Food for Thought: Designing New Ways Of Eating

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Abstract: First proclaimed an amazing innovation, now plastic permeates everything—our homes, food, earth, oceans, many living creatures, including ourselves. The use of plastic is problematic, but hard to change. It is culturally situated, commercially embedded, learned, ingrained, often automatic. And, while alternatives are available, they can be hard to find and more expensive than their plastic counterparts. To engage with this issue, we undertook a design-based investigation of DIY bioplastic, edible and hyper-compostable tableware. Our aim was to render such alternatives more accessible. DIY recipes are available online. Yet, often lack vital information to make their use easy. We discovered how to "tame" fabrication of plastic alternatives by adding information about cooking and curing to the recipes. Our experiments suggest that 'at home' production of bioplastics and the accompanying re-design of cutlery and tableware, engender new, more sustainable, eating habits by—literally—designing new ways of eating. They also afford reframing of food 'waste' into material resource. We present a hand-made book and material samples set that make our findings tangible and accessible to design researchers, amateur gastronomists, DIY enthusiasts, and others curious about plastic alternatives. Our findings support a move of scientific practices from the lab to people's homes.

Keywords: Bioplastics; DIY practises; Sustainabillity; plastic alternatives;Materiality;Research through design.

FOOD FOR THOUGHT

Introduction

This research unfolds within the larger context of a research program that uses food as a starting point for thinking about real-world material practices (Wilde, n.d.). It aligns itself with the upsurge of interest in DIY practices (Kuznetsov and Paulos, 2010; Nascimento and Pólvora, 2018) and parallel moves to democratize scientific practices (DIY bio, n.d.). Our objective in undertaking this research was to discover what it would take to make bioplastics without prior experience or specialist knowledge: to create functional, hypercompostable tableware using only open source instructions and the background design knowledge of the authors. Plastic is a key environmental issue (Wagner et al., 2014). It is commonly used to cook, distribute, eat, store and dispose of food. It was first proclaimed an amazing innovation. Now we find it permeates everything—not only the tools we use to handle food, but the food itself, the soil and water that our food grows in, many living creatures on our planet, including ourselves. We felt it was important to broaden our understanding of how people might engage with plastic and plastic alternatives.

It is increasingly common to find alternatives to plastics on supermarket shelves and online stores (f.x. biodegradable dishes and cutlery). Yet, we find they are often more expensive than their plastic counterparts and—despite the assumptions that accompany bio- and eco- goods (Emadian et al., 2017)—not all bioplastics are eco-friendly. Corn-based fabrics, for example, despite their natural origin, are not obtained through exclusively natural chemical processes. At the same time, growing corn produces harmful results on the environment due to use of pesticides and water use. We therefore felt it was important to nuance our relationship to plastics and bioplastics and determined to do so as part of a DIY making process. (Hemphill and Leskowitz, 2012)

Our investigation unfolded over four months. During this time we determined to (a) master the process of DIY fabrication of bioplastics, and (b) determine if others may be interested in making such things at home. As we report here, we used research-through-design (RtD) to engage with open source biology, and participatory RtD to bring varied stakeholders together to grapple with the question: How can we shift our material practices around food towards ecological flourishing, using tableware as the locus of our attention? Our participatory experiments consisted of workshops and 'research labs in the wild'—participatory events that conflate exhibition, studio and lab to expose early research in process to public scrutiny (Wilde, 2015).

Our findings are gathered in a book and collection of material samples. The book is at once a design artefact, a report, an invitation and a call to arms. It includes a collection of instruction sets—modified recipes, empirically tested through two participatory RtD experiments, as well as material samples, our reflections on the process and outcomes.

For the exhibition at RtD2019 we would like to present a collection of diverse material samples, our book and several food related bioplastic objects, like bowls, cups and cutlery. To get an impression of the compostabillity of our work we intend to exhibit older artefacts, crafted during initial research as well as freshly made objects.

