. Their total sum is shown on the vertical axis as happiness. As a function type, the first letter of each is used; for example, Ha=AESC. We have illustrated here the direct relationship between appetite satisfaction and a person's level of happiness. Adding the inversely proportional contemporary terms, we have C=α/(HoRM), and in the end Ha=AES[α/(HoRM)]. α probably differs depending on the era, but for now we will make it constant. Today, since the groups to which people belong have become ambiguous, opportunities for contributing have decreased. This might mean that the α regarding the level of satisfaction from cooperation might be rather low (for example, 0.1).

We might be able to assume that in the ancient past A, E, S=0.1, 0.1, 0.5, α=1, Ho, R, M=1. Or, we could assume there was no concept of or desire for honor (fame), right (power), and money. For the time being, based on the above assumptions, for the level of happiness (Ha=AESC), we calculated that Ha=0.005. On the other hand, if one uses the figures A, E, S=0.9, 0.9, 0.6, α=1, Ho, R, M=10 at present era, one arrives at Ha=0.000486=0.0005. This indicates that happiness is basically completely gone (even more so than in ancient times). Incidentally, for example in Ancient Rome, while slaves were not treated like people, the group to which normal citizens belonged was probably clear. People, even the emperor, were evaluated based on his contribution to securing the group's three primal desires. It can be supposed that normal citizens contributed to their group and that they were aware that the responsibilities of the emperor required considerable knowledge. Thus, they probably thought the honor (fame), power, and money obtained by him were fair and justified. In other words, citizens probably had little envy, and it can be assumed that the desire for these same rewards probably was not widespread in this civil society. For example, if one sets the strength of these desires as 2, when A, E, S=0.5, 0.6, 0.6, the result is Ha=0.023. Perhaps they had a great deal of happiness in Ancient Rome. This is why it appears that, in order for everyone today to obtain happiness, it is necessary to restrict HoRM. In other words, restrictions on free competition will probably be the key.

However, another characteristic of humans is their special inherent cooperativeness. If one thinks about the happiness of humans, it appears that after fulfilling their three basic desires as living organisms, they then have a desire to feel the joy of being useful to and recognized by everyone in their group. If they can satisfy this desire, they can live happily. In Figure 3, we have schematically shown human happiness as a function of the level of satisfaction of the four aforementioned desires.

Masuho That's right. I've heard the following statistic. There are lots of people who when asked, "Are you happy?" or "Are you living right now with joy?" will say "Somewhat; I live my life with moderate joy." This does not depend upon economic difference, as rich people and poor people generally answer the same way. Insofar as things are not extremely bad for the person (for example, starvation), there is no difference in the typical response to questions about their happiness.

Yamatō In other words, most people in Japan know that they will probably be able to eat, and are feeling a moderate amount of happiness as organisms. However, it does appear that, to some extent, everyone feels isolated at times.

Masuho If this is the case, with regards to human happiness, today the minimal biological conditions for it are generally satisfied; they have been improved considerably. However, the problem lies in whether or not people are psychologically satisfied. There's a documentary movie called the *Economics of Happiness,* directed by Helena Norberg-Hodge, based on her research in a small village in India called Ladakh. This village is not blessed with a great deal of material wealth, but the people there don't have much envy, and are generally happy. The director proposes localization as a factor for this happiness; for example, in the form of local production and consumption of food. This is similar to the self-sufficient and self-supporting spheres that we talked about in Chapter 7 ("Globalization"). Around the end of the Edo Period (1603–1868) and beginning of the Meiji period (1868–1912) foreigners had a perception of Japanese people's lives and happiness based on popular portrayals of these people living "according to their lot." They were seen as living properly, cooperatively, and happily, as well as being satisfied with their self-sufficiency (Kyōji Watanabe, *Yukishi yo no omokage* [The Face of the World Passing], Published by Heibonsha).

Yamatō Yeah. I think so as well. At the very least, Japan, Europe, and other developed countries today are pretty well-off economically. In this sense we must be happy. However, not everyone agrees that we are happy. Based on biology, we have analyzed this as originating with the cooperative nature of humans.

Masuho The minimal conditions for us as living beings to thrive have, in the past 100 years, vastly improved. Will these conditions be maintained in the future as well? Will they get better? One can consider the China rare metal problem as typical of this scenario. Of course, if something benefits a certain country, it is very possible that the country will use this advantage as a weapon, even if other countries suffer great inconvenience. Thus, is there not a danger that Japanese people won't be able to secure happiness as living beings if they don't aim to produce things for local consumption and become self-sufficient and self-supporting?

Yamatō That might be the case. That's just what we're talking about. This might become a huge problem that involves politics, the world's climate, the environment, and other global factors.

<Future Image>

Masuho Let's talk about our image for the future. But because it is difficult to offer a concrete proposal for living happily, I won't attempt to do so here. I will just summarize our analysis of the causes and provide our proposal. First, we analyzed the causes of societal issues such as child abuse as being a sickness of contemporary competitive society. I think that our findings can be applied to contemporary people's unease in general. In other words, by contradicting humans' cooperative nature, the competitive principle of society encourages selfish strategies (which are growing stronger in Earth's current restricted environment), thereby increasing inequality. This causes people more stress in the form of the desire for money and power, and causes conflict in their hearts as well as feelings of unease. We can see that people's sense of isolation has deepened, and a situation has arrived in which people even lose sight of the meaning of life. Thus, reform of the social system is necessary. This is what we are searching for throughout this dialogue. As a conclusion, we (two life scientists) proposed the establishment of self-sufficiency and self-support on any scale, national, regional or world-wide depending on the technological development. Please read the conclusion of this book for more information.

Chapter 9　Space Exploration: Mars Explorers, Seeking New Frontiers

Christopher Columbus (1451-1506), who was active during the Age of Discovery and discovered the American continent.

Yamatō I would like to discuss space exploration. We've talked about how Earth today is a severely restricted environment with dwindling resources, and have proposed possible measures for survival within this context. However, another approach could be to recreate unrestricted environmental conditions like those that existed during the Age of Discovery in the early 15th century. A likely way to accomplish this is through space exploration. Thus, I would like to touch upon the current space exploration situation a little bit. Even if unrestricted environmental conditions are once again put in place, it is possible that, due to the division of labor-based efficiency in the context of free competition, the population would immediately increase, leading once again to a restricted environment. Therefore, we don't see this as a very effective course; however, since the universe is infinite, it may contain infinite possibilities. Now, it appears that the United States' space program is turning more toward privatization. In addition, NASA is planning to send humans to Mars by the 2030s. The first manned space satellite was the Soviet Union's *Vostok 1* in 1961.

Masuho The cosmonaut Gagarin was aboard.

Yamatō While space exploration started as a competitive tool between two superpowers, judging from the direction of the United States, it appears that now we have entered an era in which greater opportunities are possible. I think at one point, however, people said that too much of the national budget was being used for space exploration, and that Congress should reduce its funding, which ultimately led to its stagnation. But of course this passion, or should I say fundamental wish, continued, and while NASA is trying to reach Mars, a not-for-profit called Mars One is talking about even migrating to the planet and setting up a colony in the near future.

However, people in the US might be wondering whether it's really worth it to use so much money for such activities. Will the people of the world allow for this kind of thing? For example, there are lots of people in Africa who truly have trouble getting enough food for the day (Figure 1), while flying into space even once consumes an immense amount of money, close to $2.3 billion dollars or 10 billion yen even for one

Figure 1. Left: The Mars rover that landed on Mars from the Mars explorer *Curiosity* (2012). Image by NASA. Right: An open-air classroom at a Somalian refugee camp in Dadaab, Kenya (2011). While on one hand the rover delivered information and data regarding Mars (e.g., the existence of elements considered to be the building blocks of life), on the other hand there is starvation in Africa, where 13 million people await emergency assistance. Image from Wikipedia.

Japanese rocket. Is it okay for this to be allowed on a worldwide scale? I think that this is an issue that we need to discuss.

Incidentally, why do Russians and Americans (particularly the latter) have a desire to engage in space exploration? Maybe it's just the nature of the Japanese nation to be quiet and private; maybe currently it's the disposition of Japanese people to be content with what they have. When Japan was closed off during the Edo period for almost 300 years, there was basically no interaction at all with the outside world. The foreigners who came at the end of the Edo period and the beginning of the Meiji period in 1868 portrayed Japanese people as polite and proper, truly living with joy, and enjoying every day. They even wondered whether or not it was okay to encourage them to modernize.

Maybe Japanese people are satisfied to just explore and exist on Earth, while Americans and Russians incessantly want to go to outer space. I think that it is more of a national passion for these countries.

Masuho But think about the problems on Earth today. The world population is currently seven billion, and according to the UN's 2014 "State of World Population," it's predicted that this will probably surpass 10 billion by 2100. If this happens, what will be the food situation? The ozone hole is another problem. It's not just the one in the South Pole anymore, as in 2011 it was reported that a gigantic ozone hole has appeared over the North Pole as well.

Furthermore, global temperatures are expected increase due to carbon dioxide, leading to a rise in sea levels. As a result, land will become more limited. While it's true that one cannot easily imagine what will happen in 100 years, taking these problems into account, it's pretty doubtful that the Earth will be able to sustain human life.

As is well-known, between 50,000 and 100,000 years ago, *Homo sapiens* left Africa, which was the first time that *Homo sapiens* spread throughout the world, thereby increasing the population. About 74,000 years ago, the Lake Toba volcano in Southeast Asia erupted, leading to aridification, enabling the Red Sea to be passable by land and *Homo sapiens* to leave Africa. In this way, climatic changes have always considerably dominated *Homo sapiens*' society. I think there's no guarantee that in 100 years people will really be able to flourish on Earth like they do now. Taking this into account, I'm led to think that just like humans left the bountiful forest for the severe environment of the savannah, it might be logical to go from this bountiful Earth into outer space.

Yamatō Exactly. The origin of this is nothing other than the first *Homo sapiens* leaving Africa. And humans—as well as other living beings—naturally feel a pressure to expand, no?

At the time, *Homo sapiens* might have had this same kind of adventurous spirit, since the environment became harsh. Since it became difficult to live in Africa,

they sought a new world. Today, a similar severe situation is emerging. Maybe since humans have this inherent nature for exploration, we're now going to have an adventure in outer space.

Masuho Also, in the past 20,000 years, agriculture has developed considerably, enabled by proper conditions being in place—namely, a continually moist and mild Earth environment. There is no guarantee at all, however, that this will continue forever, as some research states that global temperatures are going to rise, leading to a rise in sea level as well. Places like Japan will become considerably smaller, and the farmland that can be cultivated globally might decrease rapidly.

Yamatō I don't know why, but Europeans and Americans, in other words Caucasian races, have historically felt pressure to expand. I feel like they have a passion that drives them to want to go on adventures to unknown places.

Masuho While some might disagree, I think that this is because of a difference in the biological motivations for activities; for example, Caucasians were initially a hunting race, and Japanese people were generally a farming race.

Yamatō They may unconsciously realize that the nature of human beings as living beings lies in the nucleic acid organisms created on or originated from the bases that fell from outer space. They thus dream of going back to outer space, the home of these original nucleic acids. Or maybe I'm wrong. Do you have the desire to go back to outer space?

Masuho (*Laughter*) I don't have it at all.

Yamatō But during that Age of Discovery, when Europe was saturated with farmland, Europeans decided to go outside the continent, traveling by boat across the ocean, aiming for the new American continent. They increased their known land. Where does this passion of Caucasians come from?

Masuho This appears in science as well, where Caucasian scientists engage in really original things, whereas their Japanese counterparts tend to diligently build things up bit by bit. I've experienced this. There was an outside committee meeting regarding projects of the Ministry of International Trade and Industry's Japan Aerospace Exploration Agency. There were 20 or 30 committee members at the meeting, and the ministry said that they wanted to somehow industrialize space exploration; however, while I don't remember the exact figure, it takes something like 10 billion yen to launch one small rocket into outer space. They said, "Please tell us things that can be industrialized with this." In the United States, there are bio-venture companies manufacturing protein crystals in outer space, and I was asked to look into and consider this; however, I found that doing so does not have much merit, as protein can be crystallized on Earth as well. In the end, I don't think there was really anything from the committee that was justifiable to be made into reality. Ideas were gathered from throughout the country: hatch *medaka* (Japanese killifish) in outer space, bring rats into outer space to see if they get osteoporosis, and so on. In the end it was about

whether it would make money or be immediately useful. I think that engaging in this kind of science just for the sake of doing it is bad.

Yamatō There's an undercurrent amongst Japanese people in which things are done because they make money or advance technology. Essentially, they have a practical purpose. However, why do Americans, for example, have dreams like going to Mars no matter what the cost? Is it for the prestige of their country? Or is it the Caucasian ardor that we've been talking about?

If so, maybe it's the same as the *Home sapiens* who dared to leave Africa, or the people who went to the Americas during the Age of Discovery. It's a strong will or fervor to seek new frontiers in outer space when Earth's resource environment is becoming harsh. Maybe Caucasians particularly have this quality, or perhaps people in general do.

Also, as I said earlier, I think it's surely that we—as nucleic acid organisms—want to once again return to outer space. But this might just be my silly talk.

Masuho That's just you speaking rhetoric (*Laughter*). What's important is whether or not humankind can really live in outer space. It would be good if there was a proposed scenario that would convince us that it might be possible.

