

# THE PANDEMIC COOKBOOK

a guide to material autonomy during global crises

Manuel Kretzer

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Fundamentals in Materials and Technology in Design 2020/21  
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The Chinese use two brush strokes to write the word 'crisis.' One brush stroke stands for danger; the other for opportunity.

In a crisis, be aware of the danger  
- but recognize the opportunity.

John F. Kennedy,  
Indianapolis on April 12, 1959

# INTRODUCTION

## VIRAL PNEUMONIA

Two days after Christmas eve 2019, on December 26, an elderly couple and their son arrived at the Hubei Provincial Hospital of Integrated Chinese and Western Medicine complaining about unusually high temperature, coughing and tiredness. Zhang Jixian, director of the hospital's respiratory and critical care medicine department, performed the initial diagnosis and concluded with something that "looked like flu or common pneumonia." However, after taking a closer look at their CT scans, the 54-year-old doctor found patterns that were very different from the earlier guess. Zhang's involvement during the 2003 SARS outbreak, when she worked as a medical specialist examining patients in Wuhan, had made her sensitive to early signs of an epidemic, especially after she discovered the same abnormal features during a CT scan of the couple's son. Her intuition was further confirmed, when during the following day a merchant from the Huanan Seafood Wholesale Market came to the hospital with fever and cough, displaying the same characteristics in his CT scan. When all blood tests from the four patients indicated viral infection, Zhang Jixian informed her superiors and set up a provisional quarantine area.<sup>1</sup> Five days later, on December 31, the World Health Organization (WHO) Country Office in the People's Republic of China discovered a media statement on the website of Wuhan Municipal Health Commission officially affirming cases of 'viral pneumonia'. By then 27 cases were confirmed, but the virus had already begun its spread far beyond the city's periphery.

## A GLOBAL DISEASE

The first infection on American soil was reported on January 20, 2020 by a man in his 30s, who had travelled from Wuhan five days earlier.<sup>2</sup> On January 24, France confirmed the first three cases in the WHO European region, all of whom had also arrived from Wuhan.<sup>3</sup> By the end of the month many more countries including, Russia, Italy, the UK, India etc. reported similar occurrences and international borders began to be closed. On February 11, the death toll for the corona-virus surpassed 1,000 people and the WHO hosted the first of a two-day global research and innovation symposium on the issue. One month later, with now over 5,000 related deaths worldwide, they officially declared that the COVID-19 outbreak "can be characterized as a pandemic," which is defined as global spread of a new disease for which most people do not have immunity.<sup>4</sup> On April 3, the Johns Hopkins University stated that the corona death toll had by now risen to 58,773 people and there were at least 1,094,068 confirmed cases.<sup>5</sup> On May 11, there were over 5 million infected, 10 million by June 28, and on October 9, more than 43 million global cases with 1,155,473 related deaths.<sup>6</sup> As of writing this article, during the peak of the Omicron variant in Europe in February 2022, the international death toll has reached almost 6 million people, which is more than the entire population of Denmark.

2 Holshue, M. L., Al., E., for the Washington State 2019-nCoV Case Investigation Team\*, Author Affiliations From the Epidemic Intelligence Service (M.L.H.), Others, Y. D. and, Others, V. M. and, Others, G. F. and, Others, R. P. and, Others, D. M. and, & R. L. Atmar and Others. (2020, May 7). First case of 2019 novel coronavirus in the United States: Nejm. New England Journal of Medicine. Retrieved February 3, 2022, from <https://www.nejm.org/doi/full/10.1056/NEJMoa2001191>

3 World Health Organization. (n.d.). Listings of who's response to covid-19. World Health Organization. Retrieved February 3, 2022, from <https://www.who.int/news/item/29-06-2020-covidtimeline>

4 "Coronavirus confirmed as pandemic". BBC News. 11 March 2020. Retrieved 11 March 2020, from <https://www.bbc.com/news/world-51839944>

