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Food of the future: tendencies and speculation. Why, in order to survive, we need an emotional relationship with food?

Doctoral thesis in the field of art
in the discipline of fine arts
and art conservation

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Introduction

Eating food is like breathing. Food is air, which can take many forms. And the globe is shaped by human food choices. Guided by the concepts of Carolyn Steel, creator of the term Sitopia meaning the world created by food[1], I followed studies and reports depicting the modern food production industry. Wading through the numbers and charts, I felt that the picture emerging from them was at the same time grotesque and horrifying.

When we buy an industrially made burger at the store, we pay about $2. If we calculated the total environmental cost (carbon footprint) created during its production, the same burger should cost $20[2]. Calculating the food produced around the world every day, as many as 2,800 calories are produced per person living on the planet, almost fifty percent more than the average person's daily needs. Four corporations (BASF, Bayer/Monsanto, ChemChina, Corteva) own two-thirds of crop seed varieties. Any farmer who wants to sell crops from plants of these species must buy a license from one of them.

How did it happen that humans came to be in this position? How is it possible that consumers are not burdened with the real costs of producing what they eat? Why are 850,000 people starving when we produce more food than is needed to feed everyone on the planet? How should industrial designers working in the spirit of sustainable design behave in this situation?

Following the history of human food choices over the centuries, it is impossible not to notice the fundamental change that occurred after the industrial revolution. Food, which until then accompanied man in his daily life - in homesteads and gardens - began to disappear from the public eye. In less than 300 years, residents of cities and towns lost insight into the food production process. It was taken behind the "curtain"-to specialized factories and farms. Physical distance was also followed by mental distance.

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[1] C. Steel, *Sitopia. Jak jedzenie może ocalić świat*, Kraków 2001, p. 16.

[2] J. Safran Foer, *Zjadanie zwierząt*, Warszawa, 2019, p. 106.

We lost sight of food. The great majority of people living today have no idea who, where and how produce food. We have gotten rid of the onerous work involved in producing food products, and with it we have gotten rid of awareness and a sense of responsibility. Food has become a commodity, and is it possible to care about a commodity?

In this dissertation, I put forward the thesis that only a (even if only symbolic) return to the traditional understanding of plant cultivation as food production can recover human understanding and respect for the world of which we are a part. In awakening feelings such as care and protectiveness, I see the way to restore balance in the world. I believe that as a designer, I can guide everyday behaviors and gestures that turn into rituals over time. Restoring subjectivity to food and eating is the beginning of the way to bring attention to their meaning.

I regard passive (non-automatic) hydroponic growing as an example of an activity in which it is possible to observe the entire process of a plant's life - from seed germination to flowering. Although the process is largely self-guided, the involvement of a "caretaker" is necessary. Can this dedication develop into a feeling over time? And could the affection result in a change of mindset?

In the dissertation, I outline the range of contexts we face when it comes to food, its cultural and emotional significance, and its inseparable connection to nature. I describe 3 scenarios - directions in which (perhaps) the human diet will develop in the future. Their selection is a subjective choice. In the last part, I present art and design works and their context - the Hello flower! and Super spirulina.

Plants are the
primordial soup of the Earth
that allows matter to become life
and life to retransform itself
into “brute matter” [3]

[3] E. Coccia, The Life of Plants. A Metaphysics of Mixture, Cambridge 2008, p.48, cyt.za. Ł.Mojsak, Ł.Ronduda, Teresa Murak - nowe spojrzenie, Warszawa 2022, p.99.

1. Why food? About the globe that is shaped by human food choices.

Behind the most obvious and a clear function that food fulfills in human life, we can find more or less hidden meanings. The fact that we eat is as obvious as the fact that we breathe. This obviousness means that - despite the fact that we make nutritional decisions every day - we have largely ceased to see the significance of these choices, to question or challenge them. Food is a vehicle for a gigantic amount of meaning. What and how we eat can carry information about where we live, what cultural background we come from, or what religion we are following. Many times it informs about the social category to which we belong, our level of wealth, and our state of health. The contents of the plate can reflect the level of consumer and environmental awareness. Carolyn Steel argues:

„The way we eat is inextricably linked to the social, political, economic and physical structures that rule our lives."[4]

For most of the history of the human species, we have been accompanied by anxiety over the specter of food scarcity. According to the theory of social economics professor Thomas Malthus, published in 1798, the number of people on the globe is growing geometrically (multiplicative), while the amount of food produced is growing arithmetically (constant growth). Malthus' overpopulation theory predicted famine as early as the mid-19th century[5]. Data from the Food and Agriculture Organization of the United Nations (FAO) in 1947 indicated that one in two people was experiencing chronic malnutrition[6]. The milestones separating humanity from starvation to overeating (which we are experiencing today) are certainly many, but in recent history, there are two that seem particularly significant.

In 1918, Fritz Haber received the Nobel Prize in Chemistry for his discovery of a method for synthesizing ammonia, which he later developed with Carl Bosch[7]. With this method, extremely effective nitrogen fertilizers began to be produced, which allowed the rate of food production to increase. Food began to be produced to the same rate as

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[4] C. Steel, *Sitopia. Jak jedzenie może ocalić świat*, Kraków 2001, p. 28.

[5] M. Fotyma, *Chemia zażegnała widmo głodu na świecie,* Chemia 2010, nr. 7/8, p. 499.

[6] B. Wilson, *Tak dziś jemy*, Kraków 2020, p. 30.

[7] https://www.britannica.com/technology/Haber-Bosch-process, accessed: 30.08.2023.

population growth. The use of nitrogen fertilizers has helped to resolve the specter of famine, but has significantly upset the balance of the environment, interfering with the natural nitrogen cycle. It is estimated that only 60% of the nitrogen from fertilizers is used by plants, while the remaining 40% ends up in the atmosphere and terrestrial waters, causing their acidification[8]. One of the effects is eutrophication, or overfertilization of the seas and oceans, which results in blooms of algae and cyanobacteria, which, as they die off one by one, consume oxygen in the process of decomposition. In under-oxygenated water tanks, there is an increase in the number of anaerobic bacteria that produce hydrogen sulfide - a substance harmful to all living organisms[9].

The second breakthrough in the fight against world hunger was the discovery of semi-dwarf varieties of high-yielding wheat, for which the Nobel Peace Prize was awarded in 1970 to agronomist Norman Borlaug. The new grain variety gave rise to the so-called "green revolution" in developing countries , including Mexico, India and Pakistan, where the amount of grain produced was doubled in just five years[10]. Borlaug's scientific work may seem to have saved millions of lives, but such a significant intensification of agriculture has come at a huge environmental cost. It is estimated that about two-thirds of the water consumed worldwide is consumed precisely by the agricultural sector. The use of monoculture - growing the same species in the same area for many years - leads to soil sterilization and degradation. The result is not only fewer crops, but also a perturbation of the entire ecosystem. If we treat the soil or plants as a holobiont (an organism coexisting in symbiosis with other microorganisms) we will notice a huge network of dependencies that connects it to other beings.

„The plant, as a holobiont, is linked to a whole ecosystem of soil infused with microorganisms, small animals that decompose dead organic matter (e.g. earthworms, insect larvae). In addition to providing nutrients to plants, such an ecosystem also helps retain water […]*."*[11]

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[8] M. Fotyma, *Chemia zażegnała widmo głodu na świecie,* Chemia 2010, nr. 7/8, p. 503.

[9] https://www.wwf.pl/srodowisko/morza-i-oceany/eutrofizacja, accessed: 31.08.2023

[10] B. Wilson, *Tak dziś jemy*, Kraków 2020, p. 31.

[11] P. Kramarz (Sz. Bujalski), Od pestycydów po marnowanie. Tak zepsuliśmy światowe rolnictwo – wywiad z prof. Pauliną Kramarz, 2022, https://naukaoklimacie.pl/aktualnosci/od-pestycydow-po-marnowanie-tak-zepsulismy-swiatowe-rolnictwo-wywiad-z-prof-paulina-kramarz/, accessed:31.08.2023.

In India, unrestricted use of monocultures and fertilizers led to a crisis and suicides among farmers. The intensively cultivated land stopped "yielding" after several years of producing rich crops, and the situation was further aggravated by a progressive drought. Local farmers lost their livelihoods, which resulted in a wave of suicides. In June 2017, a protest was held in which the bones of victims of the agricultural crisis were laid out around the Indian Parliament. It is estimated that more than 300,000 farmers have taken their own lives since 1995[12].

Not long after the problem of hunger was solved (to a remarkable extent), man once again found himself in danger from food. Nowadays, the majority of the globe's population is no longer threatened by starvation, but by its reverse - overeating. Developed European countries provide their citizens with 170 to 190 percent of the calories they need; in the US, the figure reaches almost 200 percent[13].

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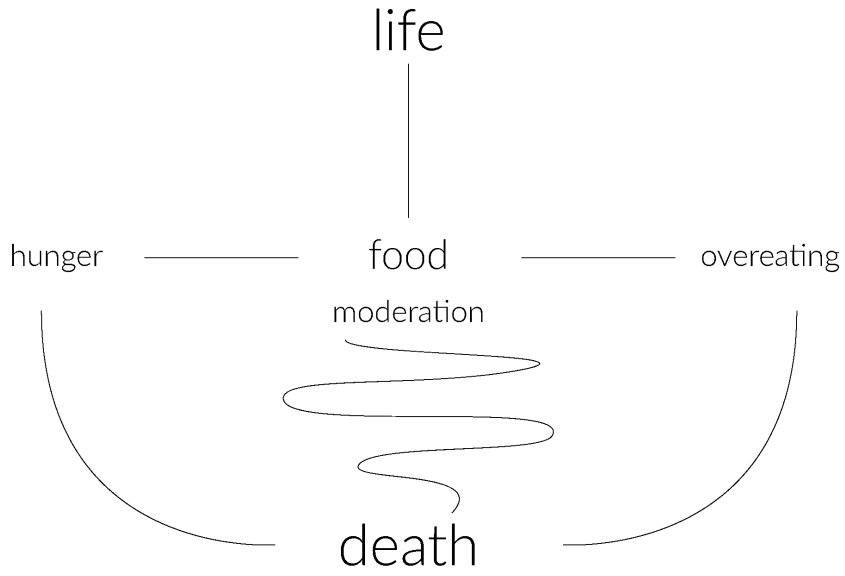

[12] M.Safi, *Suicides of nearly 60,000 Indian farmers linked to climate change, study claims*, The Guardian, 2017, https://www.theguardian.com/environment/2017/jul/31/suicides-of-nearly-60000-indian-farmers-linked-to-climate-change-study-claims , accessed:31.08.2023

[13] C. Steel, *Sitopia. Jak jedzenie może ocalić świat*, Kraków 2001, p. 28

2. Food as nature. Nature as food.

If we consider how man fed in the early days of the human species, we could safely say that he fed on his surrounding environment. Or in other words, he lived where the environment could feed him.