Related works

The DIY movement has permeated society with a vast number of options to be chosen from and therefore gave us the opportunity to address our work through it. Nowadays, the experts leverage the popularity of DIY to democratize anything from industrial products to technology and science (Kuznetsov and Paulos, 2010) (Watson and Shove, 2008). The number of recipes for making bioplastics has risen significantly with the rise of open source materials and the maker movement (Gobble & Euchner 2013), especially after such products began to hit the market with plastic alternatives (Global Bioplastic Market Forecast to 2020, 2016). Even while writing this article, we discovered new and better bioplastic instructions which were not available at the time we conducted our research. In general, there are two types of bioplastic recipes and instructions online. The first type provides measurements of ingredients and step-by-step instructions (Instructables 2018; wikiHow 2018). The other takes a more experimental approach to bioplastics: authors do not provide specific amounts, rather, they encourage readers to discover for themselves the elasticity, thickness or finish that they prefer. As an example, (Davis, 2017) gives tips for how to achieve the desired results by providing a set of bullet points to consider, and does not discuss in detail many variables of the curing process. Similar to any craft, every step of making bioplastics invites people to explore, alter the amounts of ingredients, try out techniques that haven't been used before, resulting in new, unexpected outcomes. The DIY craft that has the longest tradition and most numerous catalogue of documented cases is food-making. There are countless approaches for documenting the secrets of cooking. Our project therefore found inspiration in recipes for food.

Methodology

Our process consisted of iterative prototyping, a research lab in the wild, a workshop undertaken in the context of a symposium focused on FOOD+[material practices] (Wilde, n.d.) and iterative development and testing of instruction sets.

To gain a better understanding of bioplastics, their possibilities and limitations, we began with iterative prototyping sessions (Figure 1a, b). We cycled through mould making, material explorations, cooking and casting. Through this process, we developed a collection of design artefacts and methods to take to the public. We initially focused on producing bioplastic cutlery that feels and looks exactly like plastic cutlery. Following some challenges in the production process—forks and spoons that were unable to hold the weight of food, knives that struggled to cut—we shifted our focus to the development of new shapes that do what cutlery does, without necessarily looking how cutlery currently looks. This shift better positioned us to craft bioplastic cutlery. Over a research lab in the wild and a workshop we used open interviews and participatory methods to engage people in the making and discussion of bioplastics for a sustainable future. Both events were used to reflect on the methods used and contribute to the development of new instruction sets.

In our research we discard the idea of solution-driven research that simplifies a design space to known solutions as discussed by (Dobbins, 2009). We instead open up our process using speculation and participatory RtD. Speculation supports the emergence of new practices. It slows down the decision-making process, as it affords consideration of the implications of a design before it is brought into the world. It thus short-circuits reactive decision-making and encourages deep, nuanced reflection (Dolejsova, 2018). When diverse actors are included in a speculation process, it can bring to light new imaginaries, make concrete previously hidden or under-expressed values, prompt essential discussions and lead to new practices—without resorting to solutionist approaches.

The Food for Thought research project is not limited to the operational concerns of improving instruction sets or creating design artefacts; it is an investigation of people's interaction with and acceptance of bioplastics. Our intention through the research lab in the wild and workshops was to bring together people from divergent backgrounds, bring attention to environmental issues and discuss future scenarios involving bioplastics and alternative, sustainable practices.

a.

b.

Figure 1a, b. Gelatine bioplastic samples. Photo: First Name Surname [ANON. FOR STAGE 2 SUBMISSION]. Exploring material limitations and possibilities in creating design artifacts.

Food For Thought

Modern society is rapidly becoming aware of an ecological footprint that plastic industry is leaving behind. 20 years ago, it would be hard to believe in plastic waste landfills, drifting in the open sea. Today, videos of this scenery can be found on social media channels, filling news feeds and being a constant reminder of the impact that we have on the planet, and responsibility behind simple everyday decisions. We chose bioplastics as a medium which is rich in interaction, proposing a discussion around sustainability of common plastic-related practises.