5 Rawlinson, Kevin (4 April 2020). "Coronavirus latest: 3 April, at a glance". The Guardian. Archived from the original on 4 April 2020. Retrieved 5 April 2020, from <https://www.theguardian.com/world/2020/apr/03/coronavirus-latest-at-a-glance-friday>

6 Updated: Timeline of the coronavirus: Think global health. Council on Foreign Relations. (n.d.). Retrieved February 3, 2022, from <https://www.thinkglobalhealth.org/article/updated-timeline-coronavirus>

1 Xinhua Headlines: Chinese doctor recalls first encounter with mysterious virus. Xinhua. (n.d.). Retrieved February 3, 2022, from [http://www.xinhuanet.com/english/2020-04/16/c\\_138982435.htm](http://www.xinhuanet.com/english/2020-04/16/c_138982435.htm)

## FLATTEN THE CURVE

With many countries' health systems and hospitals struggling to cope with the numbers of patients, various strategies to "flatten the curve" were soon implemented. Social distancing, wearing protective face masks, increased hygienic care, the avoidance of gatherings and larger groups, staying at home and even lock-downs quickly became the new norm. Bars, clubs, hotels, museums, restaurants, cinemas, theatres, pools, gyms, saunas, and any other socially and culturally relevant institutions, even schools and universities, remained closed and much was switched to online and digital domains. While the majority of citizen complied and still complies to the rules and - even after triple vaccination - understands the importance of solidarity and mutual care, it remains unclear what the larger, longer lasting effects of the pandemic will be. Whereas social distancing and lock-downs worked initially to isolate and reduce infections, those actions also caused a severe financial downturn, paralysing the economy's ability to produce and offer goods and services. For the first half of 2020 Germany's economic output fell by 10.1% with a public deficit of €51.6 billion.<sup>7</sup> At the same time more than 600,000 people lost their jobs due to Corona related measures.<sup>8</sup> In the United States over 40 million Americans filed for unemployment and the country's economy shrank at a 32.9% annual rate between April and June 2020, marking the deepest decline since the government began keeping records in 1947.<sup>9</sup> Globally, according to the Asian Development Bank (ADB), the pandemic could cost between \$5.8tn and \$8.8tn, which is almost double Germany's annual gross domestic product.<sup>10</sup> Although it might never become completely clear how much the pandemic has affected the world financially, it remains hard to understand why sanctions to prevent similar future events are still underrated.

Les Kaufman, professor of biology at Boston University, proposes to invest heavily in pandemic prevention measures such as intensifying wildlife trade monitoring programs, increasing efforts to end the wild meat trade in China, raising policies to reduce deforestation by 40%, and fighting the spread of diseases from wild animals to livestock. In total such actions would cost between \$22.2 and \$30.7 billion each year, which is 500 times less than what was being spent on the pandemic in 2020.<sup>11</sup>

However the pandemic not only has financial and economic effects. Other, maybe even more disturbing realisations are a vast increase in domestic violence,<sup>12</sup> and the realization that ethnic minorities, with inferior medical support, limited healthcare, less access to public spaces and greenery, and difficulties in using technology for remote work and education, are besides being at a greater risk from the virus<sup>13</sup> also extremely underprivileged in dealing with its consequences.<sup>14</sup> The present situation thus not only reminds us how fragile our way of living is or how vulnerable our global systems are, but also how social inequality and not climate change or the current pandemic might be the biggest challenges of our time.