The nomadic lifestyle of hunter-gatherer societies was replaced by a settled lifestyle with the invention of agriculture, which occurred 10,000-12,000 years ago[14]. Considering the history of the human species - the sedentary lifestyle (which the vast majority of the population leads today) - is still a new phenomenon. For 95%[15] of its existence, man as a species has wandered in search of food. Acquiring food was his main activity, the axis around which the rest of his activities were planned. Eating was inextricably linked to contact with nature and vice versa.

The development of agriculture and the subsequent industrialization of food production made the process of acquiring food simpler and, at least in theory, more predictable. Certainly, however, this simplification has impoverished human contact with nature. While before the technological revolution in the 18th century, the economy was still based on agriculture and handicrafts, which obviously translated into contact with nature, after the transformation into an industrial economy[16] this bond began to disappear.

As early as in the 1960s, there was research among indigenous tribes in Australia and South Africa, among others, to study the impact of a hunter-gatherer lifestyle on the health and well-being of tribal members. Surprisingly, they found that the people there eat a well-balanced diet, providing themselves with all the nutrients they need. "In these groups, starvation, malnutrition, and crime are nil"[17]. Despite

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[14] https://open.oregonstate.education/cultivatedplants/chapter/agriculture/#Lee-1968-1-return, accessed: 16.09.2023.

[15] Ibidem

[16] K. Zamorska, *Pięć rewolucji przemysłowych - przyczyny, przebieg i skutki (ujęcie historyczno-analityczne)*, https://bazekon.uek.krakow.pl/rekord/171608585 accessed:15.09.2023.

[17] https://open.oregonstate.education/cultivatedplants/chapter/agriculture/#Lee-1968-1-return

expectations, "primitive" tribes have proven to function more efficiently than industrialized societies. Their members, working 2-3 days a week, were able to provide an adequate diet while caring for children and the elderly. American anthropologist Marshall Sahlins wrote about the lives of Australian indigenous tribes:

„Hunters and gatherers work less than we do, and the search for food is a relaxation rather than a struggle, leisure time is abundant, and there is more sleep per capita per day than in any other state in society.".[18]

In his book Biophilia, published in 1985, biologist and zoologist Edward O. Wilson defined biophilia as::

„[…] the inherent human inclination to affiliate with nature that even in the modern world continues to be critical to people's physical and mental health and wellbeing"[19]

It seems reasonable to conclude, therefore, that the hunter-gatherer lifestyle, in addition to meeting nutritional needs, also fulfilled other necessary functions for well-being. Obtaining food was closely associated with being in a wild, unaltered environment. It was accompanied by the sounds of birds, animals and the rustle of leaves. There was the smell of earth, plants or fresh rain. The landscape of the meadow, forests, mountains spread before the eyes. When we juxtapose this sensory experience, which could be described as soothing and harmonious, with the experience of obtaining food in the modern world, we get a picture of a completely different, even opposite nature. For the average city dweller (regardless of its size), sourcing food means a multisensory "journey" into a world of boundary-pushing stimuli. Colorful store shelves create an abstract, aggressive landscape, and energetic music often comes from loudspeakers to stimulate action, that is, buying.

In this context, the growing interest in "wild" cooking and gathering in recent years is not surprising. In an interview with Carolyn Steel, British gatherer Robin Hartford explains the importance of this way of obtaining food, describing it as a state of mind. He points out, "Gathering is about feeding and being fed on many levels: psychological,

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[18] Ibidem.

[19] S. R. Kellert, *The practice of biophilic design*, 2015.

emotional, spiritual and physical. A person wants to go out as often as possible and take care of the plant, so that their relationship deepens and their well-being improves."[20] It is important here to note the role of place and time. Wild plants grow in conditions and places that are optimal for them, and as a result, they produce rich yields, significantly higher than in conditions created for them artificially. It is important to be attentive and notice them before they pass away according to the natural cycle. In gathering, there is no fear of crop failure that accompanies monoculture agriculture - yields may vary, but nature invariably gives birth and feeds every year.

very few of us can see from the window the landscapes that give us the food to eat! [21]

[20] C. Steel, *Sitopia. Jak jedzenie może ocalić świat*, Kraków 2001, p. 275.

[21] C. Steel, *Sitopia. Jak jedzenie może ocalić świat*, Kraków 2001, p. 228.

food must be experienced,
and I worry that writing about it
may not make the sense
i want it to! [22]

[22] A. Waters, *Chez Panisse Menu Cookbook introduction*, Toronto 1982.

3. Humans' emotional relationship with food.

In 1943, Abraham Maslow developed a model of the hierarchy of human needs[23]. At the base of the model are the physiological needs necessary for survival - along with sleep and water is food. On the next floors of the pyramid are the needs (in order): security, belonging, recognition and self-actualization. In order to realize the needs located in the hierachy higher up, it is necessary to first realize the needs located lower down[24].

Adapting the principles on which Maslow's hierarchy of needs is based, in 2007 Ellyn Satter developed a pyramid of human drives and needs relating only to food management . Like Maslow, she made the assumption that in order to fulfill higher-order needs, it is necessary to first satisfy lower-order needs. The base of the hierarchy according to Satter is the need to "have enough food". At this level, the satisfaction of hunger and, consequently, the need for security comes into play. The function of nourishing the body is also fulfilled here, of course, but it is not a priority. The second level is the "need to eat acceptable food" . Functioning at this level, individuals are not at risk of starvation and can (subjectively) decide whether the type or method of acquiring food is acceptable to them. "Reliable, ongoing access to food" represents level three and defines the position of individuals who are absolutely certain that they will have access to enough acceptable food in the days ahead. Consequently, they can make food-related plans and gather supplies. The next, fourth level of the pyramid has been referred to as the "need for tasty food". Once the lower-level needs have been met, the individual can let appetite, taste, or aesthetic considerations guide food choices. At the fifth level is the "need for original (novel) food".

Satter describes this level as a situation in which the individual, due to the abundance of food, does not have to worry about wasting it, which allows for culinary experimentation. The last, sixth level of the pyramid is "food as an instrument" (instrumental food). An individual on this level, after satisfying lower-level

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[23] https://educationlibrary.org/maslows-hierarchy-of-needs-in-education/ , accessed: 20.08.2023.

[24] A. Rawa-Kochanowska, D. Turska, *Jedzenie a potrzeby psychiczne jednostki*, 2016.

needs, can treat food as a tool to produce certain physical, cognitive or spiritual results / states[25].

The hierarchy outlined by Satter vividly illustrates the breadth of perspective necessary to consider when it comes to food-related needs. In addition to satisfying hunger, there are a number of other functions.

Touching on the subject of human feelings and emotions related to food, it is essential to note that we do not touch only on the subject related to the sense of taste. Certainly, it is crucial to the human perception of the consumed food, but it is also necessary to appreciate the influence of the other senses: smell, sight, hearing and touch. The concepts of intermodality and polysensory segregate the relationships and dependencies that occur between the senses[26]. Intermodality means that "what happens at the level of one sense affects what we experience with the other senses."[27] The term polysensory, on the other hand, describes the integration of data received by two or more senses, the assembly of which produces a sensory impression. Recognizing these relationships makes it possible to see that the preparation or consumption of food is always accompanied by a multisensory impression. Where, with what, in what acoustic and visual environment one eats has an impact on the perception of the meal consumed and the event itself as it is. Dinner can be accompanied by euphoria, joy, sadness, fear, disappointment or indifference.

If we focus on the taste of dishes, it turns out that its perception is an individual issue, shaped at the genetic level. Perception of the taste of the same food by two people can be different. For example, some of us do not feel androsterone (contained in cilantro), while others do not sense bitterness in food. The number of taste buds also varies from person to person. What's more, the human mind uses repetition to create patterns, based on which it predicts the potential taste of a given food. This schema and prediction varies significantly between people from different cultures and geographically distant places.

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[25] E. Satter, *Hierarchy of Food Needs*, „Journal of Nutrition Education & Behavior" 2007, nr 39, p. 187–188.

[26] Ch. Spence, *Gastrofizyka*, Warszawa 2018, p. 21.

[27] Ibidem, p.44

An indication of how intimate a person's relationship is with the food we eat is the fact that we are unable to record the experience of taste as well as smell, unlike the experience of, for example, sounds or images. The inability to record taste makes experiencing it an individual experience. Of course, we can and often do share food, but the sensation of taste always remains an individual experience.

When we analyze the act of eating a meal as an encounter between an individual and food it seems to take on an even deeper meaning. American family therapist Judi Hollis believes that eating is the most intimate experience available to humans. She views putting food - a creation separate from our bodies - into our mouths as crossing a boundary and fusing two entities together.

„When we eat, something external enters the temple of our body and combines with our juices to create new cells. Even sexual intercourse does not induce such a deep fusion. It is a total unity."[28]

Just as we can view eating a meal as an act of love, preparing food for another person often acts as a demonstration of the feelings we have for that person. The emotional value here seems to overshadow the taste value. In his autobiography, chef Nigel Slater, recalls a cake baked by his mother with the words: "what matters most is that it was made with love," "I believed that the cake held the family together. The way my mother put it on the table made me feel that everything was okay. Safe. Secure. Unshakable."[29] The strongest, most lasting memories of food are often associated with the family home. Home is the place that nourishes us, both metaphorically and literally.

Experiencing the taste of food stricto sensu is an individual experience, but eating food is definitely a social activity. Eating together may represent the most primordial ritual that the human species has practiced and still practices. In the past, our ancestors fed collectively to survive - out of concern for their safety. In the modern world, the vast majority of the population is no longer at risk of unexpected attack from wild animals, but we still enjoy eating in company.