Experiments

Most of the DIY-bioplastic recipes that we tested had no more than 6 ingredients, all of them available in supermarkets and pharmacies in Denmark. Without prior knowledge of bioplastics, we determined to find out which ingredients are required to produce plastic-like materials, and which methods are most convenient when making them. As a starting point we used open-source materials, such as recipes and presentations, that contained instructions and applications of various bioplastics.

The ingredients to create bioplastics are widely available. Nonetheless interacting with them can be challenging (Figure 2.). Most recipes describe the bioplastic preparation process as a simple step-by-step tutorial, but the steps were not as straightforward as we anticipated. In our first iterations we discovered that bioplastics have a complicated and sometimes unpredictable nature. For example, casein bioplastic appeared very greasy with a smell similar to a parmesan cheese. Agar bioplastic shocked us, as almost the entire sample evaporated (Figure 3a.). We were left with a barely perceptible layer of material on the surface of the mould. When heated, gelatine bioplastic changes colour and emits an unpleasant smell. Because of these properties, we found the instructions sets incomplete and inconsistent in their description. We relied on them as the basis to develop a strategy for our material explorations and systemized the knowledge about it. The general process from selecting materials to the final bioplastic sample consist of the following steps: select recipe, gather ingredients, prepare mould, mix ingredients, heat (cook), mould and dry (cure). Common ingredients used to 'plasticise' the materials included casein, gelatine, starch and agar.

To experiment with material properties of different recipes and observe changes, mould making is an important starting point. A suitable mould for bioplastic experiments needs several characteristics: it must hold its shape, be easy to reuse and have a smooth surface to facilitate the removal of the cured bioplastic. Additionally, having several moulds in a single sheet is convenient to organize and observe samples during the curing process, in particular when dif-

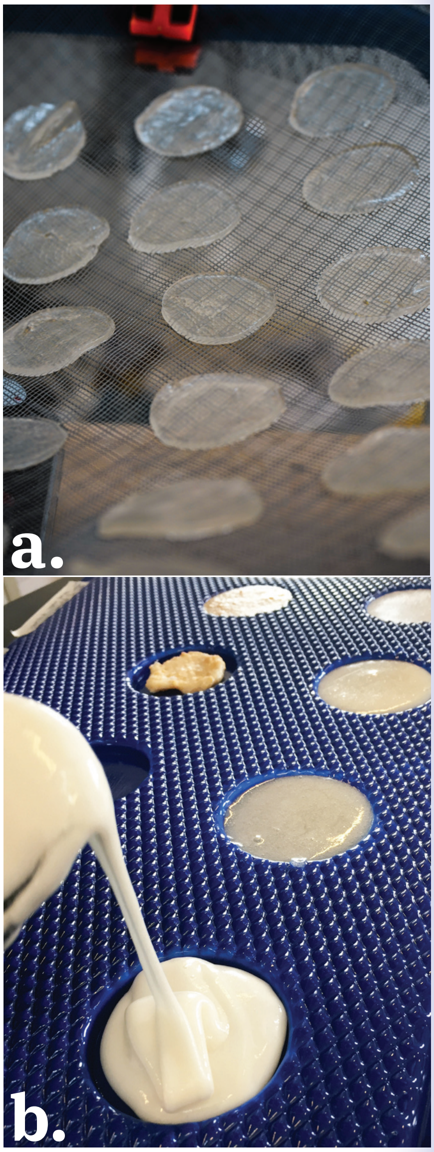

Figure 3a. Agar bioplastic samples during casting. Photo: First Name Surname [ANON. FOR STAGE 2 SUBMISSION]. The material almost fully dissolved during the casting process.
Figure 3b. Vacuum formed plastic sheets. Photo: First Name Surname [ANON. FOR STAGE 2 SUBMISSION]. Used for casting and organizing bioplastic samples.