Yamatō Do we want to have such a scenario in mind because we're Japanese? As I said before, maybe Americans can go on adventures just based on their passion, without calculating things in advance, but Japanese people are more realistic and conservative. It seems that now the United States is actually moving ahead with a plan to go to Mars, but I really don't think they know if humankind will be able to live in colonies on Mars or the moon until after a few decades of exploring them. We also don't know if living in such places would be beneficial for people who were raised on Earth. I myself think that it would be hard to live in outer space. Not to mention the fact that a huge amount of energy would be needed, and there wouldn't be that many resources after going there.

Masuho While a great deal of energy might be necessary, it could be provided by the sun. Or maybe a fuel such as coal. Plants could be grown on Mars by harnessing sunlight, and animals could be fed with these plants. People might be able to find resources for growing other types of plants as well. With regard to the United States trying to go to Mars, since it rotates on its axis once every 24 hours, its daytime is basically the same as Earth's. However, it takes 700 days to revolve around the sun, compared to our 365. There are also seasons, no?

Yamatō People might be able to engage in agriculture. If they do so, they might—more or less—be able to live in a self-sufficient and self-supporting fashion.

Masuho Right, and it appears that there is—or was—water. Nutrients might be able to be brought from Earth as well, such as nitrogen, phosphoric acid, and potassium.

Yamatō There also might be minerals. Aiming to migrate in this way, there are

various experiments being carried out in the United States, such as "biospheres," which are facilities that artificially construct ecosystems. There are similar efforts in which a number of people live for one or two years in a completely closed-off system.

Masuho In the future we might be able to make space colonies, as a result of these experiments.

Yamatō Even though, in the end, the moon is closer, the United States seems set on exploring Mars as a potential new home. But there's nothing on Mars.

Masuho As you said, why aim for Mars? I can't really understand this commitment. I think it might be better to provide support to hungry people in Africa, no? There are many people starving. So, with regard to space exploration, do you have any sort of image of the future?

Yamatō Hmmm...I can't really tell what the future holds, but there's nothing that can be done but go there and see what it's like.

Masuho People might fail in their space exploration efforts and come back—if they're able to. But I'd like to return to and summarize the original issue that we raised. With regard to the goal of going to space in pursuit of recreating unrestricted environmental conditions, judging from humanity's history, I expect that even if this happens, restricted environmental conditions will appear again. While it might not offer much hope, the universe might have many hidden possibilities that we can't imagine, since it is infinite. Regardless, I think that this effort should be considered and respected primarily as Caucasian passion. From the perspective of us Japanese people, it appears to be a waste of money, and that there are better ways to use the money for problems on Earth. Maybe this is a racial or ethnic difference.

Chapter 10　The Fusion of Academic Fields: Sociobiology-based Revival of Humankind

Cover of the Japanese version of Edward O. Wilson's *Sociobiology* (published by Shinshisakusha, 1999).

<The Fusion of Academic Fields>

Masuho Now let's discuss the integration, or fusion, of academic fields. As you know, there are many; in the humanities alone, there is sociology, political science, law, economics, pedagogy, history, psychology, philosophy, and literature. In Japan, literature is even divided into the study of "pure literature" (*junbungaku*) and popular literature. In the natural sciences, there is mathematics, physics, chemistry, biology, medicine, agricultural science, pharmacology, architecture, mechanical engineering, electrical engineering, material engineering, and aeronautical engineering. Furthermore, there are the arts, such as music, painting, calligraphy, ceramics, theater, movies, and so on. Though, the art is often considered to be part of the humanities. There is truly a wide variety of academic fields, a result of the progress of culture and civilization. I do wonder if they all share a sort of unified way of thinking about things, what could be called a fundamental principle. A new academic field, as a border area, could arise by fusing, for example, law and biology. Or a new academic field might appear by combining sociology and psychology.

I think there is a need to once again thoroughly dig down into the fields' fundamental parts, particularly with regard to the humanities. One of the most important figures in this regard is probably Edward O. Wilson, who researched ants at Harvard and wrote *Sociobiology* (1975), a popular text in which he asserted that the humanities could be rethought from the perspective of biology. It brought about strong opposition from many people, particularly those in the humanities—once when he was giving a talk, someone poured a bucket of water on his head. Perhaps for this reason alone it is important to consider it.

Recently, he published *Consilience: The Unity of Knowledge.* In this book as well, he discusses the intellectual challenge of trying to connect the humanities and natural sciences. As Wilson explains, there is a need to rethink once again the world of the humanities from a biological, in particular an ethological and evolutionary, perspective. In doing so, a new biology-based humanities will probably emerge, and we'll likely be able to see how these two fields can be integrated.

Come to think of it, Darwin's theory of evolution was related to economics. In *On the Origin of Species* (1859), he established a theory on the evolution of organisms. As you know, it's said that he consulted Thomas Robert Malthus' economics text *An Essay on the Principle of Population* when crafting his theory. Malthus' book argues that while food sources increase gradually, the human population increases in a geometrical ratio; therefore, at a certain point, there will not be enough food for everyone on Earth. In this way, Darwin and Malthus brought together economics and evolution.

In addition, Freud, who was the first person to construct the modern field of psychology, was influenced by Darwin's book. In this way, I think that there is a need

for the humanities to be once again reconsidered from the perspectives of biology, ethology, evolution, and so on. What are your thoughts?

Yamatō I would like to add two things. Recently, science has become very subdivided. I've been involved in biology for many years, but it has become increasingly subdivided into fields like cellular biology, molecular biology, bioinformatics, and so on. Despite these smaller sectors all being related to the same foundational biology, there are a lot of things in these fields that other biologists have trouble in understanding. While the general field certainly does grow deeper thanks to subdividing, it becomes hard to see the overall picture. What was originally the purpose of academic fields anyway? Of course, I feel that they first arose from the question of where we humans came from and what kind of beings we are. In contrast to the desire to see things in an integrated way and grasp the world comprehensively, recently, some academic fields—including the natural sciences—are becoming very subdivided and incomprehensible, even to those who have studied them.

The second thing that I would like to add is regarding the fusion of humanities and the natural sciences. Fields in the humanities such as economics and political science analyze the formation of societies based on their histories; they are academic fields that were created just by analyzing and considering social systems. I think Wilson thought that if these fields were to be reconsidered from the perspective of recent knowledge from the natural sciences, it would be seen that humans are the ones who manufactured politics and economics in society, and that if humans were to truly understand this, the foundational principles of humanities could be grasped more deeply. Wilson awoke to this need, and therefore proposed sociobiology, no? The subdividing that I mentioned earlier is something that I've been recently personally dissatisfied with.

Masuho When you were talking about how the purpose of biology has become unclear due to the field's subdividing, the analysis of the human genome came to mind. We now understand the sequence of human genes, of which there are said to be between 20,000 and 30,000. However, we cannot understand humans just based on this gene sequence. We have to reconstruct the genes' relationships and interactions with each other in order to do so. When it comes to reconstructing genes, cells, and ultimately the individual, unless we understand the whole person or, essentially, the biology upon which *Homo sapiens* are based, and utilize (or mobilize) all of the humanities, we might not be able to truly understand these relationships.

Yamatō The direction you're pointing out—that humanities are useful for understanding the natural sciences—is opposite to that of the need I just discussed. I said that since the objects of study in the humanities are also engaged in by humans, when trying to understand the humanities, it would be the easiest if people study things like politics and economics after having understood the behavior, evolution, and inherent nature of humans. In contrast, you're saying that while we have certainly

come to understand things like the human genome in the natural sciences, in the end we still are unable to have a full understanding of humans. If we then add the perspective of how humans actually behave in political and economic spheres, we'll be able to understand humans by adding this information to the knowledge about the genome. In other words, there are benefits for the natural sciences (particularly biology) as well as the humanities if they influence each other and fuse together.

Masuho Exactly. It's almost mysterious that this kind of thing has not yet been done at all.

Yamatō In the future, a comprehensive academic field will be important. Around when academic fields began in ancient Greece, philosophy and science were born from the question "What are humans?" It can be said that academic fields were born with the common goal of knowing oneself and our species. However, since they have become subdivided, while individual fields might have grown deeper, the bigger picture has become difficult to grasp. This is the current problem with academic fields today. In this sense, now is there not again a need to return to the beginning and create a comprehensive academic field that departs from the philosophy of today and fuses the humanities and natural sciences?

Masuho Since philosophy played such a crucial role when academic fields began, let's see if philosophy can unify the two today. For example, Descartes said, "I think, therefore I am." It appears that he means, "Asking myself why I am here is in itself proof of my existence." This is certainly true. But can it be developed even further? Unlike the natural sciences, philosophy does not advance or accumulate knowledge on its own. In this sense, if the knowledge in the humanities was also able to build upon itself, such as knowledge in the natural sciences or biology, humans would be able to arrive at higher-level concepts. I think that herein lays the limitation of the humanities, including philosophy.

I'll give another example. The stone washbasin located outside of a tearoom at the temple Ryōan-ji has the four characters "吾唯足知"—one on each corner—that surround a square in the middle. They mean "Be content with what (or who?) you are." This is a wonderful philosophy not only for Zen priests but for people in general as well. However, I don't think everything can be understood by this simplistic principle. Nothing that transcends this idea can be said to be born directly from it. In the end, to further accumulate new wisdom, the natural sciences are necessary. In this way, has the time not come to rethink philosophy as well as literature from a biological perspective?

Yamatō An academic field that others and myself know about is the famous philosophy of ancient Greece, which people learn about in their history courses at school. This philosophy was characterized by the questions, "What are humans?" and "What are living things?" Aristotle and others also wanted to understand natural phenomena. This kind of inquiry was the start of academic fields. Of course, before

recorded history, academic fields might have existed as technologies: religion, the discovery of agriculture, astronomy, and so on. So we learn in history class that the philosophy of ancient Greece was the beginning of what we currently understand to be academic fields, but what was the process of transformation by which these academic fields became as subdivided as they are today? What was the cause?

Masuho I think that, rather, technologies based on the demands of daily life such as agriculture and hunting/gathering were seen as important in the past as well. Around Egypt, astronomy was developed for the purpose of agriculture, no? Also, law was established in order to peacefully govern large masses of people. Of course math—the basis of the natural sciences (which are the source of technology)—was necessary as well. It appears that society developed with each of these fields supporting their corresponding technological aspects. Therefore, with the human population having increased and the social organization system having grown complicated, each field has had no choice but to subdivide in order to support the kind of technological development that we have today.

Yamatō True. Pythagoras came up with his triangle theorem in order to survey and regulate private property. In medieval Europe, there was textual research like scholasticism that was similar to research styles also seen in China at the time. In other words, the natural sciences and humanities did not develop that much during this time. Then, during the Renaissance, there were technology-related academic fields that subdivided due to the demands that accompanied industrial change, but there were also field that were seeking to understand humans and natural phenomena. During this period, people also went back to the origins of academic fields in ancient Greece and imperial Rome. After that, Galileo and Newton, who wanted to understand the universe, appeared, and the basis of the contemporary natural sciences was constructed. Then, based on the accomplishments of research regarding fundamental questions about the formation of the universe, Earth, and humans, multiple new technological developments appeared. These are the natural sciences and humanities that we study today. Therefore, in response to individual technologies that were seen as necessary, academic fields had to subdivide. Looking at things in this way, perhaps one can say that Wilson, who today advocates for the establishment of a comprehensive academic field that re-synthesizes the natural sciences and humanities, and the questions we pose in this chapter might both originate from a thirst for another new Renaissance in the form of a human revitalization movement. I don't really look at myself in this way, though. With all this said, it appears that academic fields were originally born from people being curious. With their subdivision growing extreme, now perhaps there is a need for more free and broad-minded ideas in the form of a new Renaissance.

Masuho Let's bring the conversation back to contemporary times. Some years ago, a famous pianist brought a piano to Cambridge Square, a busy intersection in Boston.

His performance consisted of sitting in front of the piano without playing it. Similarly, in the art world, there are incomprehensible abstract paintings, no? Can ordinary people really follow these things? Both painting and music need to once again return to the foundational, inherent nature of people and relearn what is beautiful and what feels nice. I am not saying that artists and musicians have to learn biology, but I do want to tell them to rethink their work once they understand humans as living beings. For example, with regard to music, Mozart basically made all the good music there was to be made. In the world of paintings, the same can be said about Renoir, who lived around 1900. In this way, most of the artistic creative activities that move people might have already been done a long time ago. In order to figure out what to do from here onwards, we need to return to the basics and see if biology can give us the answers as to what *Homo sapiens* feel and seek.

Yamatō Agreed. Biology will be a necessary component for the rebirth of the arts and academic fields in the future. This tendency has been strong in novels and such for some time now. The stuff that people like is generally about how to live life. It's like what we discussed at the beginning of our dialogue: the groups of people described in these novels and books are usually no more than 50, wherein when the characters follow humans' inherent nature (particularly the desire for cooperation), it is considered fair. In contrast, situations in which the characters cannot live fairly are presented as tragedies, and ones in which some act fairly while others' unfairness goes unpunished are often presented as situational comedies. Novelists are also obviously humans and therefore instinctively understand the subject matter that will be the most appealing to people. Furthermore, since the words, actions, and story lines that are easily accepted by people in lyrics and novels have been recently analyzed and understood, it appears that it is possible to produce them on a large scale with a computer. If biology was used, the most appealing themes could probably be pinpointed even more. It's now an era in which everyone should learn biology.