Scientific research indicates that eating in company has a salutary effect on our health. When we eat together, the body produces endorphins and oxytocin - substances that

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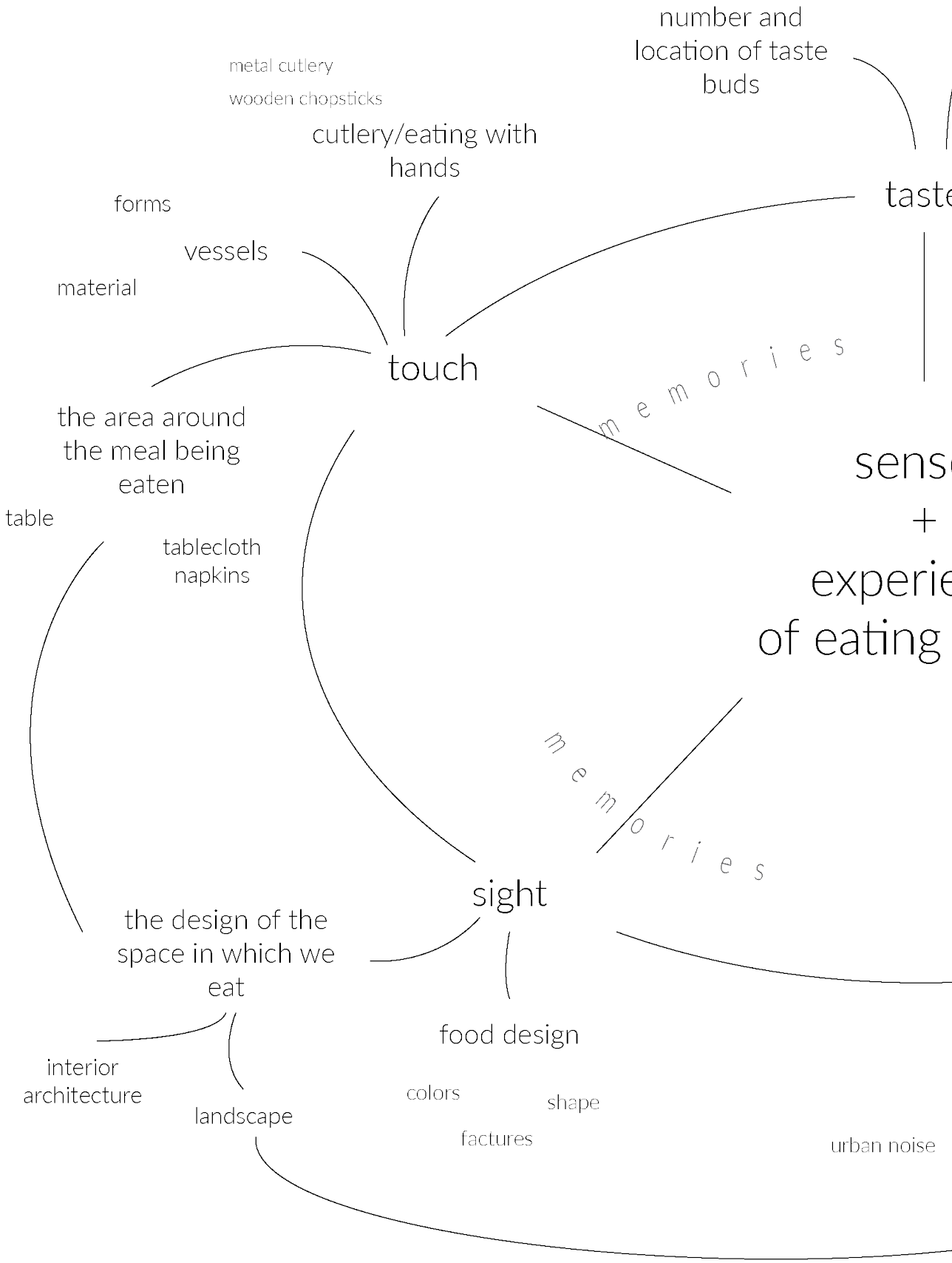
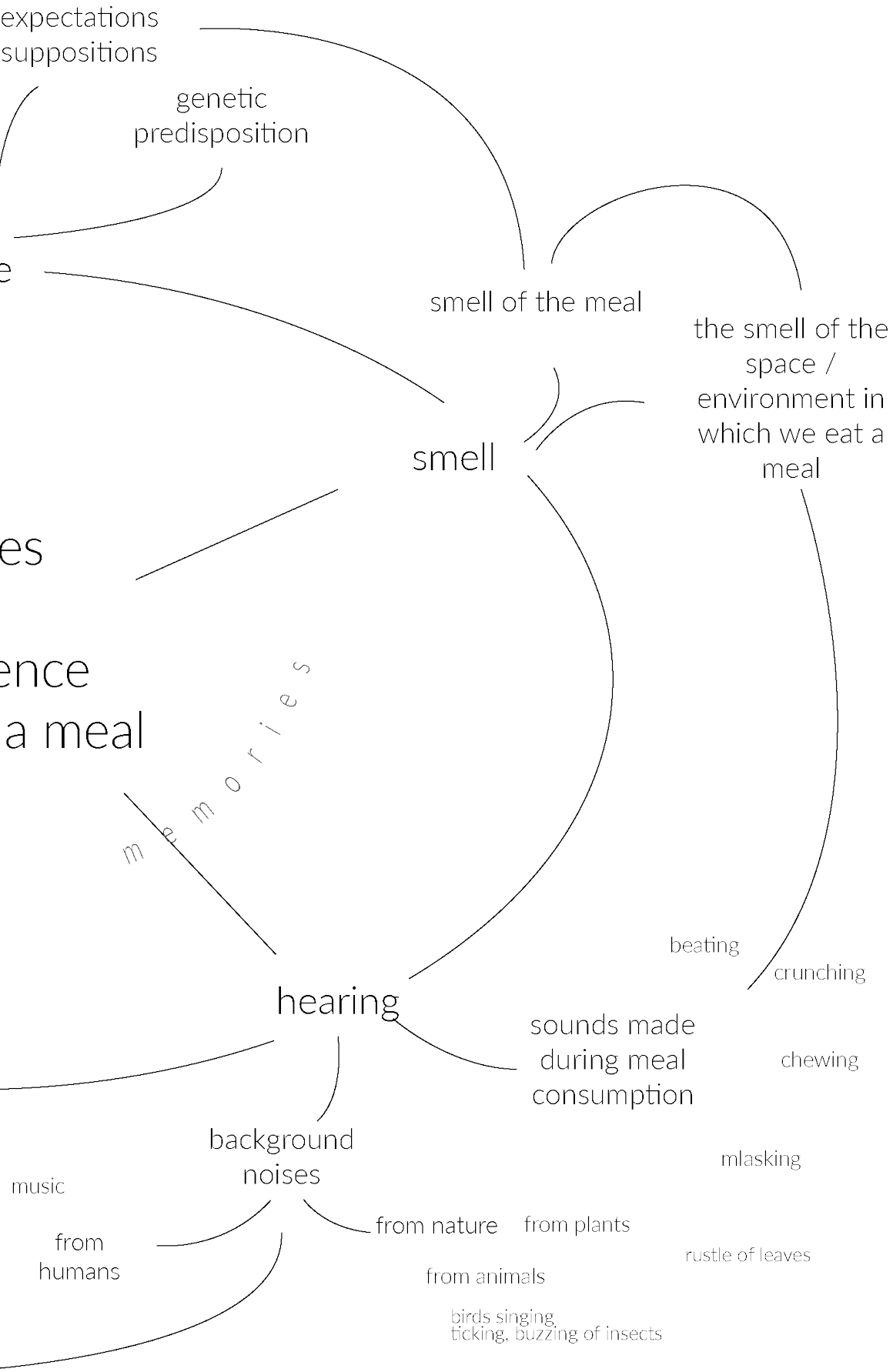
[28] J. Hollis, *Nadwaga Jest Sprawą Rodziny*, Gdańsk 2000, p. 24.

[29] C. Steel, *Sitopia. Jak jedzenie może ocalić świat*, Kraków 2001, p. 41.


number and location of taste buds
metal cutlery
wooden chopsticks
cutlery/eating with hands
taste
forms
vessels
material
touch
memories
the area around the meal being eaten
sens
+
experie
of eating
table
tablecloth
napkins
memories
sight
the design of the space in which we eat
food design
interior architecture
landscape
colors
shape
factures
urban noise


expectations
suppositions
genetic
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e
smell of the meal
the smell of the
space /
environment in
which we eat a
meal
smell
es
ence
a meal
memories
beating
crunching
hearing
sounds made
during meal
consumption
chewing
background
noises
mlasking
music
from nature
from plants
from
humans
rustle of leaves
from animals
birds singing
ticking, buzzing of insects

soothe, calm, and have a bonding effect. These are the same compounds that are released when we stroke or hug another person. British anthropologist Robin Dunbar enumerates the benefits of collective meals:

„Taking the time to sit down together over a meal helps create social networks that in turn have profound effects on our physical and mental health, our happiness and wellbeing, and even our sense of purpose in life.[30]"

Everything we do when we sit at a table in company - eye contact, smiles, conversation, storytelling - satisfies the primal need for closeness. As Professor Paul Gilbert points out, human minds and bodies are programmed to self-regulate when interacting with other members of the species.[31]

Eating in the "company" of a TV show or smartphone, on the other hand, can increase the amount and pace of food consumed. Almost half of the population watches TV while eating, resulting in a 15%[32] increase in the amount of food consumed. This is caused by the distraction of eaters, who focus a significant percentage of their attention on the screen. The limited attention devoted to eating a meal means that we may "not notice" that we have eaten. Referring to earlier considerations - what happens in the mouth represents only a fraction of the event called eating. When we subtract from it the impressions received by sight and hearing - absorbed by another event - little is left out of the meal.

In countries where food culture is of particular importance as a social activity, ideas are emerging about combining tradition and increasing digitization. Korean tradition involves sharing food at meals, hence the portions served may seem huge to Europeans, for example. However, they are not intended for one person, they are provided for the sharing with fellow diners. With the increasing number of single-person households today, the problem of loneliness has emerged, especially at mealtimes. In 2010, a trend

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[30] K. Davey, *One in three people go a week without eating a meal with someone else*, Oxford University professor finds, Oxfordmail 2016, https://www.oxfordmail.co.uk/news/14422266.one-three-people-go-week-without-eating-meal-someone-else-oxford-university-professor-finds/ , accessed: 29.08.2023.

[31] https://www.theguardian.com/society/2018/may/23/the-friend-effect-why-the-secret-of-health-and-happiness-is-surprisingly-simple.

[32] Ch. Spence, *Gastrofizyka*, Kraków 2021, p. 163.

called mukbang, which is a conglomeration of the words "eat"(meokneun) and "transmit" (bangsong)[33], emerged in South Korea. Mukbang involves broadcasting the act of eating a meal online and is intended as an alternative to the company of another person. In theory, one can eat "together" with a streamer in this way. During the recordings, we can see the person eating, hear the munching, chewing and their opinion of the meal. Mukbang has become a phenomenon, some of the videos have been viewed more than 5 million times, and their creators (the so-called BJs - Broadcasting Jockeys) earn money in virtual currency. More than a decade later, the trend no longer has much to do with the initial premise. BJs consume huge amounts of low-quality food during recordings, promoting harmful eating patterns.

Turning points in people's lives are accompanied by food. Both joyous and sad ones. Celebrations of birth and death are always accompanied by a shared meal, which "holds" the family or other social group close. Whatever happens, when happiness or tragedy befalls us, we sit around the table. Margaret Visser sees in the rituals associated with eating a code of behavior that allows us to get through edge situations in an easier, more predictable way. As she argues, ready-made behavioral scenarios simply make us know how to behave.