<Figure 2. Bioplastic foil. Photo: First Name Surname [ANON. FOR STAGE 2 SUBMISSION]. Some of the samples produced showed that bioplastics can create a variety of outcomes - from solid samples to foils and flexible materials.

ferent material variations need to be compared. For our moulds, we explored a range of materials: cardboard, gypsum, MDF, 3D printed PLA and vacuum-formed plastics (Figure 3b.). We also laser cut forms out of MDF. We acknowledge that many of these materials go counter to the underlying aims of the project to move towards sustainable practices. Nonetheless, we felt it important to experiment with what we had to hand. This approach aligns with the need to balance concerns around environment and social justice. We were not in a position to purchase expensive pressure moulds and did not want to give up on our project when our experiments with cardboard and gypsum failed. The aim of the project is to understand how to democratise DIY bioplastic, edible and hypercompostible table-ware making. This aim requires us to grapple with all of the challenges that may arise, including the unsustainable practices we commonly use in our design processes. Laser cutting forms out of MDF, while not sustainable from material point of view, best corresponded to the requirements of the mould. Vacuum-pressed forms were also suitable as they were well sealed, easy to wash and reuse. Such moulds are less time-consuming to fabricate than 3D printed moulds, for example, and produce forms more stable than gypsum.

Figure 4. Combining additives and bioplstics. Photo: First Name Surname [ANON. FOR STAGE 2 SUBMISSION]. To create more robust materials we experimented by adding different organic materials to bioplastic.

We found vacuum-pressed forms to be most useful when experimenting with different additives to be mixed together with bioplastics. Adding used coffee grounds and dried orange peel to gelatine bioplastic created a completely different result compared with initial experiments. Adding coffee grains to gelatine, for example, changed the smell and texture. This result expanded our view towards combining ingredients (Figure 4.). We repeated the process for starch-based bioplastics, and the results were different again. In this case, it took more time for material to cure. Samples of gelatine bioplastic mixed with coffee grains were hard and robust rather than brittle, while starch-coffee ground samples were flexible and fragile. This outcome indicated that the time taken for curing may be an important step in determining the final outcome of bioplas-

tics. Most of the bioplastics we experimented with—casein, gelatine, starch and agar—dried at room temperature over a few hours or days. The exact time for curing depended on the amount of surface area exposed to air and material thickness. Overall, we found balancing the material properties to achieve ideal curing times and stiffness was the most challenging aspect of working with bioplastics.

At the conclusion of our exploration phase we determined that gelatine and starch-based bioplastic was the easiest to manage and would suit our purpose of crafting tableware. We then gathered together a collection of material samples from

our exploration phase and gelatine- and starch-based cutlery and prepared for our first public experiments.

Figure 5. Bioplastic exibits. Photo: First Name Surname [ANON. FOR STAGE 2 SUBMISSION]. The collection of design artifacts showcased at the FOOD+ symposium.

Engaging publics

Our public experiments were undertaken at The University of Southern Denmark (SDU). The first was a Research Lab in the Wild held as part of SDU's 50th anniversary Jubilee event; the second was a workshop (Figure 5.) held a month later during the Nordic-Baltic BioMedia network's FOOD+[material practices] symposium.

Research lab in the wild

SDU's jubilee event brought about a hundred people to the Kolding campus for talks and exhibitions of research. We took advantage of this event to create our first experiment, a research lab in the wild – a participatory event that is both exhibition and research in progress (Wilde and Underwood, 2018). The aims of our research lab in the wild were (a) to explore if visitors were willing to engage in our processes, (b) to determine how relevant they find the idea of creating bioplastic objects themselves using the methods we made available, and (c) to understand what issues people think they might face while doing so?