Masuho Massachusetts Institute of Technology (MIT) seems to have adopted such an educational policy—in 1993 they started making biology a required subject for all students. It appears that in the United States the number of universities requiring biology courses for all science and engineering students is increasing. It would be nice if in the future something like a new politics or new economics was born as a result of humanities (law department, economics department, etc.) students being required to learn a little more of biology at Japanese universities.

Yamatō Also, in order to dissolve or reduce the dissatisfaction and unease of people living in contemporary society (discussed in Chapter 8, "People's Dissatisfaction and Unease")—in other words, to answer our initial question of how us humans and all phenomena are put together—it is important for everyone to study evolution and ethology, having taken into account the attainments of the life sciences. This will surely also lead to happiness in people's lives. Actually, they should be taught not at

university but rather in middle and high schools, no?

Masuho Even in high schools, biology is not a required subject. In high school biology textbooks, the mechanism by which the eyes see, the mechanism by which the ears hear, and so on are described in detail. Knowing these things is good, but thinking in terms of importance, it appears that they should teach in more detail the evolution of living beings as well as ethology.

<Future Prospects for Science Fields>

Yamatō Certainly, in the future it would be best if university students engaged in their own fields of study after they have all been taught, at the very least, the basics of biology and are made to understand human evolution and behavior. Such humanities and natural sciences would be ideal.

I'd like to talk about a topic based on my experience that is slightly unrelated to the integration of academic fields. I believe that the humanities and natural sciences should try to integrate with one another; however, as I mentioned, based on my experience, even biology is becoming more subdivided. Yet, when one looks at the field of biology from a broad perspective, one could say that research has historically been done on three main flows: research on the flow of matter, typified by work on metabolism; research on the flow of energy in organisms such as muscle movement, which began flourishing around 1945; and, more recently thanks to Watson & Crick, research on the flow of information relating to molecular biology such as DNA base sequence information analysis (Figure 1). Based on this view, it can be said that an organism is a body born amidst flows of matter (metabolism), energy, and information. It's just like the "transmigration" that Śākyamuni Buddha talked about. It's pretty impressive that he saw into the essential nature of things. Furthermore, from these three flows, one can naturally understand the three basic desires of living things that

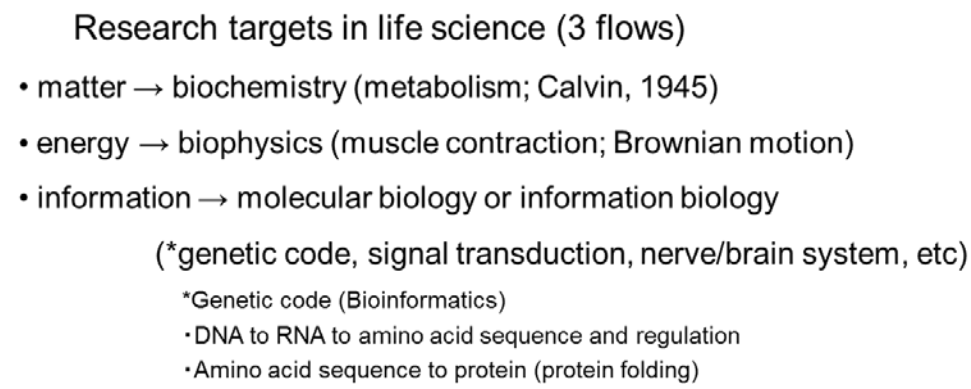


Figure 1. The Three Flows in Life Science Research. Life is a non-equilibrium system comprised of three flows: matter, energy, and information. Biochemistry has primarily studied the flow of matter, biophysics has primarily studied the flow of energy, and with the 1953 discovery by Watson and Crick of DNA's double helix, molecular biology began, which primarily studied the flow of information in life. Of course, there are many aspects that intersect and overlap each other. Above, typical examples of each academic field's object of research are shown.

we discussed in Chapter 1: eat, avoid danger, and reproduce.

I recently realized that this perspective can be applied to the natural sciences as a whole. In other words, in physics there was the research on matter by Newton, Galileo, and others, and then energy research typified by thermodynamics (e.g., the heat engine's Carnot cycle). Around 1950 there was the information research of Shannon and von Neumann. The accomplishments of these researchers came to fruition based on the research of others, as well as the development of new technologies, such as the Internet.

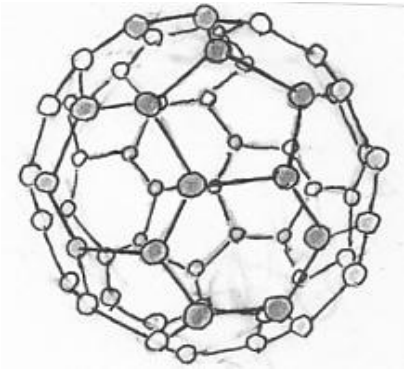
Looking at it in this way, I feel that research on these three flows (matter, energy, and information) has developed considerably and has now reached maturation in all the natural science fields. I'm interested in the direction that next-generation natural science fields will take. It's pretty hard to predict. Each field will probably continue to subdivide in an effort to look better into detailed topics, which led me to be concerned that a fourth new research field similar to the above three may not emerge.

However, I just realized when we were talking about the importance of integrating the humanities and natural sciences that the fourth research field could possibly be the integration of research findings on various flows. A little while ago people often spoke of "complex systems science." People forecasted that research seeking to understand overall systems—such as how matter, energy, and information work together—would finally mature. I think it's probably true.

Masuho It might be. A typical example would be the development of organisms. If overall systems are researched as an integrated academic field, biology will certainly follow in that direction. Then, in the world of matter, for example, similarly complex systems science would surely emerge. In the natural sciences in general, various fields will likely begin fusing together. To go back to the start of our conversation, it is important that, in the future, biology goes in the direction of understanding people by fusing together with various academic fields, and that the humanities be reconsidered from the perspective of biology. At the same time, it's also important that biology is understood from a humanities perspective.

<The Progress of and Concerns Regarding the Academic Fields of Natural Sciences>

Figure 2. C60 Fullerene



Masuho We've been discussing the progress of and changes occurring within the academic fields of the natural sciences. Looking at the past 40 years, there were incredibly large strides in the field of biology. When I first started doing biochemistry experiments, the quantities were 10 millimeters, 100 millimeters, and so on. However,

today scientists are using amounts like 10 microliters (1/1000 of a milliliter) and even sometimes 1 microliter. The objects of research went from the level of individual whole organisms to microscopic analysis, and finally to the world of genes. Recently, people have been working to unify this research again. For example, developmental engineering seeks to understand molecules on an individual level as well as gene function and diseases in order to establish effective treatment methods. This is true not only in our field of biology but also in chemistry. It's not my area of expertise, but there is research that, skillfully joining carbon chains, creates fullerene (a general name for hollow and spherical cage-like clusters comprised only of multiple carbon atoms; see Figure 2). In physics as well, the existence of the Higgs boson (an elementary particle) finally became clear in 2012.

So, in the next 100 years, how much will these natural sciences progress and influence the world in which we live? Also, are there types of research in which scholars should not engage? Let's think about these issues.

First, an important direction for the next 100 years might be space exploration (discussed in Chapter 9, "Space Exploration"). Currently there is a space station flying over Earth. Since there are, at most, around 10 astronauts aboard the station and they only stay for several months, it's unthinkable that evolution would occur under such conditions. However, it would be different if in the future tens of thousands of people go into outer space and multiple generations settle in colonies on other planets. It might be similar to how *Australopithecines* went into the savannah from the forest 5 million years ago. Compared to the forest, the savannah was an extremely difficult environment in which to survive; however, from a long-term perspective, it improved the human lineage considerably. When one thinks about it in this way, going into outer space might give *Homo sapiens* considerable opportunities, just as going into the savannah did for the *Australopithecines*.

Yamatō Since the Industrial Revolution—particularly in the past 100 years—science and technology have been progressing at a very fast rate. This is expected to continue in the future as well. In my somewhat biased view, it concerns me that the development of the basic natural sciences appears to be reaching a standstill. On the other hand, I think that there is a wonderful accumulation of academic knowledge, and that technology based on this research will continue to contribute to the development of humankind by expanding to the nano-level, the universe, and so on. In this sense, natural sciences will probably continue to progress and contribute to our happiness in the future.

You said that going into outer space might lead to something as epoch-making as our ancestors going into the savannah. That might be the case. While again there is a restricted environment and a harsh situation on Earth today, if humanity goes into outer space seeking new resources, I expect that there might be possibilities for wonderful development, as was the case during the Age of Discovery. In this sense, I

have high hopes for the future development of science and technology. However, I think that a big problem in the future will be the appearance of technology and science that, from a humanitarian standpoint, is detrimental.

For example, nuclear power—like the Fukushima Daiichi Nuclear Power Plant—is currently being used for peaceful purposes. However, is it really technology that people can control? It appears that it's not. In my field, iPS cells were created, and regenerative medicine is just around the corner. Moreover, for a time there was chatter about human cloning. Is it really okay to do this kind of thing? I am afraid that people will probably want to and probably will do it. What do you think?

Masuho While I am against developments in such science and technology as cloning, I am afraid that someone will probably do it if it is technologically possible.

Yamatō So we see it the same way. Since a situation is emerging in which it can successfully be done technologically, it would be pretty terrible if someone attempts to do so anyway. What would we do if a cloned person really appeared? What would be the dangers of this?

Masuho I've read a book in which an American biologist touches upon the cloning of people, questioning whether it would really be a problem if an embryologically modified human was superior to a non-modified or "normal" human. He argued that there was no difference between such modifications and spending a lot of money on your children's education by hiring home tutors and the like. It's the same in the world of sports. An era might come in which a cyborg-like athlete will win Olympic gold medals.

Yamatō An easy response to this discussion is that things will be fine if rules are put into place. Things like this will of course be accepted by some people and rejected by others; however, rules, even though most are arbitrary, should be established. Additionally, if such clones or cyborgs were allowed by these rules, would you be able to easily accept such a person as part of your circle? For example, these "people" might have legs like those of the manga and anime character Astroboy, and jump short distances as if they were flying, or increase their exercise abilities by remodeling their hearts to increase blood flow. Will such people be accepted into normal society?

Masuho I think not. Wouldn't it become a similar issue as doping? There are rules against doping in athletics. It's definitely beneficial when running if you have taken a dose of the hematopoietic growth factor erythropoietin, which considerably increases one's red blood cell count. Since presently even this erythropoietin is not allowed, certainly in the future cloned people and cyborg-remodeled people will not be allowed to compete in events alongside normal humans. Acceptance into everyday society might be a delicate problem as well.

Yamatō The reason why I asked is as the followings: At present, people would feel discomfort and dislike if a cloned person were to appear. Perhaps the white people who had come to settle in the New World felt that the Native Americans were a different

race or different type of living being because they had such different features. So at that time, the white people could kill the Native Americans rather without hesitation. Similarly if cloned people appeared in this world, it might be hard for them to be accepted by others at present.

However, while racial tensions still exist somewhat, people accept that all humans are of the same fundamental species. So even though people presently might feel a sense of discomfort or dislike when they think about a cloned or cyborg individual, this might change as time passes, and such individuals might come to be accepted as brethren. When this happens, do you think that people would still feel a sense of discomfort?

Masuho I think they would. However, they would probably have to accept them regardless. For example, people who settled in Australia drove native Tasmanians to extinction. Considering this kind of tragedy, I think that having open doors is a fundamental requirement. As you often say, if the nucleic acid aliens' invasion of Earth was the beginning of life on this planet, then aren't all nucleic acid living beings originally part of the same circle, regardless of if they're cloned? However, as we discussed in Chapter 2 ("Sexual Desire"), globalization can lead to a loss of diversity, particularly in terms of immune systems' defense against pathogens. Since there is the possibility that there will be a considerable amount of undesirable aspects with regard to cloning and cyborg people, an abundance of caution is necessary.

Yamatō That's right. Touché. While this is a topic I frequently talk about without realizing it, you got me. If one adopts this dialogue's basic stance of considering various social phenomena and problems from the perspective of the origin of living beings (particularly humans), in the end one should at the very least see all as companions insofar as they are living beings that evolved from nucleic acid. In the real world, even if people are different races, I feel that they are part of the same circle. However, do you really think that if people could be reconstructed with regenerative medicine, or clones or cyborgs appeared, that they'd be accepted?

Masuho I think they would. In this sense, while current research on medicines has hit a wall, its future progress may lie in cyborg technology, or perhaps I should say medical engineering. Making blind people see, deaf people hear ... it would be quite good news.

Yamatō In this context it would be good news, but if it were applied differently, and there were fully cloned people, human ethics would become truly important. Or maybe not ethics—I really think that, as we've said throughout this book, *knowledge* regarding how humans appeared and what kind of beings they are must be spread throughout the world.

Masuho In Takama Daisuke's *Ningen ha doko kara kita noka, doko he iku noka* ("Where Did Humans Come From and Where are They Going?" 2010), there is a discussion of robots. If robots are shaped like machines, no one thinks that they are

disturbing, but if they are designed with a human face, people feel uneasy. If they are made even more sophisticated and their expressions can mimic humans', they get even scarier. The greater the resemblance to an actual human, the deeper the fear that we will someday not be able to tell who is a robot and who is not.