„Ritual is about lasting (which is one reason why ritual occasions are constantly repeated). Because it is preordained, it always expresses order, and it predicts endurance; it links the present with the past, and it hopes also to link the present with the future. Ritual can be used, in its "continuity" function, to keep things going when energy flags and the members in a group cannot maintain their experience at the pitch they would like."[34]

Holiday celebrations such as Christmas and Easter, held in a significant part of Europe, proceed around lavishly set tables. The food on festive tables is never random, it is strictly defined by tradition. In many modern homes, the religious context of the holidays celebrated has lost its importance, and it is the communal meal that comes to the fore. Christmas is twelve dishes, carp, hay under the tablecloth, borscht, dumplings, dried fruit compote. It is also a family gathering, in many homes the only one of its kind during the year.

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[33] B. Wilson, *Tak dziś jemy*, Kraków 2020, p. 240

[34] M. Visser, *The Rituals of Dinner*, Toronto 1991, p. 23.

In recent years [...], consumers have wised up

and are voting with their dollars

against the cruelty to animals, damage to their own health,

and environmental destruction caused by meat [35]

[35] K. Fox, *This Ban On Vegan 'Meat' Labeling Sets A Dangerous Precedent (It's Also Hypocritical)*, „Forbes", 2018, https://www.forbes.com/sites/katrinafox/2018/08/30/this-ban-on-vegan-meat-labeling-sets-a-dangerous-precedent-its-also-hypocritical/?sh=4aa663c32ace, accessed: 07.08.2023.

4. Future scenarios from a contemporary perspective.

4.1. Cultured meat.

In 2013, laboratory-grown beef was cooked and tasted for the first time in the world in London. The event took place in a TV studio and was broadcast live. It cost 250,000 euros to produce the tasted burger[36]. Eighty-two years earlier, in 1931, Winston Churchill in his essay "Fifty Years Hence" predicted:

> „We shall escape the absurdity of growing a whole chicken in order to eat the breast or wing, by growing these parts separately under a suitable medium."[37]

In vitro meat production involves taking muscle tissue from a live animal, which is then transferred to a laboratory environment, where it undergoes a series of processes, including separation of fat and muscle cells. Under these conditions, it is possible to control the amount and type of nutrients the meat will contain. Factors that affect the very poor quality of meat produced today, such as the low grade of pasture fed to animals or the use of antibiotics, are eliminated.

The main reason for the growing interest in laboratory meat production can be seen as an increase in consumer awareness - regarding both the state of the environment and the animal suffering inherent in meat production. As Carolyn Steel concludes, mass animal farming is:

> „[…]ridiculously inefficient. Today, a third of the world's grain harvest is fed to animals, food that, if we were to consume it ourselves, would feed ten times as many people. Industrial meat production consumes a third of the water used in agriculture and is responsible for an estimated 14.5 percent of total greenhouse gas emissions"[38].

A decade after the public presentation of a burger prepared from in vitro meat, another landmark moment took place. In early 2023, the U.S. Department of Agriculture authorized the sale of in vitro produced poultry meat by two companies, Upside Foods and Good Meat. Earlier, the producers had obtained approval from the Food and Drug

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[36] C. Steel, *Sitopia. Jak jedzenie może ocalić świat*, Kraków 2001, p. 19.

[37] https://www.nationalchurchillmuseum.org/fifty-years-hence.html accessed: 06.08.2023.

[38] C. Steel, *Sitopia. Jak jedzenie może ocalić świat*, Kraków 2001, p. 24.

Administration, which unequivocally rated the products as safe for health. Admittedly, three years earlier, Singapore's Food Agency had been the first in the world to approve the sale of in vitro meat in the local market, but due to the small scope of the venture, it is the introduction of the lab-grown product into the U.S. market that is considered a turning point in food history[39].

The technology to produce meat in labs is a topic that has attracted the interest of tycoons such as Google co-founder Sergey Brin and Bill Gates. In Silicon Valley, California's technology basin, there were already more than a dozen start-ups working on using plant proteins to create substitutes for meat products or just in vitro meat in 2013[40]. How does the "traditional" meat industry feel about this? In 2021, Businesswire valued the global meat market at $1.3 bilion[41], by comparison, the meat substitute market accounted for $5-8 million or just 0.4-0.6% of its value in that said year[42]. Despite these significant imbalances, producers of "traditional" meat seem to feel threatened by bloodless production, whose potential is massive. Forecasts predict a very dynamic shift in favor of the latter. According to estimates by U.S. analytical firm A.T. Kearny, in 2040 60% of the meat consumed worldwide will not come from raised and slaughtered animals. As much as 35% will just be lab-grown meat, and 25% will be vegan substitutes, they predict[43].

The food transformation is accompanied by discussions of what meat is and what is not. In 2018, Missouri became the first U.S. state to introduce regulations according to which only products resulting from so-called "animal production" can be called meat. There has also been a petition from the United States Cattlemen's Association to the

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[39] . Rzymski, *Kto i dlaczego obawia się mięsa in vitro?*, „Polityka”, 2018, https://www.polityka.pl/tygodnikpolityka/nauka/1770070,1,kto-i-dlaczego-obawia-sie-miesa-in-vitro.read , accessed:06.08.2023.

[40] C. Steel, *Sitopia. Jak jedzenie może ocalić świat*, Kraków 2001, p. 22.

[41] https://www.businesswire.com/news/home/20221115005893/en/Global-Meat-Market-Report-2022-A-1314.2-Billion-Market-in-2021---Size-Competitive-Landscape-Regional-Analysis-Distribution-Channel-Packaging-Formats-and-Forecasts-2016-2026---ResearchAndMarkets.com

[42] A. Ptak- Iglewska, *Coraz więcej mięsa z roślin*, 2023, https://www.rp.pl/przemysl-spozywczy/art37862051-coraz-wiecej-miesa-z-roslin, accessed: 07.08.2023.

[43] D. Carrington, *Most 'meat' in 2040 will not come from dead animals, says report*, 2019, https://www.theguardian.com/environment/2019/jun/12/most-meat-in-2040-will-not-come-from-slaughtered-animals-report, accessed: 07.08.2023.

U.S. Department of Agriculture, in which the association calls for a legal definition of beef, and ultimately meat in general, to mean only "tissues obtained by traditional means, that is, in the process of reproduction, breeding and slaughter of animals."[44] Interestingly, the legitimacy of the petition was argued by the need for transparency in product labeling, protection of consumers from misinformation and dishonesty. Appealing to the above values precisely by meat product manufacturers was perceived by many as hypocritical. Katrina Fox at Forbs enumerates:

> „If the animal agriculture industry really wanted to promote 'integrity' and avoid 'misrepresenting' products to consumers, they'd be honest about and educate people on the systemic abuse regularly inflicted on animals in industrial farms and abattoirs. […] The presentation and promotion of meat in the form of 'nuggets', 'drumsticks' or other euphemisms is aimed at distancing consumers from the abhorrent cruelty endemic in animal agriculture, reducing someone to something (a 'product').[45]

Supporters of using the term „meat" to call in vitro-produced tissues or plant-based meat substitutes, among other things, refer in discussions to the First Amendment of the US Constitution, which guarantees freedom of speech.

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[44] D. Gzyra, *Prawo do mięsa (i innych tradycyjnych wartości)*, „Krytyka Polityczna", 2018, https://krytykapolityczna.pl/kraj/prawo-do-miesa-i-innych-tradycyjnych-wartosci/, accessed: 07.08.2023.

[45] K. Fox, *This Ban On Vegan 'Meat' Labeling Sets A Dangerous Precedent (It's Also Hypocritical)*, „Forbes", 2018, https://www.forbes.com/sites/katrinafox/2018/08/30/this-ban-on-vegan-meat-labeling-sets-a-dangerous-precedent-its-also-hypocritical/?sh=4aa663c32ace, accessed: 07.08.2023.

4.2. Alternative methods of plant growing. Hydroponics, aquaponics.

Soil degradation and ecosystem disruption, as discussed in previous chapters, have led to an intense search for alternatives to traditional agriculture. Over the past 50 years, the population has doubled, and in 2022 it exceeded 8 billion[46]. Although the rate of growth of the planet's population is slowing down, there is still growth.

The planet is not growing, it is not stretching, it is getting poorer as a result of intensive exploitation. Hence, the idea that growing crops in the soil should be replaced by soilless crops that could function vertically - "stacked" - seems as reasonable as possible.

The hydroponics and aquaponics in discussion are significantly more efficient and environmentally friendly than traditional agriculture. The term hydroponics comes from the Greek words hydro (water) and ponos (to work). In this type of farming, it is water that is crucial. Unlike traditional farming, in hydroponics there is no need for soil. The seed and then the seedling (the stage of the plant's development after the seed has germinated) take root in a layer of substrate several centimeters thick, which can be perlite, keramsite or coconut fiber. The roots "grow through" the substrate and throughout the life of the plant are immersed in a reservoir of mineral nutrient dissolved in water. It is worth noting that in traditional cultivation, the soil acts only as a "reservoir", and the nutrients necessary for the plant are supplied with water, which the soil stores[47].

The difference between hydroponics and aquaponics is the inclusion of aquaculture - fish - in the aquatic environment, which create a symbiotic system (fish excrement functions as fertilizer). In aeroponics, on the other hand, plant roots are not constantly immersed in water, but are only regularly sprayed with it.

" Disconnection" of plant cultivation from the ground (soil) has created opportunities for cultivation within selected territories, and in interiors. This way of plant cultivation, creates a stable environment independent of atmospheric conditions, which are not

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[46] P. Kramarz, *Czy nasza Planeta będzie w stanie wyżywić kolejne miliardy Homo sapiens?*, 2022, https://nauka.uj.edu.pl/aktualnosci/-/journal_content/56_INSTANCE_Sz8leL0jYQen/74541952/152181517 , accessed: 12.09.2023.

[47] http://e-biotechnologia.pl/artykuly/hydroponika/ , accessed: 12.09.2023.

disturbed, for example, by sudden weather phenomena. Hydroponics is a technique that significantly reduces water consumption - only 2-3 liters of water are needed to produce 1 kg of green fodder plant, while in traditional agriculture it is as much as 60-80 liters[48]. Under artificially created conditions, it is possible to precisely adjust the factors affecting growth (the amount of light supplied, temperature, etc.) to the needs of the plant. As a result, it is possible to achieve in a week a crop that would require about 2 months in a soil system[49]. What's more, hydroponic farming does not use pesticides, and there is no need for weed or pest control.