To realise these aims, we had a dispay table on which we showcased our material samples and artifacts. The table included a workspace to cook and create bioplastics together with interested spectators (Figure 6a.). Through the event we probed the idea of bringing the recipes to people by interacting with them. This approach gave us a sense of interest and perceived necessity for such practices. While cooking, we noticed that our process was understood by most participants. Many claimed it to be similar to jelly making, which also uses gelatin as a base. Our visitors were intrigued and excited about the look and feel of the outcomes but didn't seem convinced by their functionality or ability to replace disposable cutlery made from synthetic plastics. In contrast, the examples for food wrapping alternatives were readily accepted. It seemed an issue for the participants that food wrapping is unsustainable, yet many use it on daily basis in their kitchens. The collected findings from the event were used to improve the instruction sets that we created for our second public intervention: a workshop at the Nordic-Baltic BioMedia network's FOOD+[material practices] symposium, which was also hosted at SDU.

Workshop

The fourth Nordic-Baltic symposium brought together key actors

Figure 6a Research lab in the wild. Photo: First Name Surname [ANON. FOR STAGE 2 SUBMISSION]. Exhibiting design artifacts and creating bioplastics with participants. **Figiure 6b** Food+ Symposium. Photo: First Name Surname [ANON. FOR STAGE 2 SUBMISSION].Engaging workshop participants in bioplastic fabrication process.

<Figure 7. Ramsons pie on an estragon-gelatine bowl. Photo: First Name Surname [ANON. FOR STAGE 2 SUBMISSION]. Incorporating taste by adding herbs and spices into bioplastic tableware. Food made by Design School, Kolding.

in bio media from the Nordic and Baltic region, Germany and Switzerland to participate in workshops, discussions and research presentations about FOOD+ [material practices]. The symposium included workshops and presentations on bioplastic and hyper-compostable cutlery, biotextiles and microplastics. The symposium was our opportunity to test our most recent instruction sets, understand in more depth how others engage with bioplastics, and to observe and improve the way we communicate such practices. The instruction sets we prepared for this workshop consisted of a series of clearly articulated, short steps with explanations to reassure novices that they are doing the right thing. The overall design was minimalistic and had a fun recipe look. The workshop began with a short presentation of outcomes, then participants were invited to make their own bioplastic and hyper-compostable cutlery using our instruction sets (Figure 6b.). People chose an instruction set to work with. They could choose between gelatin-based bioplastic, starch-based bioplastic and edible cutlery made from pie crust or pizza dough. Working in pairs, they then began analyzing the instructions and reflect on what the product should look and taste like. As facilitators, we observed how the different experiments unfolded and engaged directly with the participants by giving advice or assisting them with parts of the process as needed. The starting point of our workshop was cutlery, yet, we also observed other interesting practices such as:

- using Bioplastics as repair material for a broken glass vase
- Creating jewelry from bioplastic elements
- Casting bioplastic tubes for use as weaving threads

We also observed other practices such as:

Figure 8. Bioplastic kintsugi. Photo: First Name Surname [ANON. FOR STAGE 2 SUBMISSION]. Recreating the ancient art of kintsugi - repairing broken pottery with gold.

- imbedding herbs in bioplastic cutlery to infuse dishes with flavour as they are eaten
- using centrifugal energy in an experiment to render the mixing process more uniform

Some of these approaches were modifications of techniques we had used. For example, our samples included bowls with herbs and spices embedded within them (Figure 7.). The taste of the herbs infuses a soup or other soft food that is placed in the bowl. By moving the spices to the cutlery, our workshop participants made the flavour experience portable between dishes. It thus constituted an even bolder move towards playful gastronomy (Bertran and Wile, 2018) Other experiments, such as using bioplastics to create unconventional repairs (Figure 8.) and centrifugal force to hack the making process, relate to notions such as making things apart, de-construction, repair and obsolescence, foregrounding material literacy, playful hacking


FOOD
FOR
THOUGHT

a.

b.