Yamatō Yeah, that really does appear to be the case. Right now, we're talking about our image of the future, and while it might be fine to say that the natural sciences should progress and develop, it's hard to really get an idea of what's going to happen.

Masuho In the end it's hard to have an outlook. The natural sciences might produce research that should not be applied. If, technologically speaking, these things became possible it would be pretty hard to put the brakes on them. Is the cloning of people the only kind of research that should be banned right now? For example, we really don't know how the world of cyborgs will change in 100 years. I think that this is a scientific problem that must be thought about in terms of governance as well. It is my hope that everyone thinks about this, having properly understood the origins, history, and inherent nature of life, particularly humans.

<Summary: The Integration of Academic Fields>

Masuho So, let's succinctly summarize our image of academic fields in the future. I think that humanities and natural sciences—particularly biology—will fuse together more and more. Mathematics is probably the most fundamental science, followed by physics, chemistry (which follows the laws of physics), and biology (which follows the laws of chemistry). While it might lead to misunderstandings if I say that the humanities are below biology, I think that things will move in the direction of the humanities being understood via theories and principles found in biology (Figure 3).

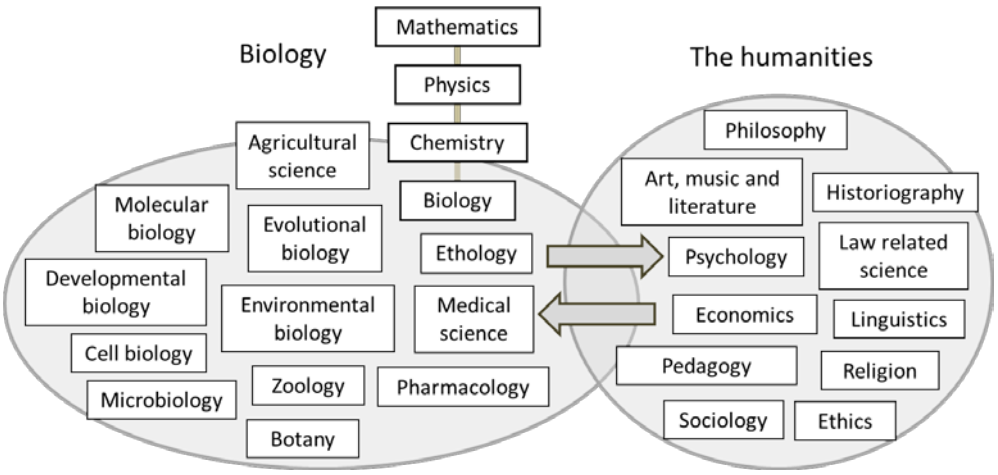


Figure 3. Overview of the relationships between academic fields.

As we mentioned earlier, Charles Darwin drew from the economic work in Malthus' *An Essay on the Principle of Population* when formulating his theory of evolution, and I've heard that there is even an area of research called evolutionary economics. Economics is surely related to living things' struggle for survival, and it appears that the field of law will, in the future, be more deeply understood based on biology or one of the higher sciences.

This was not understood up until the present, probably because only in the past few decades has biology—particularly the theory of evolution and ethology—made considerable progress.

Representative works on this subject include Edward O. Wilson's *Sociobiology* and *Consilience: The Unity of Knowledge*. One also can find other works that consider humans' various social behaviors and the arts from an ethological perspective. I've heard an interesting example in relation to this: The color of a room's walls can influence the progression and conclusions of discussions that are held in it. It appears that just seeing the shade of a room influences our thoughts. In terms of music, for many people, listening to Mozart brings about a peaceful mindset (if I understand correctly, it is said this is due to its $1/f$ fluctuation noise—a noise in which the density is inversely proportional to the frequency—that is often also found in natural phenomena). In terms of painting, looking at a Renoir, people truly feel that they are seeing the form of a healthy woman.

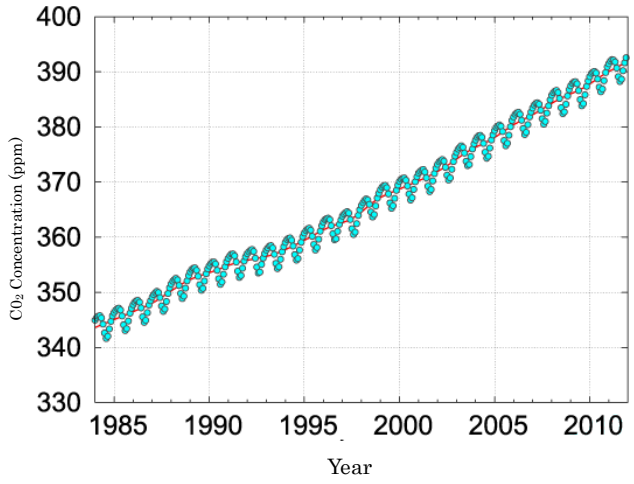
I hope that in the future an integrated academic system such as life science sociology or bio-economics will emerge. Similarly, while the natural sciences are currently subdivided, individual academic fields such as physics and biology will probably become more integrated, and individuals will probably try their hand at understanding larger systems, like complex systems science.

Furthermore, as we have discussed, it appears that amidst the growth of the natural sciences, research and technological developments are appearing that should not be allowed from a humanitarian perspective. I think that by engaging in discussions and studies that go back to the origins and history of life and humans, we will be able to establish solutions and ethical standards regarding them that are appropriate for humankind on Earth. Similarly, the basics of biology must surely be brought into law and ethics. In order to do this, though, I think that bold reform is necessary. The educational system needs to be improved by, at the very least, eliminating the gap between the humanities and natural sciences, and teaching biology to all first-year university students.

For the past 40 years, you and I have engaged in biology research, so we may both have talked too much from the side of biology. Now I will summarize this chapter as follows: (1) In the past 100 years, the natural sciences have advanced rapidly and analyzed phenomena in detail. (2) The natural sciences have subdivided into many academic fields. (3) In the same way, the humanities have analyzed in detail people's

speech and behavior, social structure, and so on. (4) As a result, society and cultural activities have developed. (5) However, this deep knowledge did not go in the direction of fusing with that of other fields. (6) New forms of science that fused the natural sciences and humanities basically did not develop at all. (7) In the future, the integration of all sciences will probably be necessary, such as the natural sciences (particularly biology) developing into the humanities, and the humanities developing into the natural sciences. Based on this, we think that a path to people's happiness will be accessible.

Chapter 11　Seeking Happiness: Mankind and Society



This graph shows the yearly changes in the concentration of carbon dioxide (CO_2) on Earth based on a statistical analysis of data from the World Data Centre for Greenhouse Gases (WDCGG) (from the Japan Meteorological agency's website). Originally, Earth had a high concentration of carbon dioxide and the surface temperature was very hot. When life appeared, photosynthetic organisms (particularly cyanobacteria) produced oxygen. Subsequently, aerobic organisms appeared, Earth cooled, and the concentration of carbon dioxide decreased. However, as shown in the above graph, due to recent human activity, the concentration of CO_2 has begun to rapidly increase, and it is feared that this is going to lead to Earth's warming. The primary source of this CO_2 increase is said to be fossil fuels.

Masuho This is our last topic. Let's talk about the outlook for the future, or rather, what kind of outlook we should have when thinking about the future with regard to the preservation of world peace and Earth's environment.

The planet's population is comprised of various races, religions, and languages; thus, it is difficult to figure out how to overcome such differences and achieve world peace. Even today there are countries that are about to go to war with one another and others in civil wars. Because one can't declare that there will be absolutely no war in the future, how can world peace be maintained, and what kind of shared way of thinking can enable us to do so?

You've talked about one world country, suggesting that Earth as a whole could be established as a single country. If this happened and international rules were made, world peace could probably be maintained and the environment might be able to be preserved. That's how I understood the idea. However, I'm a little concerned as to whether or not a world country can really function properly—even the UN cannot today.

Also, with globalization and free competition advancing as they are today, as a result of a division of labor-based efficiency and the acceleration of industry, it looks as if we're not going to be able to maintain Earth's current environment. For example, high CO_2 emissions are leading to a rise in surface temperatures and chlorofluorocarbons have created holes in the ozone. As a result, environmental changes (such as the strengthening of ultraviolet rays) are occurring, which exert a massive influence on living beings. What should be done so that Earth's countries can preserve the environment based on shared ideas regarding these problems?

Yamatō You've raised a difficult issue. Of course, ideally there would be the one world country that you mentioned, and looking at history, it's quite clear that we may be headed on that path, considering that, historically, humans expanded from villages into domains, and then into countries like Japan. Right now, however, people's sense of belonging remains limited to their home nation, especially in Japan, where it also appears that we are in an era in which people's patriotism toward the country is slowly fading. I think it's the influence of globalization, where people can quickly travel throughout the world. In this sense, it might be good if things progressed one step further and countries united to form a single world country.

Masuho I think that the provinces in Mikawa, which were united as a result of war during the Tokugawa family's emergence, and countries being united on a worldwide scale are completely different. The races, languages, religions, and cultures involved are completely different.

Yamatō That's true. Today on Earth, large-scale wars are not likely to occur. Thinking just about individual differences between countries and regions, however, it

might appear that regional wars are still a possibility. While there's nothing that can be done about racial differences, at the very least races will mix together. I believe that religions that are openly confrontational should be abolished, and the remaining belief systems unified into something that people will widely consent to and that is inclusive of everyone. With regard to language, soon things will be able to be automatically translated, maybe in ways similar to the cartoon character Doraemon's "translation jelly" (*honyaku konnyaku).* At the very least, translation will be considerably improved thanks to the progress of science and technology.

However, unlike situations in which people in villages or domains were united after attacking and destroying one another, there is no clear answer as to what can be done in modern times without engaging in war where there should give rise a winner and a loser. We're in an era in which superpowers like the United States and China could not consider attacking and destroying each other, no?

Masuho National borders cannot be eradicated without countries destroying each other. Countries have interests, so they would not do away with borders and let people and commerce flow completely freely. With that said, however, I have been paying attention to the EU, which was awarded the Nobel Peace Prize in 2012. Perhaps they're dreaming of constructing a world country by peaceful means.

Yamatō The EU is a wonderful effort. I don't want it to fail. Also, to return to our original topic, in the past, even though Japan's provincial languages and religions were different, it was unified through military force, leading the Japanese people to feel that it was basically one country all along. If the world was unified into one country by military force, then I think a situation like this would arise. Do you think it's possible? I think that it would be impossible to successfully use military force today, so it's pretty hard to figure out what to do. Anyway, let's leave this subject behind. Similarly, because religion is a very sensitive issue, I think that it would be good if it went away.

Masuho Well, I think that Buddhism is fundamentally different from Christianity and Islam, which are both monotheistic and have an absolute set of values. Today, conflict between religions is intense, and has repercussions for world peace. In Buddhism and Shinto, however, there is a myriad of gods—they might even increase sometimes. In this sense, monotheistic religions such as Christianity and Islam are exclusivist. Also, naturally, the individual God that is the object of belief in these religions is different.

Yamatō As we talked about earlier, I think that religion emerged in the context of a society in which villages and settlements were expanding and stratification was beginning to emerge. In order to encourage obedience and unify people who didn't have a strong sense of group belonging, religion appeared as a solution. In this way, religion was useful for creating social rules and morality in smaller areas. However, in today's

world where there are multiple monotheistic religions with strict rules that are in conflict with one another, I think that religion is undoubtedly more harmful than beneficial. That's why I think that religions should be done away with. Maybe people with deep faith will criticize me for saying this, though. Regardless, if biology education spreads on a general level, I expect that the power of religion will be weakened, even if it does take some years. In the future, there will be the DNA religion, so to speak, or the idea that we all have the same origins as members of humankind and therefore are all companions.

Masuho DNA religion…It would be pretty hard for people to become aware of themselves as part of the same circle of humankind. This is because we feel united and strengthen our sense of belonging only when there is a common force to which we are opposed (as discussed in Chapter 3, "Desire for Cooperation"). In fact, Islam and Christianity might be using this kind of consciousness. For a long time now, in response to the expansion of domestic contradictions and national dissatisfaction, individual country governments have frequently found enemies abroad and fanned their nation's oppositional consciousness, dissatisfaction, and patriotism.

Yamatō That's right. That's why, in order to weaken the power of today's religions, people who have studied biology should analyze contemporary times, establish an academic field that integrates the humanities, and create a unified theory or concept for how humankind's social organizational system should be.

Masuho And it must be understood by as many people as possible.

Yamatō Right. I'd like to guide society and the world. While saying so sounds audacious, basically, the purpose of this book is to propose a guide for society based on the origins of humans and their inherent nature.

Masuho Since the humanities deal with people's activities, biology should be its basis. Biology would be the pivot point, and, to use the metaphor of a river's course, downstream from biology would be the humanities, and upstream would be chemistry, physics, and mathematics. Biology would be the cornerstone that ties together the humanities and physical sciences.

<Summarizing Our Understanding>

As discussed, biospheres on Earth exist in very restricted environments. According to the Ecological Footprint assessment in 2012, the amount of resources on Earth for each person is, when converted to land area, only 1.9 ha. (The Ecological Footprint is an indicator that expresses ecosystems' burden. Every year, an NPO reports statistics that express the burden human activities are placing on the environment using indicators that show Earth's environmental capacity.) Today, a single Japanese person

consumes 4.2 ha on average. By using space exploration to discover new resources and innovations in science and technology (such as the development of nuclear fusion reactors), we might be able to increase the 1.9 ha capacity to 2 ha or 3 ha. Furthermore, we might be able to decrease the amount of resources consumed at the same lifestyle level by 3 ha or 4 ha. Science and technology researchers are working daily so that this can happen.