## A NEW TYPE OF COMMERCE

Despite millions of people dying, struggling and fighting for their very existence Amazon founder Jeff Bezos successfully increased his wealth by an estimated \$48 billion between March and June 2020. The founder of the video-conferencing system Zoom grew his fortune by over \$2.5 billion, former Microsoft CEO Steve Ballmer's net worth grew by \$15.7 billion, and Elon Musk saw a raise of \$17.2 billion.<sup>15</sup>

7 Germany sees record GDP decline amid coronavirus spending. The Local Germany. (2020, August 25). Retrieved February 3, 2022, from <https://www.thelocal.de/20200825/germany-sees-record-gdp-decline-amid-coronavirus-spending>

8 Hagelüken, A. (2020, July 2). Corona-Krise KOSTET 600 000 jobs. Süddeutsche.de. Retrieved February 3, 2022, from <https://www.sueddeutsche.de/politik/arbeitslosigkeit-corona-krise-kostet-600-000-jobs-1.4954212>

9 BBC. (2020, July 30). Coronavirus: US economy sees sharpest contraction in decades. BBC News. Retrieved February 3, 2022, from <https://www.bbc.com/news/business-53574953>

10 BBC. (2020, May 15). Coronavirus 'could cost global economy \$8.8TN' says ADB. BBC News. Retrieved February 3, 2022, from <https://www.bbc.com/news/business-52671992>

11 Jeremy Schwab. (n.d.). Fighting covid-19 could cost 500 times as much as pandemic prevention measures. World Economic Forum. Retrieved February 3, 2022, from <https://www.weforum.org/agenda/2020/08/pandemic-fight-costs-500x-more-than-preventing-one-future/>

12 Germany sees record GDP decline amid coronavirus spending. The Local Germany. (2020, August 25). Retrieved February 3, 2022, from <https://www.thelocal.de/20200825/germany-sees-record-gdp-decline-amid-coronavirus-spending>

13 Collinson, A. (2020, August 5). Coronavirus: Ethnic minorities 'over-exposed' to covid-19. BBC News. Retrieved February 3, 2022, from <https://www.bbc.com/news/health-53651954>

14 Joe Myers, W. (n.d.). 5 things covid-19 has taught us about inequality. World Economic Forum. Retrieved February 3, 2022, from <https://www.weforum.org/agenda/2020/08/5-things-covid-19-has-taught-us-about-inequality/>

15 Woods, H. (2020, October 30). How billionaires saw their net worth increase by half a trillion dollars during the pandemic. Business Insider. Retrieved February 3, 2022, from <https://www.businessinsider.com/billionaires-net-worth-increases-coronavirus-pandemic-2020-7?r=DE&ir=T>

This is not further surprising, since with societies confined to their homes and their only connection to the rest of the world being the Internet, a different, a new type of consumer culture has emerged. However, it's not only an increase in online shopping and e-commerce that can be perceived,<sup>16</sup> but also a rising awareness of personal behaviour and resulting consequences. With the uncertainty about how much longer the crisis will last or when or if at all the world will return to "normal" remaining one of the most pressing questions, people are beginning to realize that it's the cumulative effect of their individual actions, decisions and choices that leads to vast global change; change that can be felt. During summer 2021 California was ravaged by wildfires, Louisiana hit by several tropical storms, Australia fought for months against bush-fires, earthquakes shook Mexico, there was severe flooding in the UK, volcanic eruptions on the Philippines and devastating thunderstorms in Italy. It seems that finally people are seeing and understanding the inextricable linkage between the production and consumption of goods and services and the resulting change in global climate, and slowly begin adapting their behaviour.

Research from IRI and the NYU Stern Center for Sustainable Business shows that during the first half of 2020 products carrying a sustainability claim have increased to a 17% market share and sustainability-marketed products saw a 56% rise in sales.<sup>17</sup> Another recent study, entitled "Consumer Products and Retail: How sustainability is fundamentally changing consumer preferences," explains that COVID-19 has increased consumer awareness and commitment to buying sustainably, with 67% saying that they will be more cautious about the scarcity of natural resources due to the crisis, while 65% say that they will be more mindful about the impact of their overall consumption.<sup>18</sup>

But is a change or shift in consumer behaviour all that needs to be done? Climate and youth activist Greta Thunberg's opinion is clear: "You cannot mass produce [...] or consume 'sustainably' as the world is shaped today. That is one of the many reasons why we will need a system change."<sup>19</sup>