The first mention of growing plants in water appears in "Sylva Sylvarum," a 1672 work by Francis Bacon, published after the author's death. In the years that followed, experiments were conducted, notable among them the work of John Woodwar, who observed that a branch of mint did much better growing in "ordinary" water than in distilled water[50]. In 1842 he created a compilation of the list of 9 elements necessary for plant growth, crucial in composing a mineral nutrient solution for soilless crops. Several decades later, in 1929, American biologist William Frederick Gericke grew a tomato seedling sprinkled with "fruit", 25 feet (over 750 cm)[51] tall. Gericke earned the epithet "the father of hydroponics" and proved that the method could be successfully used for food production.

Hydroponics was first used on a larger scale during World War I to provide access to fresh food in places where growing food was impossible, such as on rocky Wake Island. In 2000, NASA began conducting intensive research into growing hydroponics during space missions, and as early as 2015, astronauts tasted lettuce grown in space for the first time[52]. In the same time, on Earth, work was and still is in progress on exploring the possibilities of vertical farming.

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[48] J. Seerat, Z. Rashid, Tanveer Ahmad Ahngar, S. Iqbal, M. Abbass Naikoo, S. Majeed, Tauseef Ahmad Bhat, R.Gul, I.Nazir, *Hydroponics – A Review*, https://www.ijcmas.com/9-8-2020/Seerat%20Jan,%20et%20al.pdf, accesed: 18.09.2023

[49] Ibidem.

[50] J. Singer, *A Brief Overview of the History Of Hydroponics*, 2021, https://gardenculturemagazine.com/a-brief-overview-of-the-history-of-hydroponics/,accessed: 18.09.2023.

[51] Ibidem.

[52] https://sitn.hms.harvard.edu/flash/2019/hydroponics-the-power-of-water-to-grow-food/, accessed:15.09.2023.

We can grow in the Antarctic.
We can be on an island.
We can be on the moon
or in the space station.[53]

Bustanica is a hydroponic farm that is considered the largest in the world at the moment. Located in Dubai, near the Dubai-Al Maktoum airport, it produces about one million kilograms of food per year[54]. A similar scale of production is carried out by AeroFarm of Newark, New Jersey, USA. Worth noting is Nordic Harvest, a Danish farm on the outskirts of Copenhagen established in 2020, where crops are grown on 14 floors. In the Czech Republic, Future Farming is developing intensively, having already created 5 aquaponic farms in the country alone[55]. The largest of them, located in Brno, is competing for the title of European leader in vertical farming.

Extremely interesting are projects involving the creation of hydroponic farms in existing urban spaces, which for various reasons are so-called wastelands. In addition to their primary function, which is food production, they offer "recycling" of existing infrastructure, and what's more, they often enable the return the agriculture to the cities, which in the traditional sense is nowadays impossible due to land prices, for example. The Growing Underground, a London farm located 33 meters underground, is an important reference. All production takes place in a World War II-era tunnel located below the northern subway line, which at the time functioned as a bomb shelter[56].

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[53] https://www.nytimes.com/2021/07/06/dining/hydroponic-farming.html, accessed: 18.09.2023.

[54] B. Knowles, *Emirates catering unit opens world's largest vertical farm*, https://sustainabilitymag.com/sustainability/emirates-catering-unit-opens-worlds-largest-vertical-farm, accessed: 15.09.2023.

[55] https://www.futurefarming.pl/farmy/, accessed: 20.09.2023.

[56] https://www.cam.ac.uk/stories/growingunderground, accessed: 20.09.2023.

Plans to incorporate the tunnel into the subway line never materialized, and it remained an unused space until 2015. Growing Underground sells its crops at the New Covent Garden market, which is 1.5 kilometers away from the farm, making all production nearly carbon-free. The combination of organic hydroponic farming and local distribution is a model scenario for more sustainable cities.

4.3. Powdered food

Powdered food or food in tablets are visions that have appeared in science fiction films and books for decades. As early as the 1960s, during the first space missions, scientists faced the challenge of creating food that takes up as little space as possible while being highly nutritious. In the 1970s and 1980s, intensive work was underway to create the ideal MRE (meal ready to eat), which American soldiers could easily transport during battles.

The pace of modern life has led "ordinary" people to think about minimizing the time it takes to prepare a meal. One of the ideas to meet the problem of lack of time are powdered meals so-called powder food. The idea was simple - to compose a set of substances necessary for the proper functioning of the human body and put them together in the right proportions. The first proposal of such a product appeared in 2013 in California[57]. The founder of the Soylent brand, engineer Rob Rhinehart, came up with the idea that preparing a wholesome meal should not be expensive and complicated. Since 2015, Soylent products can be purchased through Amazon, among others, making them available worldwide. In the following years, more than a dozen brands based on a similar premise appeared on the market. Products such as Soylent or Huel, popular on the Polish market, are blends of carbohydrates (e.g. from oats, tapioca, corn) about 40%, proteins (from peas, rice) about 20-30% and fats, fiber, minerals and vitamins[58] - all of plant origin. Preparation of the meal is banally easy and involves dissolving the appropriate amount of powder in water with the addition of a little of oil.

The undoubted advantage of powder food is the ability to control the composition and quantity of food consumed. Huel provides detailed composition and nutrient information, which greatly simplifies monitoring the amount of calories consumed. This can be helpful not only for those concerned about their weight, but also, as doctors point out, for those suffering from diabetes or insulin resistance[59]. Meanwhile, in a research conducted for the Food of the future report by the Infuture Hatalska

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[57] https://soylent.com/pages/about-the-company, accessed: 20.09.2023.

[58] https://www.damianparol.com/soylent-green/, accessed: 20.09.2023.

[59] K. Burda, *Jedzenie w proszku. Zdrowe, ale przecież w posiłku nie chodzi tylko o to, by się najeść*, Newsweek, 2020, https://www.newsweek.pl/zdrowie-i-nauka/nauka/jedzenie-w-proszku-zdrowe-ale-przeciez-w-posilku-nie-chodzi-tylko-o-to-by-sie-najesc/38hnvbv , accessed: 15.09.2023.

Foresight Institute, as many as 18% of respondents declared that in the future the human diet could be based precisely on shakes or pills[60]. These results may indicate a significant level of acceptance and "familiarity" of modern people with powdered foods.

In a process which is 20 times more efficient than photosynthesis [61]

Independent from the phenomena described above is the work of Finnish start-up Solar Foods. The company, which has been operating since 2017, has developed Solein, a protein created from air using electricity and fermentation. The Solein production process involves extracting microbes (single-celled organisms) from the air, which multiply and grow through natural fermentation. After drying the resulting substance, a nutrient-rich powder (meal) is produced[62]. The whole process is significantly greener than the production of traditional food. Water consumption is 20 times less than during crop cultivation and 600 times less than in beef production. Greenhouse gas emissions are lower by 5 times (compared to plants) and 200 times (compared to beef), respectively. The land consumption required for production is also incomparably less.

Solar Foods' actions may seem puzzling and its plans far-fetched, but recent months prove that the Finns can revolutionize the food market. In May 2023, the company announced the start of Solein sales in Singapore, where it has received permission to launch. On June 15, at a Fico restaurant there, ice cream made with proteins from Solar Foods joined the menu.

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[60] Food of the future, infuture hatalska foresight institute p.207

[61] https://solarfoods.com/our-story/ , accessed: 10.09.2023.

[62] Ibidem.

George Monbiot - a British journalist and environmental activist - sees in the Finnish product, which he himself had the opportunity to taste, "the greatest economic transformation of the last two hundred years."[63]. Non-farm food, he says, is the only chance to avoid extinction and bring about the restoration of wildlife. The transformation will have side effects in the form of job losses for agricultural workers, among others. However, according to the journalist, it is necessary.

[63] G. Monbiot, *Oto sposób, by się wyżywić bez zabijania planety*, https://krytykapolityczna.pl/nauka/wykarmic-swiat-nie-pozerajac-go-monbiot/, accessed: 18.09.2023

5. Hello flower!

Hello flower! is a speculative project in which I refer to the situation of seeds in the modern world, their commodification and position. In the project I use a passive hydroponic method and use the figure of edible flowers . I describe these contexts in the following subsections.

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I cannot afford to purchase seeds for every planting season. With indigenous seeds I am sure I can get the seeds I need, when I need them. Why does the government want to oppress smallholder farmers by abolishing the use of indigenous seeds?[64]

[64] G. Gordon, How the World Bank is restricting farmer's rights to own, save and sell seeds, Institute of Development Studies, 2023, https://www.ids.ac.uk/opinions/how-the-world-bank-is-restricting-farmers-rights-to-own-save-and-sell-seeds/, accessed: 19.09.2023.

5.1. Seeds. Who do they belong to?

The seed is the starting point, and when it comes to food production, one can venture to say that it's where it all began. Had it not been for the existence of seeds, man may never have ceased his nomadic lifestyle. The discovery of the life-giving power of seeds made it possible to partially tame nature and point it to produce crops where man desired.

In the past, having seeds could make for independence. Sown in season, they produced fruit and more seeds. And so every year. In previous decades, with the industrialization of agriculture, seeds began to become a commodity. The profit-driven capitalist actions of large corporations have led to an almost complete takeover of the food production and supply chain.

In 2013, the report "Agropoly - A handful of corporations control world food production" was published, created by NGOs EcoNexus and PublicEye (formerly operating as Berne Declaration). The report outlines the breadth of corporate influence over the food production sector. According to the data, in 1996 about 30% of the global seed market was owned by large companies, and by 2013 it was already 50%[65]. In contrast, 2018 data show 60% and growing corporate consolidation[66]. Four companies, chemical and pesticide producers-Bayer, Corteva, ChemChina and BASF-control more than half of all seeds on the planet. The seed industry consolidation chart created by Professor Phil Howard of Michingan illustrates the extent of acquisitions and mergers taking place in the seed industry in recent years[67]. It perfectly shows how larger companies are buying up smaller ones leading to a weakening of competition.

Seeds sold by global corporations are overwhelmingly genetically modified species (so that they produce higher yields), which require fertilizers and pesticides. The latter lead to contamination and rapid soil depletion. The progressive loss of biodiversity is also dangerous. The EcoNexus report provides as an example the cultivation of rice in the

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[65] Agropoly – A handful of corporations control world food production", report by EcoNexus and Berne Declaration, 2013.

[66] https://civileats.com/2019/01/11/the-sobering-details-behind-the-latest-seed-monopoly-chart/ , accessed: 15.09.2023.

[67] Ibidem.