On the other hand, in free competition under a restricted environment, a selfish strategy becomes predominant (because insofar as people do not act for their own benefit they will suffer losses), and many cases appear in which people feel isolated and unhappy due to the collapse of trusting relationships. Furthermore, as a result of people pursuing efficiency and economic growth in order to "win," globalization like that of today appears, and large, global companies dominate. One thing that then occurs is the loss of diversity of economic actors and a decreased ability to handle changes. Furthermore, and most importantly, with efficiency having increased due to globalization, in order to maintain a lifestyle level that consumes the equivalent of 4.2 ha, people might promote inequality instead of trying to reduce this to 3 ha or 4 ha with scientific and technological progress. They might even raise their lifestyle levels, and consume 5 ha or 6 ha. Either way, it appears that at the end of this prioritization of efficiency—based on selfish strategies—is an even more unequal society filled with envy. As a result, one can imagine that people's unhappiness will increase even further.

In such situations, up until recently, common enemies were created in order to satisfy people's desire to cooperate, which fed their sense of happiness. I don't know if this is a valid example, but the recent demonstrations in China regarding the Senkaku (Diaoyu) Islands involved people proclaiming things like "Down with the Japanese Empire!" and "The Japanese Empire is the Devil!" At the very least, it's fresh in our memories how, during World War II, we Japanese declared, "The Americans and English are devils!" However, today the human genome has been decoded, and I hope that it is becoming widely taught that all people are the same species and also are fellow Earth organisms that descended from nucleic acid aliens. In other words, an era is surely emerging in which people don't see other fellow people as enemies. People are beginning to realize that even if one makes enemies and competes, such actions will only make Earth's limited resources dry out, and in the end, everyone will just drive each other to extinction.

So, what should be done to make people happy, or create a society in which people are happy that they are alive? What should be done to satisfy the four basic desires, particularly the desire for cooperation? I think that in this conversation we're in the process of getting a hint regarding the answer. Space exploration is probably

necessary, but for the time being we're in an environment with limited resources, and we will probably have to restrict free competition, leading to a selfish strategy. Ultimately, we should probably restrict globalization, which gives priority to efficiency. Of course, political globalization, such as that symbolized by this year's Nobel Peace Prize (2012) awarded to the EU, should be advanced. This is because, today, awareness based on hyper-universal love regarding all living things on Earth—particularly other members of humankind—is spreading. On the other hand, there is humans' inherent boundary condition of only being able to cognize on a scale of 50 to 150 people, which means there is a limit to the scale on which people can feel empathy. Is a social organization system possible, which takes into account this boundary condition and maximizes people's happiness? The concrete social organizational system that two life scientific researchers like us can propose is the establishment of self-sufficient and self-supporting spheres in a world country, but we're not confident that this will really solve the problem. We hope that researchers in the humanities and social sciences who have widely incorporated the life sciences into their research will work on this issue. We think that introducing a free land and free money economic system is also crucial.

<Our Concrete Proposal for a Social Organizational System: Self-Sufficiency and Self-Support>

Humans are living beings that are manipulated by their selfish genes. For this reason, they constantly feel pressure to multiply, and aim for the flourishing of their offspring. For this reason, humans have developed science and technology, pushed forward with the division of labor, heightened efficiency, and increased their population. However, today this population has expanded to the extent that it cannot be supported by one planet. In other words, we must restrict the population multiplication strategy in order to maintain Earth's environment.

Thus, is it not the case that the only thing that can be done to restrict population growth without directly ordering people around is to make each area or region self-sufficient and self-supporting? A long time ago in economies of self-sufficiency and self-support there probably was no division of labor and very low efficiency on an individual level, and the population that could be supported was limited. The growth in size of groups—villages to townships to domains—was, on the one hand, due to the expansion of agriculture, development of writing, advancement of civilization, and progress of science; on the other hand, another important cause appears to have been the division of labor on a worldwide scale. Therefore, in order to limit the world's population and resource consumption to a range sustainable by Earth’s environment, it is my hope that we can figure out an appropriate division of

labor at the current level allowed by science and technology. In other words, it is our hope that we can calculate an appropriate scale for self-sufficiency and self-support, and that this scale, in accordance with the development of science and technology, can support our current lifestyle levels.

If we run societies without stratification or inequality in an effort to ensure (to some extent) freedom, we can—without getting in the way of people's happiness—manage nature and the run-away human population to avoid bankrupting Earth's resources. To achieve this, it appears that robotics will be key: By introducing robots, the scale of self-sufficient and self-supporting spheres will gradually grow smaller. Today, due to the spread of the division of labor based on globalization, developed nations have achieved a high level of efficiency that can squander the equivalent of several Earths worth of resources. As a result, they're troubled by a population explosion. If we proceed without doing anything about population size, at some point the destruction of Earth's environment by humankind will be complete, and like other living beings have experienced many times, this time humanity may experience extinction. Of course, as has been done throughout humanity's history, there is the option of temporarily putting in place unrestricted environmental conditions and trying our hand at a new social organizational system, but people are more aware now that war is not always the best answer. Thus, it is our wish that in order to avoid extinction, humanity will be able to restrict the natural population explosion and squandering of resources. We hope that this can be done by realistically restricting free competition as a result of Earth being reborn as one world republic and the establishment of regions or spheres that are self-sufficient states. Is this not the only measure that can be taken regarding our way of living on Earth in a restricted environment?

With regard to China's rare metal issue and so on, in the end there is nothing that can be done but for the world government to find points of compromise regarding distribution. Also, while globalization is occurring at present, for the time being each country could be made into a self-sufficient and self-supporting unit. If this happens, we might be in time. Thus, I think that the introduction of self-sufficiency and self-support is realistically possible. However, we might be too late, because if globalization continues to progress and countries with only deserts produce nothing but oil, one can imagine that it will be impossible and unrealistic to introduce self-sufficiency and self-support in each region. Conversely, since now in these countries there's a little bit of farming and industry, the introduction today of a self-sufficient and self-supporting system might still work. If globalization and the division of labor advance even more, then self-sufficient and self-supporting spheres will no longer be possible, and there will be nothing that can be done but wait until

Earth's resources are completely exhausted.

It's just like the issue of nuclear power. Even when nuclear power plants were first introduced, there was no plan for how to handle nuclear waste. At the time, there was opposition to the introduction of an energy source this dangerous, and there were people who called for the promotion of development research on various kinds of safe and renewable energy. However, partially due to the push from political lobbyists from the nuclear power industry (who profit from nuclear energy), there came to be many nuclear power plants, and the development of renewable energy technology fell behind. Then, the Fukushima Daiichi Nuclear Power Plant accident occurred in 2011. To go back down the route of stopping nuclear power plants would involve considerable roadblocks and costs. To revise a policy that's already been so heavily invested in and promoted involves a lot of money. With regard to Earth's environment, while I think it is clear that we are no longer in a situation in which all countries would fight a war amongst each other, it must be said that awareness regarding this issue by many politicians is outrageously low.

Of course, if depreciating money is introduced, businesses that use money unfairly are bound to disappear. Furthermore, due to the advancement of science and technology (including robotics), it will probably be possible in the future to shrink the required size of self-sufficient and self-supporting units. If this happens, the human population might be able to decrease naturally. In other words, it appears that we can bring the activity level of all of humankind down to one that can be sustained by Earth's environment. Politicians and economists who can only think of economic growth are misreading the era. There may be nothing that can be done but for them to step down from the stage of politics.

Furthermore, the self-sufficiency and self-support that we are proposing would be partial. It certainly does not mean closing off countries. In many countries, as we mentioned, complete self-sufficiency and self-support may never be realized. By "partial" we mean the extent that is possible for a country; it is the construction of a system in which a country provides as much food and the like as possible for itself so that its people can survive when emergency conditions arise. Besides this, countries' industries could beneficially contribute to people in other areas of the world. For example, Japan could produce automobiles, and the earnings from doing so could be used to not only sustain the automobile industry but also increase self-sufficient and self-supporting industries. Therefore, with regard to the activities of industry under somewhat restricted freely competitive conditions, Japan has, compared to other areas of the world, adequately favorable technological abilities.

Another system might be possible as well. It might also be an option to bring back the planned economies of communism. However, insofar as people want freedom

as organisms, restricted competition would probably be appropriate. At the time, the sharing of the information around the world would be indispensable.

A partially self-sufficient and self-supporting society could be achieved not only on a country scale, but also on a prefectural, city, or 50-person group scale. The scale, of course, will depend upon the necessary number of people to make products. The members of these groups would surely be able to produce results, satisfy their desire for cooperation, and feel happy.

A problem with partially self-sufficient and self-supporting societies, however, is that there will probably be cases in which groups will be geographically separated from people with skills that they could put to use if they were in the same country. In a world country, this issue would be solved, but in the current situation, this would be difficult. If people are self-sufficient and self-supporting, they can exchange things using free money within a specified sphere. It is our hope that the strengths of free money will be utilized.

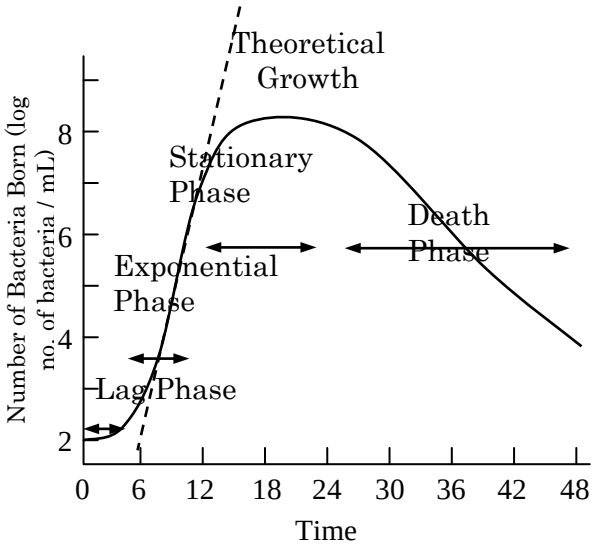
Furthermore, since restrictions will probably be added to the free competition that takes place amidst large masses, each person's dissatisfaction and unease will be addressed. And as we have talked several times, our inherent boundary condition of cognition size is 50 to 150 people. Therefore, the group size should be limited to no more than 50 to 150. The size of the self-sufficient and self-supporting would be determined by the science and technology level at the time. Then what is our social and political system of one country on the Earth? We have no concrete idea; but we think the system should be free in its information transfer and mobilization like as the Internet without any center.

Conclusion

Homo sapiens emerged 500,000 years ago in Africa, and left the continent approximately 50,000 to 70,000 years ago. There probably were not even 1,000 people who succeeded in this journey. They spread throughout the world, and their population increased. Particularly after agriculture was adopted, larger groups of people could be supported. Around 1 CE, the population had increased to approximately 100 million, and for approximately 1,800 years thereafter, it varied between 100 million and 300 million. However, starting around the time of the Industrial Revolution during the latter half of the 18th century, the population began to rapidly increase. By 1900, there were between 1.6 billion and 1.7 billion people on Earth, swelling to 6.1 billion people in 2000, and 7 billion people at the time of this book's publication. It is predicted that by 2100 there will be more than 10 billion people living on the planet. Despite the 500,000 years of human history, only in the last 200 years has the human population increased explosively.

Now let us (abruptly) turn to the reproduction of *Escherichia coli* (*E. coli*), which we discussed in Chapter 2 ("Appetite"). These bacteria live in animals' large intestine, and are approximately 1 µm (1/10,000 of a cm) long. Though they are inherently small (e.g., one *E. coli* is $(1 \times 10^{-4})^3 = 10^{-12}$ g), if they are cultured appropriately and provided with adequate nutrients at 37°C, in approximately 30 minutes, one bacterium will reproduce (by division) to form two. If cultured for 24 hours, one bacterium will increase to $(2^2)^{24} = 2.8 \times 10^{14}$ bacteria that weigh 280 g. In reality, however, nutrients run out before they can increase like this. If a large receptacle is used and unlimited nutrients are provided for one week, how much will they weigh? After 24 hours they weigh 280 g, so if each *E. coli* bacterium divides into two in 30 minutes, they should weigh 280^7 g, or $280^7 = 1.3 \times 10^{17}$ g (1.3×10^{11} tons). If this were divided up evenly among all 7 billion people on Earth, there would be 20 tons of *E. coli* per person. Incidentally, Earth weighs 5.972×10^{21} tons, so if cultured with unlimited resources for two weeks, the bacteria would be $(1.3 \times 10^{11} \text{ tons})^2 = 1.7 \times 10^{22}$ tons, or heavier than Earth.

As mentioned, however, there is a limit to the amount of nutrients that can be given to *E. coli*, as well as the size of the container. In reality, there is a reproduction curve like the one on the right. Until getting used to their culture environment, reproduction is slow (lag phase), but in the exponential phase they double every 30 minutes. When *E. coli* increase, nutrients decrease and waste accumulates in the culture. When this happens, reproduction ceases (stationary phase). If one continues to try and culture them, they will die out. However, if one moves some *E. coli* to a new container during the



stationary phase, they will again reproduce as in the curve shown.