16 E-commerce in the time of covid-19. OECD. (2020, October 7). Retrieved February 3, 2022, from <http://www.oecd.org/coronavirus/policy-responses/e-commerce-in-the-time-of-covid-19-3a2b78e8/>

17 Danley, S. (2020, July 23). Sustainability is surviving covid-19, Iri says. Food Business News RSS. Retrieved February 3, 2022, from <https://www.foodbusinessnews.net/articles/16480-sustainability-is-surviving-covid-19-iri-says>

18 It's not just coronavirus, consumers are changing purchase preferences based on social responsibility, inclusiveness, or environmental impact. InternetRetailing. (n.d.). Retrieved February 3, 2022, from <https://internetretailing.net/sustainability/sustainability/its-not-just-coronavirus-consumers-are-changing-purchase-preferences-based-on-social-responsibility-inclusiveness-or-environmental-impact-21676>

19 Guardian News and Media. (2021, August 10). Greta Thunberg: Ethical fast fashion is 'pure greenwashing'. The Guardian. Retrieved February 3, 2022, from <https://www.theguardian.com/fashion/2021/aug/10/greta-thunberg-ethical-fast-fashion-greenwashing>

## SYSTEM CHANGE

Changing a (social) system that works in favor of those who could make a change is almost impossible since it implies a considerable amount of discomfort.

But, when the richest 1% on the planet possess half of the world's wealth,<sup>20</sup> while the poorest half own only 2%,<sup>21</sup> how can we believe in political systems that promote ideals like democracy and equality?

When Amazon manages to generate a sales revenue of €44bn in Europe in 2020 but does not pay any corporation tax,<sup>22</sup> while the average worker has to deduct almost half of their annual income, how can we trust in financial systems that prioritise economic growth over individual independence?

When countries decide to spend billions on building fences and reinforcing borders to prevent people who have left everything behind for an uncertain future because their present has become unbearable,<sup>23</sup> how can we assume we have sufficient humanitarian systems in place?

And when during a global disease - that has long-lasting, incurable effects on whole generations - the world's tiny elite of 2,755 billionaires sees its wealth increase more than they have in the last fourteen years combined,<sup>24</sup> how can it be that we gather on the streets, complaining violently against our health system, instead of understanding how extremely privileged Western countries are in terms of access to vaccination and other related issues?<sup>25</sup>

20 Guardian News and Media. (2017, November 14). Richest 1% own half the world's wealth, study finds. The Guardian. Retrieved February 4, 2022, from <https://www.theguardian.com/inequality/2017/nov/14/worlds-richest-wealth-credit-suisse>

21 Joe Myers, W. (n.d.). These charts show the growing gap between the world's richest and poorest. World Economic Forum. Retrieved February 4, 2022, from <https://www.weforum.org/agenda/2021/12/global-income-inequality-gap-report-rich-poor/>

22 Guardian News and Media. (2021, May 4). Amazon had sales income of €44bn in Europe in 2020 but paid no corporation tax. The Guardian. Retrieved February 4, 2022, from <https://www.theguardian.com/technology/2021/may/04/amazon-sales-income-europe-corporation-tax-luxembourg>

23 Poland starts construction of €350 million border fence with Belarus. euronews. (2022, January 26). Retrieved February 4, 2022, from <https://www.euronews.com/2022/01/26/poland-starts-construction-of-350-million-border-fence-with-belarus>

24 A deadly virus: 5 shocking facts about global extreme inequality. Oxfam International. (2022, January 17). Retrieved February 4, 2022, from <https://www.oxfam.org/en/5-shocking-facts-about-extreme-global-inequality-and-how-even-it>

25 'vaccine apartheid' shows white privilege is woven into globalisation. South China Morning Post. (2021, March 13). Retrieved February 6, 2022, from <https://www.scmp.com/week-asia/opinion/article/3125085/vaccine-apartheid-how-white-privilege-woven-fabric-globalisation>

## NEW BEGINNINGS

All the above are most certainly not signs of a healthy society, but instead the result of a dangerous and violent economic system, or as Thomas Jefferson once put it: "Experience demands that man is the only animal which devours his own kind, for I can apply no milder term to the general prey of the rich on the poor."