Philippines where, before 1960, more than 3,000 varieties of this food crop were bred. 20 years later, 98% of the crop was already occupied by just two varieties. Of the roughly 300,000 species of edible plants that exist on earth, 90% of food is produced from just 17 of them[68]. This means that we use only 5.6% of edible species in a very intensive way. Biodiversity is under threat all over the world. In Poland, Jadwiga Łopata, founder of the International Coalition for the Protection of the Polish Countryside (ICPPC), is actively working for its protection, commenting on the situation in the country as follows:

„ The National Register is an official list of agricultural, vegetable and fruit plant varieties, the seed of which may be produced and marketed in Poland, as well as in the European Community, after their entry in the Community Catalog. Currently, varieties of 149 crop species, including 66 agricultural plant species, 55 vegetable plant species and 28 fruit plant species, can be entered in the National Register. This is an appalling depletion of plant species!"[69]

Only registered seed varieties are allowed to be cultivated. The registration of a variety comes with a fee, as does the maintenance of the variety on the register the following year. This state of affairs strongly affects farmers, especially those operating on a smaller scale. If a farmer decides to buy seed from a corporation, he cannot keep some of it for his own use, as logic would dictate. The following year he is forced once again to buy new seeds from the "producer," making him completely dependent[70].

The policy of seed industry consolidation hits developing countries the hardest. It is estimated that 80% of the world's population living below the poverty line live in rural areas and are therefore engaged in agriculture. A case in point is Africa, where the World Bank (an institution that, by design, aims to alleviate poverty in developing countries) is actively promoting intensive industrial agriculture, and thus the purchase of genetically modified seeds and fertilizers suitable for them. In 2012, a law was passed in

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[68] C. Steel, *Sitopia. Jak jedzenie może ocalić świat*, Kraków 2001, p. 291.

[69] J. Łopata, *Tradycyjne nasiona - nasze dziedzictwo i skarb narodowy. Tradycyjne i ekologiczne rolnictwo zamiast GMO*, https://www.scribd.com/document/9637324/TRADYCYJNE-NASIONA-NASZE-DZIEDZICTWO-I-SKARB-NARODOWY, accessed: 20.09.2023.

[70] Ibidem.

Kenya that prohibits farmers from collecting, selling or exchanging unregistered seeds[71]. Failure to comply with the law is punishable by imprisonment and fines. Julian Rose, co-founder of ICPPC, calls this strategy a "process of enslavement.".[72]

Seed, treated by many as a potential source of profit, has become a subject in need of special care and protection. Since the 1960s, intensive efforts to protect biodiversity have been underway, resulting, among other things, in the establishment of more seed banks and libraries. The largest such institution is the Millennium Seed Bank located on the grounds of Kew Gardens in London, which currently stores 2.4 trillion seeds representing 40,000 plant species[73]. In 2008, the Svalbard Global Seed Vault was launched, a facility located on Norway's Spitzbergen, just 1,300km from the Arctic Circle. Hollowed out 130 meters into the rock is a series of passageways and crypts where seeds are housed. The vault stores "duplicate" seeds from all the banks in the world. Its location and the specifics of its construction are meant to ensure the safety of the contents of "the most important refrigerator in the world"[74]. as architect Zygmunt Borawski described the facility.

Over the past 40 years, grassroots, often local initiatives to preserve seeds have also begun to emerge, and their number in Europe has begun to grow rapidly in the past 15 years[75], in parallel with the deepening consolidation of the seed industry. Community seed banks are also called library, home, archive or network, reflecting the motivation of their creators, driven not by profit but by respect for natural resources. Most community seed houses make seeds available at no charge, which serves to build

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[71] G. Gordon, How the World Bank is restricting farmer's rights to own, save and sell seeds, Institute of Development Studies, 2023, https://www.ids.ac.uk/opinions/how-the-world-bank-is-restricting-farmers-rights-to-own-save-and-sell-seeds/, accessed: 19.09.2023.

[72] J. Łopata, *Tradycyjne nasiona - nasze dziedzictwo i skarb narodowy. Tradycyjne i ekologiczne rolnictwo zamiast GMO*, https://www.scribd.com/document/9637324/TRADYCYJNE-NASIONA-NASZE-DZIEDZICTWO-I-SKARB-NARODOWY, accessed: 20.09.2023.

[73] https://www.kew.org/science/collections-and-resources/research-facilities/millennium-seed-bank , accessed: 20.09.2023.

[74] https://przekroj.pl/spoleczenstwo/najwazniejszalodowkaswiata-zygmunt-borawski , accessed: 20.09.2023.

[75] https://agropermalab.org/agropermalab.org/agro/robocze/Nasiona_w_naszych_rekach_strona.pdf, accessed: 20.09.2023.

a "sharing economy." Seeds are understood by their members as a common good that should be available to all.

4

5.2. Edible flowers

Flowers integrally affect the human senses. Shapes and colors stimulate the sense of sight. Scents stimulate the sense of smell. With edible flowers, they also affect the sense of taste.
According to scientists studying behavioral patterns, giving someone flowers almost always provokes the appearance of a so-called Duchenne smile[76] on their face. The Duchenne smile is known to be the most sincere type of smile. This is because groups of muscles located around the eyes and mouth, which a person cannot control, are involved in its formation. It is considered an expression of true, deep joy.

In culinary traditions around the world, flowers appear in every historical period. From prehistoric times, from gatherers, to medieval feasts, to the sophisticated dinners of modern chefs created with molecular gastronomy in mind. Flowers are not a typical accompaniment to dishes - their appearance usually marks a special occasion. In some cultures, their presence is associated with celebrations or rituals.

The first references to edible - medicinal - flowers come from Sumer and Assyria from 2500 B.C. and concern saffron and crocuses. The Ebers Papyrus of 1500 BC, a compilation of Egyptian medical texts, one of the oldest works on human healing, describes the cultivation of saffron, crocuses and lilies. The potions created from them were used not only in medicine, but also during rituals in temples.
Also in the Bible, in the Old Testament book of Ezra, the author refers to edible flowers:

„if thou wilt cease yet seven days more, (but thou shalt not fast in them, but go into a field of flowers, where no house is builded, and eat only the flowers of the field; taste no flesh, drink no wine, but eat flowers only and pray unto the Highest continually, then will I come ."[77]

The passage seems to position edible flowers as a fasting food, creating, as it were, a portal - an opportunity to connect with the Supreme -God.

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[76] C.L. Kirker, M. Newman, *Edible flower. A global history*, Londyn 2000, p. 9

[77] http://www.bibliamesjanska.com/2_Ez/9.html, accessed: 12.09.2023.

In considered one of the first culinary/cooking books in the world (1st century AD), Marcus Gavius Apicius already mentions a whole range of edible flowers and suggestions for their use. Apicius, a wealthy, educated aristocrat, was famous for his extravagant ideas, which often included culinary experiments. In The Roman Cookery Book, he suggests violets, mallows and roses, among others, in addition to the saffron and crocuses mentioned earlier.

Medieval monks repeatedly mention in their writings the nutritional and medicinal effects of edible flowers, especially hops and cloves. During this period in the Middle East, the distillation method by which rose water or orange blossom water, among others, was brought to perfection. With the colonization of America and the expansion of trade routes, new species of plants were "discovered", including edible ones. Renaissance kitchens were "blooming." Flowers became a symbol of the Victorian era.During this period in Britain, floral motifs were present on fabrics, interior design elements, porcelain. Candied flowers or rose water-based ice cream were popular. There was even a "language of flowers" that allowed messages to be sent in the form of a bouquet of flowers, the composition of which would betray the intentions of the giver.
In Europe, the Industrial Revolution began, which forever changed all aspects of life, including food and the ways it was consumed. Edible flowers disappeared from tables for a long time. New technologies allowed freezing, storing in cans or jars which worked perfectly for many products, but did not serve delicate flowers. Food safety standards emerged in the US, which changed the way we think about food and medicines:

„The evolution of the modern pharmaceutical industry in the United States and other developed nations changed people's perceptions of medicine. People learned to trust labels and government assurances of content and safety over oral history and traditional folk knowledge, ushering in what could be called the 'dark ages' of edible flowers. Still , throughout the rest of the world, European Roma, indigenous peoples and traditional healers continue to keep the knowledge of medicinal flowers alive.”[78]

[78] C.L. Kirker, M. Newman, *Edible flower. A global history*, Londyn 2000, p. 43,44.

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During World War I and World War II, however, flowers as food made a comeback in a completely different context. Already during World War I, the U.S. government promoted so-called victory gardens also known as war gardens[79] as opportunities to engage in the battles being fought. The home vegetable gardens were meant to relieve the pressure on the front lines and support food production. Crops from this period included edible flowers such as marigolds. When World War II broke out shortly after the Great Depression), the heavily weakened state once again encouraged civilians to produce food themselves. An extensive marketing campaign caused more than 60% of Americans to start growing their own vegetables, so that as much as 40% of the fresh food produced in the U.S. at the time came from home gardens[80]. The initiative was promoted by Eleanor Roosevelt, among others, by growing a victory garden on the White House lawn. Nowadays it is believed that American citizens were not threatened by starvation, and the main purpose of government action was to stimulate solidarity[81].

The 1960s and hippie culture outlined a return of interest to the natural. At the same time, for the first time, the role of pesticides in growing fruits and vegetables began to be criticized. Edible flowers were once again an object of growing interest. In Europe, a changing approach to food could be seen. French chefs launched the nouvelle cuisine trend, revolutionary in the history of gastronomy, which broke with traditional assumptions. The "new cuisine" emphasized freshness, lightness and care in the presentation of food. In 1973 Henri Gault, one of the pioneers of the movement, published a manifesto - a set of 10 principles of nouvelle cuisine[82], among which were such revolutionary tenets as the principle of working on dishes from start to finish (avoiding reheating), steaming, not abundant meals, invention - experimentation or following the advice of nutritionists. The concept brought renewed attention to cooks' use of edible flowers, which fit perfectly into its rules.

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[79] https://virginiahistory.org/learn/victory-gardens , accessed: 18.08.2023.

[80] J. Steinhauer, *„Victory Gardens Were More About Solidarity Than Survival„* The New York Time Magazine, 2020, https://www.nytimes.com/2020/07/15/magazine/victory-gardens-world-war-II.html , accessed: 18.08.2023.

[81] Ibidem.

[82] https://www.britannica.com/topic/nouvelle-cuisine , accessed: 19.08.2023.

A California origin, acclaimed chef Alice Waters took a trip to France in 1964[83] that changed the way she thought about cooking. Seven years later, in her hometown of Berkeley, she created Chez Panisse, a restaurant that still exists today. Seasonality, organicity, sustainability, were the foundations on which the menu there was created. Edible flowers were a regular ingredient in most of the dishes served at Chez Panisse. Waters established a foundation in 1996 that advocates the right of access to healthy, organic food for everyone. She actively promotes the farm to table movement , and creates educational programs for schools.