Presently the world human population has increased to 7 billion. Put in terms of the reproduction curve of *E. coli*, humans are likely now in the exponential growth phase or later. We wrote this book out of a sense of crisis that the population has reached the stationary phase, or death phase. As we have discussed, there are many problems on Earth currently, on both individual and worldwide levels; for example: (1) in European countries, the United States, and Japan, individuals with lifestyle-related diseases are increasing due to an overabundance of food, while in various countries in Africa and elsewhere, 600 million people are starving; (2) as a result of the same types of food being consumed around the world, diversity of plant life is in danger and the number of living things that will go extinct is increasing; (3) the sense of unfairness people have in unequal societies—comprised of "the rich getting richer" on the one hand and "working poor" on the other—is leading to unhappiness; (4) amidst intense free competition in a capitalist society, people feel isolated from the anonymous mass of people whom they are competing against; (5) family bonds are growing weaker, and people's joy derived from cooperating with family members (and others) is decreasing; (6) with industry around the world globalizing, rapid progress is being made and division of labor is advancing, but amidst this, people are losing sight of their reasons to live; (7) industrial efficiency based on globalization is reaching its limit, and as transportation has developed, the world has become smaller, leading to competition in a restricted environment on a worldwide scale (as a result, "selfish strategies" are replacing "good-natured strategies"); (8) with both the natural sciences and humanities progressing and becoming more subdivided, people have lost sight of their overall aim. Ultimately, the humanities need to fuse together with biology, particularly from perspectives of the theory of evolution and ethology. As things are, there is no doubt that humanity is in danger of extinction. While it would be great if "the invisible hand" (coined by Adam Smith) maintained stability in the human population and people lived happily, each of the 7 billion people on Earth instinctively are trying to increase their own descendants due to their selfish genes. Can we just ignore these problems of today? While this issue might be beyond us life scientists, we have been engaging in this conversation in the hope of presenting a path forward from the perspective of biology.

Our basic aim is to identify solutions based on the lives of humans in the ancient past. Of course, a species comprised of only 100 million people cannot be directly compared with the fractured societies of science and industry jammed with 7 billion people. With that said, humans' bodies, emotions, and thoughts have surely not changed drastically in the past 10,000 years. Thus, comparing the differences in the lives of people in ancient times and in our more recent path with our current human condition today, we tried to consider the discrepancies between them.

Originally, humans created groups that were approximately 50 people in size. We are only able to grasp the personalities and abilities of between 50 and, at most, 150 group members. Large companies today

have many employees—often upward of 10,000 people—who have labor divided between them. When labor is considerably subdivided, it is easy to lack clarity in one's own role. Wouldn't it be ideal if we return to groups of approximately 50 people again so that people can understand each other and demonstrate their reciprocal altruism?

As we stated, since the Industrial Revolution, the population has rapidly increased. Along with progress in the natural sciences, there has also been the globalization of culture and industry. For example, Japan makes a massive number of cars and imports food from many countries. The world has attained overall efficiency in this way; however, due to globalization, local cultures are disappearing, animals and plants are near extinction, and humans have become more homogeneous. Not only is plant and animal diversity lost, but diversity is reduced in society as well. People are exposed to competition in a restricted environment on a worldwide scale, and become isolated and unhappy. In order to improve this situation, localization can be adopted, where each area or region produces local goods to sustain itself with the minimum food and energy needed for its people to live. If just this is done, there will end up being self-sufficient and self-supporting countries closed off to the world; however, we do not reject the idea of these areas exporting their unique technologies and products while also importing things that they lack. Looking at the world as a whole, there appear to be some areas that cannot be self-sufficient and self-supporting due to environmental factors. The hypothetical "single Earth country" would administratively make adjustments with regard to this.

In order to correct the economic inequality in a capitalist society, Gesell's "free land" and "free money" principles could be introduced (as discussed in Chapter 7, "The Merits and Demerits of Money"). Land that people own and currency would depreciate, so as time passes, their value would go down, just like products. It would be possible to depreciate free money if people use credit cards; however, we are still unsure as to how land should be depreciated.

Similar to how *Australopithecines* went into the dangerous savannah—and over the course of millions of years became *Homo sapiens*, who came to dominate the world—perhaps space exploration should be encouraged. One day, perhaps millions of people will be able to relocate from Earth's restricted environment to a newly discovered unrestricted one. However, it is still hard to see how this would actually take shape.

The reason humans have prospered to the extent that they have might be the development of their brain. In ancient times, humans withstood extreme cold and heat in huts that barely kept out the rain, filled their stomachs with the leftovers of other animals' food, and clothed themselves in animal fur. Today, however, there are skyscrapers equipped with air conditioning and heating systems. People are now liberated from nature's shifting temperatures, food is imported and exported around the world, and one can choose various types of clothing, all depending, of course, on how much money ones have. Drug treatments have been developed for infectious and lifestyle diseases, and the human lifespan has now become longer

from 30 years at 200(?) years ago to 80 years. In addition, one can go from Japan to the United States or Europe in less than half a day. In this way, humans have been liberated from many natural restrictions thanks to the progress of the natural sciences; however, will people continue to develop the natural sciences out of the desire for more freedom? There are limits to Earth's resources and environment, which may serve as inhibitors to this progress.

The humanities have also made considerable progress, and as a result have become subdivided. But despite the considerable investments in these fields, to what extent have we been able to understand humans? We think that they have not provided satisfactory explanations. Has not the time come to re-examine people as humans, as one kind of animal? In the past few decades, biology has markedly progressed. It is now time to reconsider the humanities based on the knowledge of biology. Furthermore, it has also become possible to reconstruct biology from a humanities perspective.

We are both aware that our discussion has been very rudimentary. In response to the urgency of the problems in society today, we will publish this book as quickly as possible and ask for the opinions of its readers. It is our hope that in doing so, the ideal society which humans should aim for will become clear. (Masuho)

An Outline of Earth's History and the Evolution of Living Beings

Year	Evolution of Living Things	Changes Relating to Earth and Society
15 Billion Years Ago		Universe is created.
4.6 Billion Years Ago		Earth is created.
3.5 Billion Years Ago	Birth of life in the ocean (prokaryotic mono-cellular organisms).	
2.7 Billion Years Ago	Appearance of stromatolites.	Oxygen molecules increase in the atmosphere due to stromatolite photosynthesis.
1.8 Billion Years Ago	Birth of eukaryotes.	
1.2 Billion Years ago	Animals and plants split off.	
1.1 Billion Years Ago	Sexual reproduction begins.	
1 Billion Years Ago		Creation of ozone due to oxygen and radiation from the sun.
900 Million Years Ago	Birth of protista.	
500 Million Years Ago	Cambrian Explosion. End of Cambrian period: basic fish (Agnatha), which were the first vertebrates.	
420 Million Years Ago	Ferns and insects appear on land.	Ultraviolet light is blocked by the ozone layer's formation, and organisms were able to live on land.
410 Million Years ago	Birth of vertebrates. Evolution took on a rapid pace. Wide variety of fish.	
360 Million Years Ago	Vertebrates came to live on land.	Great extinction (e.g., possible meteorite collision) occurred.
300 Million Years Ago	Appearance of gigantic tree ferns and rough horsetail.	
270 Million Years Ago		Formation of the large continent of Pangaea.
250 Million Years Ago	95% of living things on Earth go extinct.	Some sort of large change on Earth's surface.
200 Million Years Ago	Dinosaurs on land, Ichthyosaurs in the sea. Birth of mammals (e.g., nocturnal mice).	
100 Million Years Ago	Appearance of flowering plants.	Separation of South America and Africa.

Year	Evolution of Living Things	Changes Relating to Earth and Society
65 Million Years Ago	Extinction of dinosaurs. Small mammals survive.	Assumed that gigantic meteorite fell on Yucatán Peninsula.
60 Million Years Ago	Explosive evolution of mammals.	
50 Million Years Ago	Appearance of the primitive primate *Lemuriformes.*	Formation of the Himalayas.
10 Million Years Ago		Earth becomes cold.
7 Million Years Ago	Appearance of *Australopithecine.* Upright bipedalism.	Use of fire and tools. Aridification of Africa.
4.4 Million Years Ago	*Australopithecus* genus.	
3 Million Years Ago	*Australopithecus africanus* (Different from *Homo* genus). *Homo habilis* ("Dexterous Human"; first member of *Homo* genus; used stone tools). *Homo erectus* ("Upright Human"; Asia and Europe).	
2.5 Million Years Ago	*Homo habilis.* Increase in brain capacity (*Australopithecus* - 400-500 cc; *Homo habilis* - 600-800 cc). Began eating meat because plant food cannot provide the brain with enough energy. Stone tool use	
2 Million Years Ago	First stone tools found by modern humans date to this period.	
1.7 Million Years Ago	Loss of body hair. Skin turned darker 1.2 million years ago.	
1.5 Million Years Ago	*Homo ergaster* developed from *Homo habilis.* From trees to the ground. Appearance of families.	
1 Million Years Ago		
	By 0.5 million years ago the human line had arrived in Europe.	
0.5 Million Years Ago	*Homo sapiens* ("Wise Human"); no major changes.	
0.3 - 0.4 Million Years Ago	*Homo neanderthalensis* migrate to Europe.	
0.2 Million Years Ago	Brain capacity becomes the same as contemporary people; however, stone stools and the like remain the same as in previous eras.	
100 Thousand Years Ago	Neanderthals (distributed widely throughout Europe). *Homo sapiens* leave Africa.	Last Ice Age. North America and Eurasia merge.

Year	Evolution of Living Things	Changes Relating to Earth and Society
50 Thousand Years Ago	Appearance of ethologically modern humans in Africa.	Toba Volcano eruption (74,000 years ago).
40-50 Thousand Years Ago	Cro-Magnon man (Europe), ancestor of modern humans. Sudden extinction of Neanderthals.	
20 Thousand Years Ago	The "Great Leap Forward": Development of language and tools, Lascaux cave murals, burial items. Humanity arrives on Australian continent.	Cold period. Europe or Siberia uninhabited by people.
15 Thousand Years Ago	Settled communities created in Middle East.	
10 Thousand Years Ago	The world human population is approximately 10 million. It rapidly increases due to agriculture, reaching 100 million about 5,000 years ago.	Beginning of agriculture (until then: hunting and gathering).
5000 Years Ago		First writing and development of civilization.
2700 Years Ago		First currency.
1900 Years Ago		Invention of paper.
1500 Years Ago		Terrestrial globe
1000 Years Ago	Assuming women gave birth at 25 years of age on average, this is approximately 40 generations ago.	
400 Years Ago		Janssen's microscope and Galileo's telescope are invented.
240 Years Ago		Watts' steam engine is invented.
150 Years Ago		Darwin's' *On the Origin of Species* is published (in 1859)
110 Years Ago		First powered flight.
100 Years Ago		
70 Years Ago		Mass murder of Jews by Nazis. Invention of the transistor.
60 Years Ago	It is discovered that genes are double-helix DNA.	
50 Years Ago		*Sputnick's* spaceflight.
20 Years Ago		Spread of computers.
2003		Sequencing of the entire human genome DNA.
Today	Average lifespan: Japanese women, 87; Japanese men, 80.	

Note: These topics are not necessarily our area of expertise. We consulted various texts and included this table in the hopes that it would be useful for understanding this book. (Masuho)

A Summary of the Book's Discussion to Enable Further Study

1) Human Happiness: Empathy and Emotion

In addition to humans, some monkey species also sometimes engage in altruistic behavior, and elephants have been known to display empathy. Animals with a central nervous system have emotions because they integrate information from their internal and external environments with their memory. Insofar as these emotions are mild and calm, there is little stress and these animals (including humans) feel happy. There are various types of desires included in the category of emotions, and the result of fulfillment of these desires is happiness. What kind of desires, then, should be satisfied? Let's have a look at the next few sections.

2) Where Did the Ingredients of Life Come From?

First, let us reflect on the formation of Earth, the solar system, and the universe. The universe is presumed to be 13.7 billion years old and is said to have begun when there was a massive explosion of a single point of energy in space (called the big bang theory). Due to inflation, the universe rapidly expanded and also began to cool. Eventually, what we understand as “time and space” began to exist, and the rudimentary particles that form elements were born. These elementary particles combined to form deuterium, helium, lithium, and so on, which came together to form galactic systems, and stars were born. Within these stars, heavy elements also appeared, and when stars exploded, these heavy elements scattered and drifted throughout the universe, and came together to create stars and moons. Amidst this history of the universe, approximately 5 billion years ago, a giant clump of gas and dust gathered together and collapsed. Nuclear fusion began at its center, and the Sun was born. About 4.6 billion years ago, the innumerable celestial bodies that were circling the Sun in close range came together, and Earth was formed. Countless times, other celestial bodies such as comets crashed into this newly formed planet.

Stanley Miller and Harold Urey reported in 1953 that they were able to create amino acids and other chemical matter that comprise life by exposing gas with a similar composition to early Earth's atmosphere to an electric discharge similar to lightning. Recently, the bases and amino acids that are the foundations of life have been found elsewhere in the universe. As such, they might have fallen to Earth from outer space. These nucleic acids found a very comfortable place to live on Earth, and evolved chemically into RNA (ribonucleic acid) molecules, which are self-replicating and proliferating and also have catalytic properties. It is therefore believed that the beginning of life took place in an RNA-dominated world. Chemical bonds between protein amino acids (which are biological polymers) are formed with the RNA within the protein synthesizing apparatus called a ribosome acting as a catalyst. RNA is highly active material in the sense that it can be a catalyst for various reactions. About 3.8 billion years ago, it is said that primitive organisms first existed.