Shockingly the current situation, which threatens and influences every single person on the planet, furthers this development instead of urging humanity to consolidate and unite towards a common solution. Much faster than the virus made its way across the globe xenophobia and anti-Chinese sentiment emerged and spread.<sup>26</sup> Alongside with increased reports of hate crimes against Asians and other ethnical minorities, the eeriness of the situation can also be witnessed in rising generational tensions. Millennials have dubbed the virus as the "#BoomerRemover," whereas the older generation blames the younger for their Corona Parties and their self-centrism.<sup>27</sup> Certainly all of these reactions are to some extent simply human and can be explained rationally through a fear of death, change and uncertainty, as James L. Knoll describes in his article "Panic and Pandemics: The Return of the Absurd."<sup>28</sup> But why remains the search for whom to blame so much more pressing and present than the search for a joint solution? And why is it so difficult to see that all that is unknown and uncertain, all that changes and evolves, and all that challenges us out of our comfort zone also represents an unprecedented opportunity, one that calls for novelty, progress and new beginnings?

26 Rich, M. (2020, January 30). As coronavirus spreads, so does Anti-Chinese sentiment. The New York Times. Retrieved February 4, 2022, from <https://www.nytimes.com/2020/01/30/world/asia/coronavirus-chinese-racism.html>

27 Bloomberg. (n.d.). Bloomberg.com. Retrieved February 4, 2022, from <https://www.bloomberg.com/news/articles/2020-03-21/covid-19-divides-u-s-society-by-race-class-and-age>

28 Panic and pandemics: The return of the absurd. Psychiatric Times. (n.d.). Retrieved February 4, 2022, from <https://www.psychiatrictimes.com/view/panic-and-pandemics-return-absurd>

## JUST DO IT (YOURSELF)

The present publication is an attempt to make sense of what has happened to education and in particular the Materials and Technology Basics class taught at the Dessau Department of Design during the first two semesters of the pandemic in 2020/21. The focus of these experiments was not only on developing strategies on how physical, material-based teaching can work remotely and online but even more so on motivating students to explore and create materials, processes and results independent and autark from pre-determined structures and systems.

Doing it yourself is in this context understood as both a critique of the dominant mode of passive consumer culture but also as a liberating force for the development of alternative and independent solutions, since DiY is much more than simply a focus on making. DiY is an attitude, a belief and a way of action that instead of complaining about the present, wants to actively and willingly engage in creation or as Amy Spencer explains: "The DiY movement is about using anything you can get your hands on to shape your own cultural identity, your own version of whatever you think is missing in mainstream culture."<sup>29</sup>

The cover and title of this publication are inspired by William Powell's Anarchist Cookbook (1971), a book that was released as a protest against the state, society and especially the war in Vietnam. Even though its contents are rather radical and on the borderline of legality, the provision of access to knowledge and information, that is often exclusive to private companies or state systems, is also at the heart of many other seminal publications of the time. Steve Baer's Dome Cookbook (1967) provides comprehensive, hand drawn instructions for the creation of a variety of domes in different shapes, sizes, and forms. Ant Farms' Inflatocookbook (1971) is a collection of the group's experience in designing, building, and erecting inflatable structures for different contexts. And the Whole Earth Catalogue (1968 - 1998) is a comprehensive collection of product reviews, instructions and details on where to get access to information, basically "the internet before the internet."<sup>30</sup>

The Pandemic Cookbook follows along these lines but also hopes to create a more opportunistic view on the current situation and instead of simply waiting for it to be over, motivate active engagement or as Richard Buckminster Fuller once said: "You never change things by fighting the existing reality. To change something, build a new model that makes the existing model obsolete."