Leading chefs and restaurants of the 21st century unanimously emphasize the importance of gathering, often enhancing dishes with edible flowers. Copenhagen's iconic gastronomy restaurant Noma features a menu in which every dish includes flowers[84]. The model of creating self-sustaining restaurants that neighbor farms that supply them with produce is becoming increasingly popular. Chefs can independently collect, among other things, the flowers needed for the dishes they are creating. Molecular gastronomy - a field of science that focuses on the physical and chemical transformations of food during its processing - against the apparent visual "artificiality" of the dishes served, actually brings out the properties of carefully selected products[85]. Chefs operating in its trend reach for edible flowers, creating often abstract settings for them like Ferran Adria, among others, using edible film (edible paper)[86].

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[83] C. L. Kirker, M. Newman, *Edible flower. A global history*, Londyn 2016, p. 48.

[84] C. L. Kirker, M. Newman, *Edible flower. A global history*, Londyn 2016, p. 51.

[85] https://www.britannica.com/topic/molecular-gastronomy , accessed : 20.08.2023.

[86] http://www.molecularrecipes.com/techniques/edible-film-create-amazing-see-through-recipes/ , accessed: 20.08.2023.

my one unbreakable rules
has always been to use
only the freshest and finest
ingredients available[87]

[87] A. Waters, introduction, w: *Chez Panisse Menu Cookbook*, New York 1982, p. 10.

5.3. Passive hydroponics

Passive hydroponics otherwise known as non-circulating hydroponic method, unlike the traditional method described in an earlier section, does not require the use of electricity-powered pumps. It is simpler and less requiring, making it more affordable for home cultivation.

The method was developed in the 1990s, by Bernard A. Kratky, a scientist at the University of Hawaii, and covered by a patent in the US in the following years. It assumes the delivery of a fertilizer solution only at the time of starting the system, which becomes further self-sufficient[88]. The principle of operation is simple. Pots of plants are suspended in a container (tank) with fertilizer, the roots of which are partially submerged in the solution and partially exposed to the air, which provides them with constant access to both water and oxygen. Together with the growth of the plant, the level of the solution drops, at the same time exposing the space with high humidity. With this method, the entire life cycle of the plant can be carried out, with the initial provision of an appropriately sized fertilizer tank. According to Kratky's research, 3-4 liters of fertilizer solution is needed to grow 200 grams of lettuce[89].

While the industrial-scale hydroponic farms described in subsection 4.3 are highly specialized and technically advanced, Kratky's method simplifies the issue to the bare minimum. The approach proposed by the scientist allows one to arbitrarily determine the scale at which plants are grown, matching the spatial possibilities. Reflecting on the form that the return of agriculture to households could take - which may seem difficult from a modern perspective - passive hydroponics is a method that can bring them back in a non-invasive way.

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[88] https://university.upstartfarmers.com/blog/kratky-method , accessed: 20.08.2023.

[89] https://www.ctahr.hawaii.edu/hawaii/downloads/Three_Non-circulating_Hydroponic_Methods_for_Growing_lettuce.pdf , accessed: 20.08.2023.

If you give a plant exactly what it needs and when it needs, the plant is likely to grow as healthy as genetically possible[90]

[90] M. Ahsan B. Habib, Mashuda Parvin, *A Review on culture, production and use of spirulina as food for humans and feeds for domestic animals and fish*, 2008, https://www.fao.org/3/i0424e/i0424e00.pdf

5.4 A speculative project

The project hello flower! consists of a series of objects created around a speculative vision of how humans will eat in the future. Based on research around the history and contemporary trends of food sourcing and consumption, I outline a scenario that could happen in the future.

In the earlier chapters of this dissertation, I recount the history of the transformation of the way we obtain food from gathering to cultivation to specialized monocultures, "separated" in the sense of distance as well as mentally from modern urban life.

I situate the project hello flower! at a moment in history when the Earth is running out of space for traditional soil cultivation, and weather conditions are not suitable for plant growing. Aggressive policies of global corporations focused on agriculture have led to the takeover of seed rights by the authorities of countries and wars over seeds.

Each person receives a dozen seeds of several varieties of plants each year, from which they independently grow edible, flowering plants in a hydroponic method. The flowers are genetically modified to meet man's nutritional needs, but their shape (physical form) has not changed. This method of nutrition has replaced the powdered products previously proposed, created by bacterial fermentation, among other things. Despite the wholesome composition, people consuming this type of food did not feel healthy - the lack of satisfaction from consuming the meal and a strong sense of its "artificiality" resulted in deepening apathy. The reasons for this condition began to be traced to a deep-rooted biophilic need, necessary for physical and mental well-being.

"Giving back" the process of growing edible plants to their consumers I restore their lost contact with nature as a home that feeds. I conceive the process of "caring" for a seed, from germination through reaching the seedling stage to the plant's growth and flowering as a nourishing experience. The empiricism of communing with a plant organism here is a soothing and at the same time moralizing experience, embedding it in a world of which humans are (only) an element.

The project Hello flower! consists of a series of objects used to perform the ritual. From storing seeds, to germinating them and growing them in special containers, to eating

the fruits - in this case, edible flowers - in goblet-like vessels. The edible flowers in the project function as a symbolic carrier of values such as respect for nature as a home that guarantees our survival.

Beginning

The first series of objects I designed are jewelry-like porcelain forms of irregular, amorphous shape. The objects are hollow inside, equipped with holes that are closed with stoppers, and thus serve the function of storage. The design alludes to the sentimental jewelry popular in the 19th century, which, in addition to its decorative function, acted as a carrier of important personal content[91]. So-called lockets, which were created during this period, were used to store photographs or locks of hair of loved ones.

[91] https://desa.pl/pl/historie/symbolika-w-bizuterii-sentymentalnej/ , accessed: 19.07.2023.

The objects I create are used to store seeds, which I treat as the most valuable asset that needs protection and care. Giving them a jewelry function makes it possible to locate them close to the human body, just as close one "places" a loved one.
The models on the basis of which the casts were created - the target objects - are the result of an experimental process of pouring dried plants with ceramic mass. Their shapes, which give the impression of being random, are derived from existing, natural entities. In the process, which I treat as a mummification or preservation of delicate plant structures, forms are saved, which in the natural world usually decompose on their own. During firing in a ceramic kiln, the plant tissue is burned away, but its reflection is fixed in the extremely resistant ceramic material. In this symbolic process, I draw attention to the significance of the plant world, whose passing in its most basic dimension we often overlook.

8, 9, 10

11, 12, 13

Growth

The second group of objects created as part of the hello flower! project are containers for passive (non-automated) hydroponic cultivation. In section 4.2 of this dissertation, I describe how to conduct and the advantages of soilless cultivation. This way of growing plants is more efficient (faster), uses less water than traditional (soil-based) growing, and takes up significantly less space.

To understand and experience how hydroponic farming works, I attempted to grow hydroponic crops in a home environment. As a person who comes from and has lived in large cities all my life, for the first time in my life I had the opportunity to observe the development of a plant from seed germination through seedling growth, the growth of the first leaves, to flowering. The seemingly trivial experience turned out to be very rewarding and at the same time soothing, allowing me to understand both the delicacy and strength of the plant organism.

The hydroponic growing containers I designed are made of dark brown clay fired at high temperatures, glazed inside. The light-impermeable clay material provides an ideal environment for the growth of the roots of the plants being grown. In the upper part of the oval containers there is a cavity in which a basket with a plant seedling is placed. Around the vessel is mounted a metal strip, which stabilizes the arm of the led lamp. The arm made up of modules allows you to adjust the height of the light, which changes with the growth of the plant. The lamp's bulb with a white color of about 6400 K provides the necessary light for growth.

14

15, 16, 17

The meal

The third group of designed objects are porcelain goblets / cups used for eating floral meals from plants grown by oneself from seeds.

A goblet is a vessel consisting of a bowl, a foot and a stem, used during feasts or religious ceremonies. Traditionally, the vessel's bowl and foot taper toward the stem, which serves as a grasping point. The stem is a slender piece adapted to be embraced by one hand and lifted. In the design, I reverse the proportions of the different elements of the vessel so that the centrally located stem becomes the widest element of the object. I replace the bossy gesture with a tender embrace of both hands.

Focusing on the design of a vessel historically used to accompany ceremonies or religious rituals, I emphasize the importance of the act of eating a meal. In a symbolic way, I draw attention to the importance and preciousness of food. Significant in their size, the dishes are meant to display food - the most precious and at the same time fragile resource.

Cup-shaped dishes are made of porcelain using the technique of casting in plaster molds. Matte on the outside, only the interior of the bowl, which contains the meal, is glazed.

„Bread can be managed by authoritarian regimes, but roses are something individuals must be free to find for themselves, discovered and cultivated”[92]

[92] R. Solnit, *Róże Orwella*, Kraków, 2023

19, 20

21

6. Super Spirulina.

6.1. What a spirulina is?

22

life form
that has created
our oxygen atmosphere[93]

[93] https://www.sciencedirect.com/science/article/abs/pii/S0924224417302182?via%3Dihub accessed: 20.08.2023.

Spirulina is a multicellular microalgae found on Earth in about 15 species. The most common of these is Arthrospira platensis[94], and it is the subject of most modern studies and research. Spirulina is referred to colloquially, but also in many scientific studies, as a microalga, but from the point of view of systematics of organisms - since 1962[95] it has been classified as a cyanobacterium.

Spirulina is considered one of the oldest life forms found on the planet and capable of photosynthesis. It is estimated to have emerged 3.6 trillion years ago, transforming a carbon dioxide-based atmosphere into an oxygen-rich one, allowing more organisms to evolve. Researchers refer to it as a "bridge between green plants and bacteria"[96] . The first historical references to spirulina date back to the 16th century from Spanish invaders conquering Mexico, who noticed that the Aztecs were using delicate nets to collect algae from the surface of a lake and then make a green cake out of it. Similar observations were made in Africa, near Lake Chad. In the 1960s, French and Belgian trans-Saharan expeditions observed algae blooms on the lakes, which were successively delivered to local markets in the form of dried dough. After spirulina was analyzed by the International Association of Applied Microbiology, it was hailed in 1967 as "the miracle food source of the future."[97].

Spirulina has an exceptionally high protein content - about 60-70% - while being low in carbohydrates (about 10-18%) and fats (4-7%)[98]. By comparison, soybeans, considered a high-protein product, contain only 30-40% protein, peanuts 25%, cereals 8-10%. Microalgae are also a rich source of minerals and vitamins, among which are vitamin A, all B vitamins, vitamins C and E, iron, calcium, chromium, copper, magnesium, manganese, phosphorus, potassium, sodium and zinc, Omega 3 and 6

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[94] M. Ahsan B. Habib, Mashuda Parvin, *A Review on culture, production and use of spirulina as food for humans and feeds for domestic animals and fish*, 2008, https://www.fao.org/3/i0424e/i0424e00.pdf

[95] Ibidem.