STARCH
BIOPLASTIC
INGREDIENTS
INSTRUCTIONS
OPTIONAL
EDIBLE
CUTLERY
INGREDIENTS
80 ml water
60 g millet
20 g rice (or rice flour)
20 g wheat
INSTRUCTIONS
GELATIN
BIOPLASTIC
INGREDIENTS
120 ml cold water
24 g gelatin
6 g glycerol
INSTRUCTIONS

c.

and un-crafting. (Murer, 2018) They afford recombining, reconfiguring, and recontextualizing material relationships, in this case to food-related material practices.
Overall, the workshop raised many new perspectives on how bioplastic can be used. Based on our observations and discussions held with participants, we were able to determine what elements were missing from our instruction sets and how their design might be changed to better assist the bioplastic cooking process. For example, providing greater detail about the changing properties of gelatin when it cooks, and a "warning" regarding the unpleasant smell it produces. The outcomes from this process helped us shape new instruction sets, identify what was needed for an exemplar of material samples and to construct a DIY book for undertaking DIY bioplastic preparation in the home kitchen.

The Book

The findings from this project are brought together in a book titled: Food for thought – your DIY guide for creating bioplastics (Figure 9a.). It comes together with a material sample box (Figure 9b.) and the corresponding instruction sets to prepare the introduced materials (Figure 9c.). The book has been designed, organized and presented to attract people's curiosity. The cover is made of MDF that has laser cutouts of a dish and cutlery scene, filled with lightly colored, vanilla-scented bioplastic in the style of stained glass windows. The bioplastic cutlery and tableware samples used in the research lab in the wild and workshop play an important role in the way we introduce this topic to the public. Their irregular shapes, colors and ingredients, elevate the dishes beyond the utilitarian purpose of containing or handling food. They become an artistic exploration and interpretation of cutlery and tableware.
The book discusses the problem of plastic and how we intend through the book to contribute to alternative ways to deal with this problem. It reflects on our experiences with this topic and how this experience helped us to shape the bioplastic samples and instruction sets. The design and layout of the book is carefully considered. It uses high end photography and food prepared by chefs at Design School Kolding. We invested a considerable amount of time designing the book to contrast the existing instruction sets and guides found online. We believe that if regular cookbooks can adopt a highly aesthetic look, so can a DIY bioplastic guides. In doing so, we tried to create a book that looks interesting enough for anyone to pick up and explore.

<**Figure 9a.** DIY guide on creating bioplastics.
Figure 9b. Material sample box
Figure 9c.DIY instruction sets.
Photo: First Name Surname [ANON. FOR STAGE 2 SUBMISSION].

Discussion

In this section we would like to reflect on our process and present the most frequently discussed topics during the research lab in the wild and our workshop, which we categorized in under the following three headlines:

Bioplastics are not for everyone

Our journey from working out the first bioplastic recipes to the final cast product was a constant process of trial-and-error-based learning marked with multiple moments of frustration. Over the course of this process we began to understand that the production of bioplastic design artefacts are definitely not for everyone. Many of the recipes we tested skipped important steps, neglected to mention effects such as fumes or rapid changes of consistency while boiling. They also left out information regarding material properties and color after casting. Almost all tutorials ended with the liquid raw material, making it challenging for non-experts to craft 3D shapes. These insights helped us to understand which values and principles are essential to include in a bioplastic recipe set if we wanted to provide the user with a positive first-time bioplastic-making experience. Overall, we received positive feedback for both public participation events. Nonetheless, many participants stated that they don't consider homemade bioplastics to be a functional solution for disposable cutlery. The products that we created did not solve their problems—they were imperfect. In reflecting on this outcome, we must admit that the search for solutions permeates our thinking, it sneaks up on us when we are not watchful. But we are not looking for solutions. The intention of our material exploration is to allow us and the reader to imagine alternative futures, to open up our thinking about culturally ingrained habits, to reflect upon our use of plastic and reconsider our values: "critical designs defamiliarize technologies and trends that we might otherwise take for granted creating a space for reflection and critique" (Blythe et al., 2016). Our purpose is not to dictate how to use bioplastics; it is to inform people that there are alternatives and engage them in the conversation.