Manuel Kretzer, February 2022

29 Spencer, A. (2015). DiY: The rise of lo-fi culture. Marion Boyars.

30 Guardian News and Media. (2013, May 4). Stewart Brand and the Whole Earth Catalog, The book that changed the world. The Guardian. Retrieved February 4, 2022, from <https://www.theguardian.com/books/2013/may/05/stewart-brand-whole-earth-catalog>



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# A BACKWARDS CORONA FORECAST

## OR HOW WE WILL BE SURPRISED WHEN THE CRISIS IS “OVER”

At the moment I am often asked when Corona “will be over” and when everything will return to normal. My answer is: never. There are historical moments when the future changes direction. We call them bifurcations. Or deep crises. These times are now. The world as we know it is dissolving. But behind it comes a new world, the formation of which we can at least imagine. For this I would like to offer you an exercise with which we have had good experiences in vision processes at companies. We call it the RE-gnosis. In contrast to the PRO-gnosis, we do not look “into the future” with this technique. But from the future BACK to today.

Sounds crazy? Let's try it:

## THE RE-GNOSIS: OUR WORLD IN AUTUMN 2020

Let's imagine a situation in autumn, let's say in September 2020. We are sitting in a street cafe in a big city. It is warm and people are walking down the pavements again.

Do they move differently? Is everything the same as before? Does the wine, the cocktail, the coffee taste like it used to? Like it did before Corona?

Or even better?

Looking back, what will we be surprised about?

We will be surprised that our social distancing rarely led to a feeling of isolation. On the contrary, after an initial paralysing shock, many of us were relieved that the constant racing, talking, communicating on a multitude of channels suddenly came to a halt. Distancing does not necessarily mean loss, but can open up new possibilities. Some have already experienced this, for example trying interval fasting — and suddenly enjoyed food again. Paradoxically, the physical distance that the virus forced upon us also created new closeness.

We met people who we would never have met otherwise. We contacted old friends more often, strengthened ties that had become loose. Families, neighbours, friends, have become closer and sometimes even solved hidden conflicts.

The social courtesy that we previously increasingly missed, increased.

Now in autumn 2020 there is a completely different mood at football games than in spring when there was a lot of mass rage. We wonder why that is.

We will be amazed at how quickly digital cultural techniques have suddenly proven themselves in practice. Teleconferencing and video conferencing, which most colleagues had always resisted (the business class flight was better), turned out to be quite practical and productive. Teachers learned a lot about internet teaching. The home office became a matter of course for many — including the improvisation and time juggling that goes with it.

At the same time, apparently outdated cultural techniques experienced a renaissance. Suddenly you got not only the answering machine when you called, but real people. The virus spawned a new culture of long phone calls without people juggling a second screen. The “messages” themselves suddenly took on a new meaning. You really communicated again. Nobody was kept waiting anymore. Nobody was stalled. This created a new culture of accessibility, of commitment.

People who never came to rest due to the hectic rush, including YOUNG people, suddenly went for long walks (an activity formerly unknown to them). Reading books suddenly became a cult.

Reality shows suddenly seemed awkward and the whole trivia trash, the garbage for the soul that flowed through all channels seemed ridiculous. No, it didn't completely disappear. But it was rapidly losing value.

Can anyone remember the political correctness debate? The infinite number of cultural wars? What, we will ask ourselves, was that all about? Crises work primarily by dissolving old phenomena, making them superfluous ...

Cynicism, a casual way of devaluing the world, was suddenly out.

The exaggeration and culture of fear and hysteria in the media was limited after a short first outbreak.

In addition, the infinite flood of cruel crime series reached its tipping point.

We will be surprised that drugs were developed in the summer that increased the survival rate. This lowered the death rate and made Corona a virus that we have to deal with — much like the flu and many other diseases. Medical progress helped. But we also learned that it was not so much technology, but a crucial change in social behaviour. The decisive factor was that people could have solidarity and be constructive despite radical restrictions. Human-social intelligence has helped. The much-vaunted artificial intelligence, which promised

to solve everything, has only had a limited effect on Corona. This has shifted the relationship between technology and culture. Before the crisis, technology seemed to be the panacea, the bearer of all utopias. No one — or only a few hard-boiled people — still believe in the great digital redemption today. The big technology hype is over. We are again turning our attention to the humane questions: What is mankind? What do we mean to each other?