[96] https://www.sciencedirect.com/science/article/abs/pii/S0924224417302182?via%3Dihub , accessed: 20.08.2023.

[97] M. Ahsan B. Habib, Mashuda Parvin, *A Review on culture, production and use of spirulina as food for humans and feeds for domestic animals and fish*, 2008, https://www.fao.org/3/i0424e/i0424e00.pdf

[98] O. Ciferri, *Spirulina, the Edible Microorganism*,1983, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC283708/pdf/microrev00019-0101.pdf, accessed: 23.09.2023

acids, chlorophyll, phycocyanin, carotenes. Spirulina researchers call it "the most concentrated whole food known to mankind."[99]

the most nutritious, concentrated whole food known to humankind

In the natural environment, the microalga is present in the tropical and subtropical zones in alkaline lakes. The largest cultures of spirulina are found in lakes Texcoco (Mexico), Bodou and Rombou (Chad), Nakuru and Elementeita (Kenya) and Aranguadi and Kilotes (Ethiopia)[100]. The above locations provide the algae with adequate temperature and sunlight. The high ph of the water (8.5-11), ideal for spirulina, is a hostile environment for most other microorganisms. The algae's life and growth cycle regulates the amount of available nutrients, which come from river tributaries or rainfall. When the growing spirulina population reaches maximum density and nutrients are depleted, the microalgae die. The decomposed algae release "nutrients "and the cycle begins again.

The first commercial cultivation of spirulina was established in the 1970s in places of its natural occurrence such as Lake Tecoco in Mexico. Today spirulina is grown in at least 22 countries around the world, including Brazil, Burkina Faso, Chad, Chile, China, Costa Rica, Cuba, Ecuador, France, India, Madagascar, Mexico, Myanmar, Peru, Israel, Spain, Thailand and the USA[101]. Industrial production of spirulina is carried out in artificially created, shallow (up to 20 cm deep) ponds, where water and algae populations are mixed with special paddles to simulate the natural movement occurring in bodies of water and ensure that the entire culture has equal access to light. As of 2022, 10,000 tons (dry biomass) of spirulina are produced globally each year, 50%

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[99] K. Moorhead, B. Capelli, G. R. Cysewski, *Spirulina, Nature's Superfood*, 1993, p. 5

[100] M. Ahsan B. Habib, Mashuda Parvin, *A Review on culture, production and use of spirulina as food for humans and feeds for domestic animals and fish*, 2008, https://www.fao.org/3/i0424e/i0424e00.pdf

[101] Ibidem.

of which comes from China[102]. Due to its unique nutritional properties, spirulina is one of the forms of food tested on space missions.

6. 2. A program of learning how to grow spirulina at home

Spirulina on an industrial scale is produced within climate zones that provide optimal conditions for its growth. After harvesting, the microalgae are dried, then packaged and distributed worldwide in the form of green powder or tablets. To reach countries far from the tropics, such as Poland, the algae must travel thousands of kilometers.

It is relatively simple to grow microalgae on a small scale and for your own consumption at home. You need a glass container, an aquarium pump, a well-sunlit spot or artificial lighting (led lamp) and a culture medium - nutrient solution. The advantages of conducting your own culture are that the carbon footprint is kept to a minimum (the production of algae and its consumption takes place in the same place) and you have an independent source of a highly nutritious substance. Fresh spirulina is also significantly more nutritious than when dried.

I obtained my first spirulina culture from the Institute of Design in Kielce courtesy of the team there. The microalgae have been cultured at the Institute since 2019 and appeared in connection with the "Crisis Kit" project, which was accompanied by a workshop by biotechnologist Aleksandra Ławrynowicz. Based on the guidance of the culture supervisor from Kielce and Aleksandra, with whom I got in touch, I began to conduct my own spirulina cultivation at home. On the web I came across small studies and discussions on forums in English. Some of them were highly specialized, and the technical language made it difficult to understand the issues. The only information in Polish to which I have reached have been provided to me by word of mouth, so I saw the need to create a written study on how to grow spirulina at home, precisely in Polish.

My goal was to create a compact publication, which would present in a simple way the requirements and issues related to the conduct of home spirulina cultivation and serve the function of popularization.

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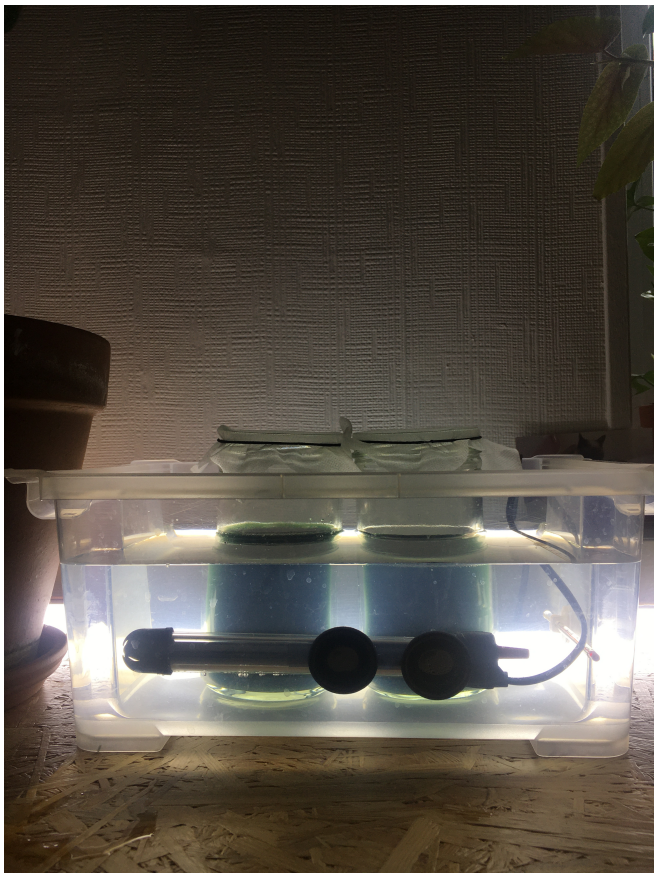
[102] https://www.sciencedirect.com/science/article/abs/pii/S1369703X22002108, accessed: 20.08.2023.

23, 24, 25



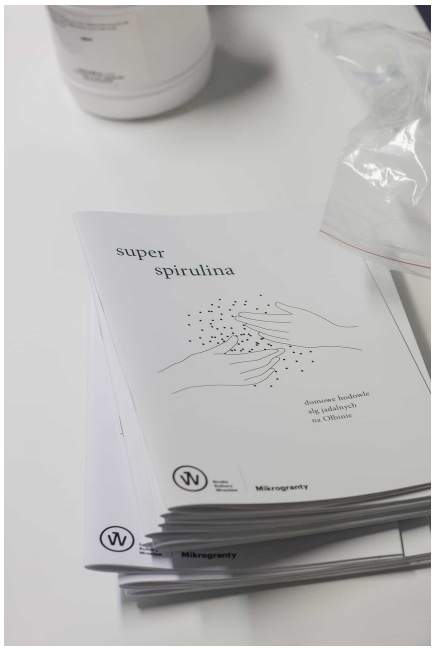
26, 27, 28

Such a study was created in the autumn of 2021 and already in printed form accompanied the workshops under the title Super Spirulina realized in the program Microgrants organized by the Strefa Kultury Wrocław. The workshop was attended by a group of about a dozen people, who received a starter culture of microalgae and the basic equipment necessary to undertake breeding. The event was accompanied by a lecture by a biotehnologist and activist working on the topic of food independence.

In July 2023, I led another workshop, this time in Gdynia, during which another dozen people started their own mini-cultures and acquired the basic knowledge necessary to continue it in their own homes.

An important aspect of the activity is its integrative context. Live spirulina culture is difficult to obtain. Currently, there are no growers selling the algae in Poland. Apart from a few mail-order companies in Europe, from which spirulina can be purchased at an exorbitant price, it is impossible to "get" live culture. This state of affairs means that the exchange of live spirulina is done as a courtesy - just as crops or seeds were exchanged in the past. Willing or unwilling, in order to get algae it is necessary to establish contact with the other person. This was also the case during the workshops I conducted, when at successive meetings we exchanged experiences of farming. The spoken message gained significantly more value than, for example, readily available Internet sources, which are difficult to relate to a subtle situation that requires the ability to observe closely, such as algae farming. The networking nature of the activity was important for the "safety" of the whole endeavor. If one of the workshop participants encountered a problem in the culture, such as it died due to contamination, they could ask another group member to share a bit of algae. As in the case of sharing seeds - giving the other person a part of one's resources did not mean impoverishment, but on the contrary, enrichment.

In addition to the main, immediate goal of the Super Spirulina project, which was to create a network of home algae farms, a side goal, perhaps more important, was realized - the process of integration occurring "around" the production of food.



29, 30, 31, 32

Instead of deciding what to eat and then expecting nature to supply it, we need to ask the landscape what it wants to grow.

Conclusion

In the past, man followed nature as the home that feeds. He did not expect or try to bend nature to his needs, he humbly accepted the gifts it gave. The modern food production system is a negation of the above values. We have stopped understanding how the environment works. We have stopped considering having knowledge of its mechanisms as important, relying entirely on digital, "perfect" tools offered by large corporations. The cost of this ignorance is enormous, and its effects are increasingly being felt. The positive, and at the same time frightening, fact is that the solution to this situation, the way out of the crisis is known to us and does not need to be reinvented. What is necessary is to give up the luxuries to which we have become used, and return to a more local, self-sustaining economy in as many aspects as possible. Sensitivity and respect are also necessary.

How many of the young adults born after 1980, raised in cities, have had at least once the opportunity to observe the growth of a seed and its transformation into a mature plant? Among people I know, most have had contact with plant seeds only on the occasion of Easter and the "sowing" of cress. A banal tradition, in children it arouses great excitement, understandably - for many, the transformation of seeds into a green plant is a new, even magical process.

Watching the germinating seed of an edible plant, which becomes a seedling, then sprouts cotyledons and, in turn, leaves proper, we become witnesses to the most basic, natural process by which humans and animals were able to appear and survive on the planet. This process occurs spontaneously in nature, but with a little effort, with the help of, for example, hydroponic cultivation, we can transfer it and observe it in our own homes. Our involvement, caring for the plant, can be reflected in its growth and crops.

Food can unite and can divide, it can initiate conflicts and be the starting point for a peace agreement. What is certain is that - in the forms we know today or in other forms - it will accompany man as necessary for survival. Accompany and also shape reality.

By choosing what we eat, we design the shape of the world every day. Not only of the nearest neighborhood, but also of its remotest corners. These decisions are worth

making consciously, and although being a responsible consumer is not easy in today's world, it is not impossible. Eating can be a daily celebration, a moment of encounter that is not accompanied by suffering and violence inscribed in the history of food production.

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