3) The Emergence of Life

With RNA as the essence, DNA (the basis of the genes of life today) and proteins polymerized by amino acids appeared, were surrounded by membranes of lipids, and became cells. The specialty of cells is self-propagation and catalysis. Life was born in this way. Considering the origins of life, it can be said that the very goal of these early organisms' existence was to efficiently propagate themselves. This is because matter that did not behave in this way would ultimately disappear. I think that this is the reason Dawkins modified

"gene" with "selfish" in the title of his book, *The Selfish Gene*. It can be said that organisms are born with an innate sense of self-preservation, or passing on one's own information to the next generation, to spread throughout Earth. When examined from this perspective, organisms on Earth could actually be seen as originating from aliens from outer space, just like in a science fiction movie. Furthermore, the meaning of each person living is very clear, is it not? The goal is to rule Earth as the one dominant species (of such aliens), while also living in harmony with various types of other living beings and defeating other competing species. All of this occurs in an effort to spread on Earth the information (RNA and DNA) that is the most similar to one's own species. Therefore, killing self and others of one's own species should not really exist in the world of organisms.

The support and evolution of organisms in this process can be explained using the example of repeatedly playing the Prisoner's Dilemma game in an unrestricted environment (see Figure 1 in Chapter 3, "Desire for Cooperation"). In this sense as long as the environment has been unrestricted, basically while organisms on Earth have been manipulated by their selfish genes and worked to propagate and make them prosper, they have not interfered or betrayed other species (because they are nucleic acid companions), and in the end they have contributed to the overall prosperity of nucleic acid organisms.

4) Again: Human Happiness

Humans, as a kind of animal, are manipulated by their selfish genes. Of course, they also have the following desires to aid self-preservation: (1) to eat, (2) to avoid danger (this includes not only running away but attacking enemies as well), and (3) to propagate oneself (sexual desire). In addition to these basic desires, it appears that humans have a fourth desire as well: the desire for cooperation. If they follow these basic four desires, humans are bound to be happy, no? However, since these desires were built into humans in tandem with a disposition necessary to adapt to a harsh environment, in contemporary society's environment—which, thanks to culture and civilization, is completely different from the harsh environment of our ancestors in terms of access to food, dangerous situations, and so on—it is important to control these desires based on reason in order to obtain happiness.

Contemporary society has particularly exerted influence on and cast a large shadow over the fourth basic desire, the desire for cooperation. Everyone surely knows that in contemporary society there are various desires swirling in people's minds in addition the above four. Typical examples include the desire for fame, money, and power. I think that today these desires have actually become central. There are probably many people who feel that these desires are of a different dimension than the four foundational ones. It appears that these new desires intensely clash with the desire for cooperation, and cause contemporary people's happiness to decrease considerably. What is different about them, and what kind of influence do they have?

5) The Emergence of Humans

Let us take a look at the lives of chimpanzees, which are said to be a common ancestor of humans. They lived in the jungle in groups of approximately 50, and collected enough local fruits to support this size of a group. Approximately 5 million years ago, the climate in Eastern Africa aridified, which created savannahs. Chimpanzees were then forced to leave the jungle in order to support their groups' way of life. These monkeys who left the forest needed to be able to walk bipedally and engage in hunting to be successful. In other words,

they evolved into *Australopithecines,* humans' closest ancestor. Of course, they also formed groups of 50, and in order to succeed in hunting on the savannah, cooperation was indispensable. Without it, they would be unable to secure food and, therefore, go extinct.

Recently, another theory has appeared about the evolution of humans, which states that within forests in Central Africa, monkeys just happened to evolve into bipedal humans. The theory suggests that this enabled them to live easily both in trees and on the ground, which led them to inhabit not only forests but the savannah as well.

Furthermore, bipedalism caused the birth canal to grow narrower, and in the end, humans had to give birth to smaller, less mature babies and raise them closely. A considerable amount of effort is involved in birth and raising human children (childcare, education, discipline, etc.), and the cooperation of a group was necessary. Furthermore, competition between men and women was to be avoided, and monogamy became foundational. This is why cooperating with the approximately 50-person (often blood-related) group to which one belonged was not a duty but actually a desire (the desire for cooperation: wanting to cooperate with everyone and feeling happy when one is recognized for doing so). In order to ensure this willing cooperation, empathy (such as sending necklaces upon the death of a child) and a rich set of emotions (caring for one's partner) became necessary. The driving force of this was language. Thanks to language, humans became unrivaled in terms of memory and the integration of emotions, and their intellectual abilities developed considerably. However, their scope of recognition was the same as their chimpanzee ancestors: 50 individuals. In all eras and places, novels and movies generally have no more than 50 characters, as people are able to more easily understand the content and be moved by the work when the groups are limited in this way.

Even when groups become so large that people cannot be aware of all of the members, if people have a sense of belonging, the feeling of being useful to their group still leads to joy. Typical examples include patriotism and love for one's hometown. Throughout the world in the past and present, this has appeared as loyalty to one's group and aggression toward a common enemy.

This inherent nature of cooperativeness also means that a human cannot live alone. I think every single person alive today would become lonely if they were to live isolated from all others. Everyone has, somewhere, a strong desire to belong to a group. The origins of this lie in the first 50-person groups, particularly those that were blood-related.

I would like to draw everyone's attention to one thing here. There are at least three different levels of desires for cooperative behavior, and they should be distinguished between. Please see Figure 2 in Chapter 3 ("Desire for Cooperation"). The most original cooperative behavior comes from what are called selfish genes. Then, there is the instinctual desire for cooperation that was developed in order to live on the savannah. The next type originates within culture, which is unique to humans. It is the utilitarian altruistic behavior and cooperativeness that takes into account reciprocal benefit. This is done in order to run society efficiently, obtain benefits for oneself and others in their group, as well as to put one's group in an advantageous position over other groups. Such cooperation was born because there was the foundation of (1) blood ties based on selfish genes and (2) the desire for cooperation based on these genes that was built into humans' inherent nature through natural selection. Another form of cooperation is one in which individuals see all living things as part of the same circle because they are organisms (or, at the very least, see all humans as the same species). One can understand this kind of companionship if one considers the origins of life. Is it not this

feeling of fellowship that drives people to, before they realize it, extend a helping hand to those in trouble? This phenomenon is depicted in Rebecca Solnit's *A Paradise Built in Hell*. In situations of distress, a cooperativeness emerges that goes beyond feelings of reciprocal altruism.

Insofar as they do not contradict the predominant strategy in organisms' evolution, mode of life, and also in people's economic and social activities (a "good-natured strategy" when there is an unrestricted environment), people feel joy when these kinds of cooperativeness are satisfied at different levels. When this happens, people probably were and probably still are able to lead lives (and even sometimes feel joy) within functional societies that are filled with the spirit of freedom, equality, and fraternity. This is a world in which people would feel that everyone is living fairly. This would even be the case in a stratified society in which there are anonymous masses of strangers. On the other hand, as has become glaringly apparent in contemporary society (and is analyzed throughout this book), the "selfish strategy" that becomes predominant in a restricted environment leads to intense conflict, as well as stress, strain, discord, a feeling of powerlessness, and a lack of meaning in life. When this happens, one can imagine how a world appears in which everyone feels that others are being unfair. In the future, what kind of world would make people be able to survive happily? In this restricted environment, in the end there is probably nothing that can be done but restricting free competition.

6) Where Did Contemporary Society Come From? Settled Lifestyles Post-Agricultural Introduction

(1) Sedentary Ways of Living and Wealth

Approximately 15,000 years ago, humans began leading settled agricultural lifestyles. First, they abandoned their nomadic ways, developed more permanent settlements, and subsequently invented techniques for growing and harvesting wheat and rice near their dwellings. The practice of agriculture is said to be humanity's greatest invention.

In order to obtain information regarding the climate, change in seasons, and so on, knowledge of astronomy and augury-based knowledge increased. When the amount of harvested food supply increased, along with the appearance of stability in people's lives, the population increased, groups expanded, and, in order to prevent conflict (such as plunder and wars) between groups, reconciliation meetings came to be held regularly. Language spread, and certain kinds of currency (they used units such as bowls of wheat) also developed. With the accumulation of wealth and the expansion of groups, non-laboring classes such as augurs were born as mechanisms for supporting groups comprised of more people than a single person could cognize, and society became stratified. Furthermore, to lead more convenient lives and for more efficient production, the division of labor advanced.

It can be imagined, then, that in this era of increased productivity and expanded economic scale (or eras of economic growth, which can be seen as unrestricted environments), people led lives based on willing cooperation born from a good-natured strategy that took the form of sharing among themselves the blessings grown from Earth. In other words, they led happy lives that did not conflict with their inherent nature as humans. The behavior norms in such a situation can be described as "fair."

(2) A Stratified Society of Nameless Strangers

The next great invention was money. Around 400 BCE in ancient Greek city-state societies, precious

metals such as gold and silver were refined and came to be used as currency. They did not decay or depreciate and were valued by people. As a result, a currency-based economic society like that of today came into existence.

Increased productivity based on the division of labor, the establishment of large groups such as city-states, and politics for the upkeep of such groups came to play an important role. It was a slavery era during which selfish strategies between groups were probably effective, as is the case in the Prisoner's Dilemma game under a restricted environment. Following the aggressive nature that people had acquired in order to protect their 50-person groups (families), war (the selfish strategy of killing others, primarily those from other groups) between groups of organisms frequently occurred. People needed a clear group to belong to (such as a family or city-state) in order to ensure their own survival, since the productivity was not so high enough as today. This meant that enemies were also clearly defined, and people were clearly aware of everyone's contributions to the group. In this way, group members might have satisfied their desire for cooperation and been happy; however, for slaves, there was no greater time of unhappiness.

It appears that this kind of situation has basically continued to the present. Since the first emergence of groups of approximately 50 people, the groups to which people belong have expanded to villages, townships, domains, countries, and so on. Furthermore, while the modes of subordination have changed from slave to serf to colonial subject to working class and so on, in the end, most people have not lived within a class in which they can enjoy happiness.

(3) Contemporary Competitive Society

It can be easily imagined how the desire for money, fame, and power have become priorities in people's minds ever since a stratified society emerged. In groups of approximately 50 people, positive recognition was given to those who cooperated and contributed to the group. However, after large groups of nameless strangers emerged, information didn't circulate as well, and money, fame, and power were probably used as a means of social recognition and to satisfy their desire for cooperation (a measure of people's contribution to society); in other words, their desire to contribute to their group and the joy felt when being recognized for doing so was attainable through these means. Perhaps because a good-natured strategy is predominant in an unrestricted environment, these desires have not worked against the desire for cooperation by, for example, giving rise to envy. Furthermore, even in restricted environments (such as those of our predecessors, when productivity was low and the existence of a group to belong to was indispensable for one's own survival), these desires may not have contradicted the desire for cooperation because enemies and group contributions were clear. In Figure 3 in Chapter 8 ("People's Dissatisfaction and Unease"), for example, we held that they were inversely proportional to happiness but did not cause so much decrease (e.g., as in ancient Rome). However, present-day culture and civilization has progressed, food can be eaten luxuriously, there is less of a need to maintain monogamy-based families, range of choices has increased overall, and people's freedom is (in most parts of the world) guaranteed. This was unthinkable for those living in the environment and situation that existed immediately after humans appeared. This, in and of itself, is great news for humanity; however, since being recognized by society is connected to satisfying the desire for cooperation, the role or position of money, fame, and power which should have started as the means of social recognition of cooperativeness inevitably changed. They've become goals in and of themselves since obtaining them is taken as the social recognition as having

been cooperative but actually people have become isolated from the real joy of being recognized as useful to everyone. With people not actually being recognized for contributing to society, an unequal social structure has appeared in which selfish desires for money, fame, and power—which contradict people's inherent cooperativeness—become predominant. These are the prime causes of envy. One can imagine that these were seen as desires incompatible with people's inherent desire for cooperation, which led to people having the sense that things are unfair. In other words, while belonging to a group is no longer indispensable due to a lack of clearly distinguishable enemies (because education has spread that asserts humans are essentially all "the same") and to people being able to live more independent lives, people suffer due to the contradictions and discord between these desires in this contemporary competitive society with predominant "selfish strategy". See Figure 3 in Chapter 8 ("People's Dissatisfaction and Unease"), for example, particularly the discussion of the desire for cooperation's inverse proportionality to desires for fame, money, and power.