We are astonished to see how much humour and humanity actually emerged in the days of the virus.

We will be amazed at how far the economy could shrink without collapsing, something which was predicted during every pre-corona tax increase and every government intervention. Although there was a “black April”, a deep economic downturn and a 50 percent drop in the stock market, although many companies went bankrupt, shrank or mutated into something completely different, it never came to zero. As if the economy was a breathing being that can also nap or sleep and even dream.

Today in the Autumn, there is a global economy again. But global just-in-time production, with huge branched value chains, in which millions of individual parts are carted across the planet, is now in trouble. It is currently being dismantled and reconfigured. Interim storage facilities, depots and reserves are growing again everywhere in production and service facilities. Local production is booming, networks are being localised, and crafts are experiencing a renaissance. The global system is drifting towards GLOCALisation: the localisation of the global.

We will be surprised that even the loss of assets due to the stock market crash does not hurt as much as it felt in the beginning. In the new world, wealth suddenly no longer plays the decisive role. Good neighbours and a blossoming vegetable garden are more important. Could it be that the virus has changed our lives in a direction that we wanted to change anyway?

## RE-GNOSIS: COPING WITH THE PRESENT THROUGH A LEAP INTO THE FUTURE.

Why does this kind of “from the future scenario” seem so irritatingly different from a classic forecast? This is related to the specific properties of our sense of the future. When we look “into the future”, we typically only see the dangers and problems coming towards us that pile up onto insurmountable barriers. Like a locomotive coming out of the tunnel that runs over us. This fear barrier separates us from the future. That’s why horror futures are always the easiest to depict.

RE-gnosis, on the other hand, form a loop of knowledge in which we include ourselves and our inner change in the future. We connect internally with the future, and this creates a bridge between today and tomorrow. A form of “Future Mind” is created.

If you do it right, something like future intelligence is created. We are able to anticipate not only the external “events”, but also the internal adaptations with which we react to a changed world.

That feels very different from a forecast that always has something dead, sterile in its anticipatory character. We leave the stiffness of fear and return to the vitality that belongs to every true future.

We all know the feeling of successfully overcoming fear. When we go to the dentist for treatment, we are worried a long time in advance. We lose control on the dentist’s chair and it hurts before it hurts. In anticipating this feeling, we bathe ourselves in fears that can completely overwhelm us. Once we have survived the treatment, there is a feeling of coping: the world looks young and fresh again, and we are suddenly full of drive.

Neuro-biologically, fear adrenaline is replaced by dopamine, a type of endogenous drug of the future. While adrenaline leads us to flee or fight (which is not really productive in the dentist’s chair, and just as useless in the fight against corona), dopamine opens our brain synapses: we are excited about what is to come, curious, foresighted. When we have a healthy dopamine level, we make plans, we have visions that lead us to the forward-looking action.

Surprisingly, many experience exactly this in the Corona crisis. A massive loss of control suddenly turns into a veritable intoxication of the positive. After a period of bewilderment and fear, an inner strength arises. The world “ends”, but with the experience that we are still there, a kind of new being arises from inside us. In the middle of civilisation’s shutdown, we run through forests or parks, or across almost empty spaces. This is not an apocalypse, but a new beginning. This is how it turns out: Change begins as a changed pattern of expectations, perceptions and world connections. Sometimes it is precisely the break with routines, the familiar, that releases our sense of the future again. The idea and certainty that everything could be completely different — and even better.