Evolution of recipes

Making bioplastics is attractive for people who are concerned about the environment and seeking to be sustainable in their daily life. On the internet it is possible to find a range of DIY tutorials that propose alternative ways to look at well-known issues related to the usage of plastic. Written by different people, with different backgrounds and sets of expertise, these tutorials rarely follow the same pattern. As a consequence, our experiments were often accompanied by frustration and insecurity of what outcomes to expect. Similar to a translation from DIY tutorials to DIY recipes (Dalton et al., 2014), we transformed the format in which we received cooking instructions for bioplastics. Aiming to make hyper-compostable tableware more attractive for citizens, we added information about physical properties of bioplastics at certain transformational levels. Usually, when bioplastic is exposed to heat, water and even oxygen, it can change its smell, plasticity and material resistance. We noted these changes under the banners: 'Water Resistance', 'Temperature Resistance' and 'Material Evaporation'. We found the addition of this information to be important. It brings attention to material properties that enable the maker to critically reflect on the bioplastic-making process.

Sustainability

With good cause, some participants questioned the sustainability of our production methods. Some argued that the MDF sheets used as moulds would contradict our assurance of an environmentally friendly product. We want to emphasize here, that our aim is not the creation of fully sustainable processes or design artefacts. Instead we are trying to open our readers to new ways of thinking and creative practices they can potentially implement in their everyday life. Through these actions we hope that people might be empowered to reflect upon and perhaps slowly reduce the environmental impact of plastic use in their households. Using plastic to create alternative materials to replace plastic in the future, might appear paradoxical. The MDF we used in the casting process was an available and functional casting method that enabled us to go on with our prototyping iterations. Other concerns were directed towards the use of starch as curing agent. Corn cultivation has become a significant contributor to deforestation and climate change the world over (Karlen et al., 2012). Gelatine as a material choice also caused some insurrec-

a.

b.

Figure 10a, b. Bioplastics in use. Photo: First Name Surname [ANON. FOR STAGE 2 SUBMISSION]. Chilli flake gelatine bowl (a) and root vegetable chips on a coffee based bioplastic plate (b). Food made by Design School, Kolding.

<**Figure 11.** Bioplastics in use. Photo: First Name Surname [ANON. FOR STAGE 2 SUBMISSION]. Cold asparagus soup served in the chilli flake gelatine bowl. Food made by Design School, Kolding.

tion. Some participants claimed that, as an animal product, gelatine cannot be sustainable in any way. The use of these ingredients has been a concern for us since we started with our first experiments. We determined that, as a so-called "waste" product from the animal industry, gelatine corresponds in some way to using recycled coffee grounds or orange peel in bioplastics. Corn starch might be a big driver for pollution in our world but can potentially be cultivated with sustainable farming methods and is therefore an interesting candidate as a plastic substitute. Despite the complex problematics inherent in their use, both materials function as extraordinary hardening agents. In using them we experienced far better results than other hydrocolloids such as the algae-based agar agar powder.

Conclusion

Our aim with Food for Thought was to investigate the viability and social acceptance of DIY bioplastic tableware as an eco-friendly alternative to disposable plastic cutlery. Using research through design we were able to determine how to create and shape bioplastics using only open source techniques. The process was not straightforward. We presented our initial bioplastic prototypes to different publics, through a research lab in the wild and a workshop. We thus engaged participants in making bioplastic and were able to discuss the possibility of a sustainable future and the role that bioplastics might play within that future. We discovered some novel features that enhance the eating experience, such as the infusion of hot and liquid foods with herbs and spices. We also discovered a need to modify our aesthetic expectations, raising the question might these new materials both demand and engender a new aesthetic? We argue here that bioplastic and hyper-compostable cutlery could be viable alternatives for plastic cutlery moving forward. Indeed, commercial options are increasingly available on our supermarket shelves. People in the DIY community are already engaging with the production of bioplastics, yet there are many challenges to overcome before the general public will apply these practices at home.