Until now, thanks to technological innovation, the restricted environments of previous eras have been temporarily eradicated due to material expansion and further economic development that went outside of these restricted environments. A typical example is the Age of Discovery. During feudal times in Europe, it appears that after each feudal lord advanced to some extent, low-growth harsh conditions emerged (a restricted environment) in which land and the population could not increase. Then, probably due to the activities of people who wanted to escape or reform this harsh situation, the Renaissance occurred, which progressed people's worldviews as well as science and technology, boat-building methods, and boat-operating techniques. As such, the European world transitioned into mercantilism and absolute monarchism. With people now believing that the world is round, the era of discovering the New World began. In this New World there were indigenous inhabitants. While today we know that the original explorers should have seen the New World's indigenous inhabitants as part of the same human circle, at the time, the people of the Old World saw them more as beasts rather than a different race of humans. This is probably why Spain, England, and France killed so many of them. Furthermore, from the perspective of Europeans in the Old World, the New World promised land and new sources of gold. One can imagine that they felt that they were in a situation similar to that of the Prisoner's Dilemma under unrestricted conditions. In such a situation, a good-natured strategy becomes predominant, so it was more beneficial for them to engage in free competition and share amongst themselves rather than scramble over these resources. A good-natured strategy spread because even if people had failed in the Old World they could try again in the New World. In other words, it was an era in which fairness became universal. As a result, civil society was established, and Adam Smith proposed the idea of the "invisible hand," arguing that if things were left un-influenced, the economy would operate naturally in an ideal form. This came to fruition in the famous 1789 French Revolution slogan of "Freedom, Equality, and Fraternity." This was an epoch-making event. Living beings had followed their selfish gene's pressure to reproduce (the fundamental principle of survival) and subsequently evolved and diversified amidst free reproduction and natural selection in an unrestricted environment. The French Revolution was epoch-making because in order to liberate humans from the fetters of slavery and feudalism, it reaffirmed that people are all one kind of living beings: free and equal. It was probably an era in which, due to people's good-natured strategy, everyone was able to live in accordance with humans' inherent disposition and felt that they were all benefiting from each other's efforts. However, very quickly the land and gold in the New World were consumed, and restricted conditions emerged. Subsequently, thanks to innovations in science and technology, new fields

and discoveries brought about small but unrestricted conditions multiple times. For example, there was the Industrial Revolution that happened due to Watt's steam engine, and the energy revolution thanks to the discovery of oil; even the recent information revolution. In other words, every time there is a major technological innovation, unlimited conditions in the economy appear (to some extent), and some people are able to live cooperatively and happy even while engaging freely in their own individual activities. This is why, for a long time, the majority of the world's social organizational systems have been capitalist ones that emphasize free competition. Of course for many people, while they may not be as restricted as slaves in Egypt, ancient Greece, or serfs in feudal times, they were forced to lead rather oppressed lives as workers. Thus, ideologies like Marx's communism emerged. Now the world's population has rapidly increased, and efficiency in economic activities due to further technological innovation and globalization has led to the rapid whittling away of Earth's rich resources and assets in this competitive capitalist world, bringing about harsher restricted conditions: How can most of the people suffering from this competitive system survive happily?

7) The Hearts of *Homo sapiens* Living in Today's Competitive Society

In a restricted environment, a selfish strategy is effective for individual people and individual countries; however, we have probably now entered into an era of conflict. How can we keep this conflict and unhappiness in check? While some people may disagree, perhaps in the past religion was created and disseminated in order to make most people accept their unhappy life conditions (such as the accumulation of wealth by a few and stratification of everyone else). Modern times are almost showing that religion and morality are powerless against our dissatisfaction. For this reason, as we have discussed in this book, there might be nothing that can be done but to appeal to people's cooperative nature as humans.

It is human nature to see cooperativeness in groups of approximately 50 people as important. They feel a sense of purpose of their living when they contribute to groups of this size. Now, thanks to considerable economic growth, an era has emerged in which individuals can live independently. For this reason, the groups to which people belong have become vague, and individuals are becoming isolated. In eras when economic growth was possible and a good-natured strategy was predominant, people's inherent desire for cooperation was probably satisfied, even if that meant finding himself in a 50-person group of such as a company or organization. However, particularly in the most recent restricted environment, a selfish strategy has become advantageous. Individuals have grown isolated from society, the groups to which they belong have become vague, there are no clear enemies, and it has become hard for people to satisfy their inherent human desire for cooperation.

In the case of people who have been able to continue old-style family relationships of groups that they get along with and live their lives for, even if they adopt a selfish strategy in the context of this society—characterized by competition with a nameless mass of strangers—they might be able to feel happy that they are contributing to their family, the group to which they belong. For such people, they might not be able to afford to think about the nameless mass of others that they have made unhappy due to their actions. I would like to see people who, in accordance with society's evaluation of themselves, are satisfied by and derive meaning from becoming "great," "rich," or "famous," to, having read this book, ask themselves if they are really satisfied. On the other hand, in the case of people whose families are dissolving or those who have become deeply isolated, they lack groups in this freely competitive society to belong to in which they can feel happy for

contributing to others. They tend to become languid and lose their reason for living. Is there nothing they can do but become social outcasts? For those who feel that they have lost a reason to live due to this loss, possibly due to being without a job or being poor, and having no choice but to be alone and alienated from the world, I hope that they read this book and reconsider the meaning of living. I imagine that the majority of people are probably as follows. In order to live their lives as part of a family, they have a decent position in their workplace and are making a living, amidst this competitive social system they sometimes feel isolated from society, and are not easily moved to work hard to contribute to it (the desire for cooperation). While education has spread that teaches that all humans are part of the same circle and people have become somewhat distant from their inherent human nature, they are hoping that an era will emerge in which individuals can see themselves as belonging to not just groups of 50 but all of humanity—they want to contribute to all of humanity in some way (the innate desire for cooperation) and be recognized by everyone as a companion who does so. On the other hand, while they have this feeling, they are also living with considerable conflict, as they see most others around them as enemies and adopt a selfish strategy in the context of this restricted environment and freely competitive society. It is a big problem that an era has arrived in which it is difficult to find meaning in life and most people feel unhappy. Is it no longer possible for people to be loyal to the groups of 50, which is their inherent human nature? Is it possible to maintain a good-natured strategy as organisms even in a restricted environment while maintaining cooperativeness within such groups? I do hope humans prove that when their inherent cooperativeness toward such groups expands and all living beings are seen as part of this group, they can make good-natured strategies possible even in a restricted environment. In such a situation there may be no choice but to restrict free competition.

I will now briefly summarize everything that we have discussed in this book. Based on the above-described nature of humans, what kind of world would ensure happiness for everyone? Clearly it appears that a dream society may be one that is not stratified, in which people belong to groups of approximately 50 people but there is free competition with high productivity thanks to the division of labor, and people can (without regret) satisfy their desire for cooperation. How could this be realized? I think that a solution may be found in knowledge from the life sciences. It is evident that some of the above-listed conditions need to be restricted, such as restricting free competition to ultimately achieve a self-sufficient and self-supporting system.

This book can be summarized according to the following themes:

(1) Evolution occurs due to spontaneous mutations, natural selection, and genetic drift. Natural selection means that the most suitable living beings, institutions, and so on flourish while others become extinct. While in such groups a restricted environment does sometimes appear and mutations accumulate, they are buried under many genes that conflict with them, and do not lead to evolution.

(2) These dominant, most-adaptable living beings, institutions, etc., however, receive severe blows and often go extinct as well due to environmental changes arising from climate change, economic depression, war, and so on. When this happens, the diverse mutated organisms that have accumulated due to a severe environment become isolated into small groups, which then results in genetic drift. Based on this, these special genotypes become fixed and evolve into new species. Generally, after extinction, explosive evolution can be seen, and organisms that adapt to this subsequent environment not only survive but flourish. After wars and economic depressions as well, various kinds of new systems and new industries are born, and in the subsequent

environment, the most suited ones are accepted.

(3) In the process of natural selection after an extinction, it appears that environments are basically unrestricted, and a good-natured strategy is adopted both within and between species, where all organisms can receive the blessings from the unlimited environment (i.e., Earth) and flourish to the greatest extent possible. At this time, many people feel that things are fair. A phrase that applies this idea to economic activities is the "invisible hand" (Adam Smith), and one that captures the cultural sphere is the slogan "Liberty, Equality, and Fraternity" (French Revolution). During such times, people who adopted a good-natured strategy became predominant, and the most appropriate things (ideas, technologies, ways of life) were chosen based on fair and free competition (natural selection). Efficiency improved, and economic growth was stimulated. This in and of itself is a good thing; however, almost immediately, an environment characterized by restricted conditions emerged. This leads to a selfish strategy being predominant where, in a restricted environment, things decline, unfairness spreads, and people are no longer satisfied.

(4) The Era of Globalization. Living beings that are manipulated by their selfish genes, such as humans, feel pressure to reproduce and expand. The scale of people's groups (such as villages) always tended to increase, and division of labor-based efficiency did so proportionally as well. How can we make today's freely competitive society—comprised of a nameless mass of strangers in a restricted environment—continue to exist without war and extinction? One direction would be to once again bring about an unrestricted environment, which would thereby make happiness and an overflowing sense of fairness possible. The fusion of the humanities and sciences in academia will probably be the seed for innovation in technology and, therefore, economic growth, as well as succeeding in the space exploration that is being advanced today, which could lead to new frontiers. However, a restricted environment is bound to immediately follow the creation of an unrestricted environment; therefore, the resulting priority would be to keep unfairness in check in this restricted environment and create a social organizational system that satisfies humans' basic desires. When trying to create such a situation, will people accept the pursuit of free-competition-based natural selection? Incidentally, one of Japan's past accomplishments was its people living peacefully during the Edo period (1603–1868) for approximately 300 years while being closed off to the outside world. Today, is it possible to devise a way for the world's 7 billion people to live peacefully on a planet isolated from the rest of the universe? Is a society possible that satisfies people's four basic desires, pursues efficiency in productivity with division of labor, and also is not stratified or unequal? Today, people see all of Earth's humanity as being part of the same circle, but unity in the form of a world country has not yet been realized. When languages and cultures differ, people resist fusing them together. It does not appear that humanity, which has experienced two world wars, would accept this global unification by a hegemonic country's military power. I would like to expect that there is unification through conversation and to have an environment in which free competition can be restricted. This is probably the future path for humanity. According to Takashi Saitō's *Nihonjin ha, naze sekai ichi oshi ga yowai no ka* (Why are Japanese People the Biggest Push-Overs in the World?; Shodensha Shinsho, 2012), the timidity of Japanese people is a result of their nature as an ethnic group that lost a competition between races and was pushed off of the Asian mainland. This agreeable nature of their ethnicity enabled them to find a way to live harmoniously during the 300 years of the Edo period. In this age of globalization, are we Japanese people not the ethnicity that on this limited Earth—which can be seen as the same as Japan when it was closed off the outside world—can show a way for humanity to live peacefully together, rather than engaging in battles over

hegemony and the like? For example, can we lead humanity down a path of self-sufficiency and self-supporting systems that this book proposes? (Yamatō)

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Afterword

Last spring, Professor Yamatō proposed that we engage in a dialogue in which we address and attempt to provide solutions for various problems in today's society. We used the method of comparing it to ancient *Homo sapiens* to better show a direction for the future. We both have had successful careers as life science researchers, and, along the way, adopted an obstinate and lofty attitude toward society and our workplace. Often, we would realize over dinner that we both shared similar ideas with regard to the societal issues discussed in our dialogue. Therefore, I agreed to his idea.

When we first tried to work through what it would be like to create this book we were of differing opinions. As such, there were two initial proposals for the book's format. The first was to discuss today's problems at the onset, and then describe the society of ancient *Homo sapiens* in the book's latter half. The second was for each topic to start by discussing today's problems, move on to society in the ancient past, and then discuss our future outlook. The former would give readers knowledge in a way similar to archeology textbooks; however, the latter selected to be the most desirable format for the majority of readers, even though we predicted that it might be difficult to engage in a dialogue in that way. Carrying out a discussion was actually difficult, but I am happy with how it turned out.

Another disagreement we had was with regard to what constitutes happiness for people. This relates to the core of our dialogue. For tens of thousands of years, people lived in groups of approximately 50 individuals and cooperated willingly and even joyously within them. The genes of living beings, including humans, do not change easily; as such, there should not be any differences between the *Homo sapiens* that existed tens of thousands of years ago and those of today. Such was the basic premise of our dialogue. As one who had worked at a company for 30 years, I had thought, in contrast, that happiness was directly tied to establishing goals, making an effort, and meeting those goals. While my perspective is different, the goal of contributing to one's group is the same. Since Professor Yamatō and I lived in different professional worlds, we realized from the beginning that we would have more than a few different ideas, but we decided to engage in our dialogue while being respectful of these differences.

The dialogue was carried out over the course of seven meetings that lasted four to six hours each. Since a detailed outline of the dialogue was not decided in advance, our exchange was neither smooth like a river current nor linear or consistent. Sometimes, one of us would obstinately argue one viewpoint, and the other person would express an opposing one; or we would voice an opinion in the second half of a chapter that contradicted one we said in the first half. We would also frequently repeat the same thing over again. Sometimes, the original chapters would become much longer than we had planned.

We transcribed our recorded conversations, reviewed their logical development, made grammatical corrections, changed the order of paragraphs, adjusted conversation length, and so on. Professor Yamatō spent a lot of time doing this. My hat goes off to him for his enthusiasm, as this editing took probably around six months. Of course, we moved ahead while these revisions were going on.

We would like for not only biology students but also individuals not associated with the field to read

this book, as it is neither an archeology or economics book, nor a book focused on sociology; rather, it is one that tries to address as a whole today's social, organizational, household, and individual problems. There are probably few people—even experts in the life sciences—who have reflected on their own lives from this kind of perspective. This was the case with us.

In closing, we would like to thank the Tokyo University of Science's administrative staff Mari Kuroda and Ayaka Tokui for editing our manuscript. They do so much for us on a daily basis, and thanks to them we were able to incorporate opinions from people with a perspective outside of the sciences. We are grateful for their suggestions regarding weak points and logical development. (Masuho)

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