Acknowledgements

References

Bertran, F.A., Wile, D., 2018. Playing with Food: reconfiguring th1e gastronomic experience through play, in: Experiencing Food: Designing Dialogues.

Blythe, M., Andersen, K., Clarke, R., Wright, P., 2016. Anti-Solutionist Strategies: Seriously Silly Design Fiction, in: Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems, CHI '16. ACM, New York, NY, USA, pp. 4968–4978.

Dalton, M.A., Desjardins, A., Wakkary, R., 2014. From DIY Tutorials to DIY Recipes, in: Proceedings of the Extended Abstracts of the 32Nd Annual ACM Conference on Human Factors in Computing Systems, CHI EA '14. ACM, New York, NY, USA, pp. 1405–1410.

Davis, C. (2017). The secrets of Bioplastic | FabTextiles. [online] Fabtextiles.org. Available at: http://fabtextiles.org/the-secrets-of-bioplastic/ [Accessed 16 Oct. 2018].

Dobbins, M., 2009. Urban design and people. Wiley, Hoboken, N.J.

Dolejsova, M., 2018. Edible Speculations in the Parlour of Food Futures, in: Extended Abstracts of the 2018 CHI Conference on Human Factors in Computing Systems, CHI EA '18. ACM, New York, NY, USA, p. alt13:1–alt13:10.

Emadian, S.M., Onay, T.T., Demirel, B., 2017. Waste Manag 59, 526–536.

Gobble, M.M. & Euchner, J. 2013, "The rise of the user-manufacturer", Research Technology Management, vol. 56, no. 3, pp. 64-67.

Global Bioplastic Market Forecast to 2020 2016, , PR Newswire Association LLC, New York.

Hemphill, D., Leskowitz, S., 2012. Adult Education Quarterly 63, 57–77.

Instructables.com. (2018). DIY Bio-plastics. [online] Available at: https://www.instructables.com/id/DIY-Bio-plastics/ [Accessed 16 Oct. 2018].

Instructables.com. (2018). Make Your Own Bioplastics!. [online] Available at: https://www.instructables.com/id/Make-Your-Own-Bioplastics/ [Accessed 16 Oct. 2018].

Karlen, D.L., Archer, D., Liska, A., Meyer, S., 2012. 12.

Kuznetsov, S., Paulos, E., 2010. Rise of the Expert Amateur: DIY Projects, Communities, and Cultures, in: Proceedings of the 6th Nordic Conference on Human-Computer Interaction: Extending Boundaries, NordiCHI '10. ACM, New York, NY, USA, pp. 295–304.

Murer, M., 2018. Making Things Apart: Gaining Material Understanding, in: Proceedings of the 2018 Designing Interactive Systems Conference, DIS '18. ACM, New York, NY, USA, pp. 497–509.

Nascimento, S., Pólvora, A., 2018. Science and Engineering Ethics 24, 927–946.

Wagner, M., Engwall, M., Hollert, H., 2014. Environmental Sciences Europe 26, 16.

Watson, M. & Shove, E. 2008, "Product, Competence, Project and Practice: DIY and the dynamics of craft consumption", Journal of Consumer Culture, vol. 8, no. 1, pp. 69-89.

wikiHow. (2018). How to Make Bioplastic. [online] Available at: https://www.wikihow.com/Make-Bioplastic [Accessed 16 Oct. 2018].

Wilde D. 2015, "Embodying Material Ideation. In: Participatory Innovation Conference, The Hague, The Netherlands", pp. 386–397.

Wilde, D., n.d. FOOD+[material practices] Nordic Baltic Biomedia Network Symposium.

Wilde, D., Underwood, J., 2018. Informatics 5.

Figure 12. Experimental composition. Photo: First Name Surname [ANON. FOR STAGE 2 SUBMISSION]. Minimalistic and aesthetic visualization of bioplastics.