We may even be surprised that Trump will be voted out of office in November. The AfD [a right-wing to far-right political party in Germany] is losing popularity and attention because a malicious, divisive policy does not fit into a Corona world. The Corona crisis made it clear that those who want to incite people against each other have nothing to contribute to real questions about the future. When things get serious, the destructiveness that lives in populism becomes clear. nPolitics — in its original sense as the formation of social responsibilities — received new credibility through this crisis, a new legitimacy. Precisely because it had to act in an “authoritarian” manner, politics created trust in society.

Science also experienced an astonishing renaissance in the crisis. Virologists and epidemiologists became media stars, but also “futuristic” philosophers, sociologists, psychologists, anthropologists, who were previously left on the sidelines of polarised debates, regained their voice and value. Fake news, however, rapidly lost market value. Conspiracy theories also suddenly looked ridiculous.

## A VIRUS AS AN ACCELERATOR OF EVOLUTION

Deep crises also point to another basic principle of change: the trend-countertrend synthesis.

The new world after Corona — or better with Corona — arises from the disruption of the megatrend CONNECTIVITY. Politically and economically this phenomenon is also called “globalisation”. The interruption of connectivity — through border closings, separations, seclusions, quarantines — does not lead to the abolition of the connections. But it enables the reorganisation of the things that hold our world together and carry it into the future. There is a phase jump in socio-economic systems.

The world to come will appreciate distance again — and this will make connectedness more qualitative. Autonomy and dependency, opening and closing are rebalanced. This can make the world more complex, but also more stable. This transformation is largely a blind evolutionary process — because one fails, the new, the viable, prevails. This makes you dizzy at first, but then it shows its inner meaning: and what connects the paradoxes on a new level is sustainable.

This process of complexation — not to be confused with COMPLICATION — can also be consciously designed by people. Those who can, who speak the language of the coming complexity, will be the leaders of tomorrow. The hope-bearers. The up and coming Gretas.

*“Through Corona we will adapt our entire attitude towards life — in the sense of our existence as living beings in the midst of other forms of life.”*

Slavo Zizek at the height of the corona crisis in mid-March.

Every deep crisis leaves a story, a narrative that points far into the future. One of the strongest images left by the corona virus are of the Italians making music on the balconies. The second image was sent to us by satellite images that suddenly showed the industrial areas of China and Italy free of smog. In 2020, human CO2 emissions will drop for the first time. That very fact will do something to us.

If the virus can do that, then can we possibly do it? Maybe the virus was just a messenger from the future. The drastic message is: Human civilisation has become too dense, too fast, and overheated. It is racing too fast in a direction in which there is no future. But it can reinvent itself.

Cool down.  
System reset.  
Music on the balconies!

This is how the future works.

# GUERRILLA MATERIALS

## INTRO

The current situation of the worldwide COVID-19 pandemic forces us to stay inside, reduce our social contacts and avoid public gatherings. While this means an unprecedented and disturbing constraint to our personal freedom and independence it might also present an opportunity to reconsider some of the things we are so accustomed with and question their necessity or greater value. In their article “[DIY materials](#)”, published in The Journal of Materials and Design, Valentina Rognolia et al. highlight the potential of self-made materials both in respect to increased personalization of products and distributed and shared production processes.

*DIY materials are created through individual or collective selfproduction practices, often by techniques and processes of the designer's own invention. They can either be totally new materials or modified or further developed versions of existing materials. The development of this new trend in the sphere of materials and design has in part been enabled by the democratization of personal fabrication technologies, in parallel to a rising desire amongst individuals to have personalized products. DIY materials offer great opportunities to positively contribute to product design through material experimentation as well as distributed and shared production processes.<sup>1</sup>*

Self-making and Do-It-Yourself thus not only allows us to customize and individualize the expected result but also marks an alternative to modern consumer culture through a more sustainable handling of resources compared for example to dumping-price products that are ordered online and then shipped half around the globe to arrive a few days later in our living room.

## TASK

In this course students were asked to explore the possibilities, advantages and limitations of DIY material making in a private environment. Following the trends of guerrilla marketing, guerrilla gardening or guerrilla film-making, which are generally characterized by non-traditional methods, relatively low budgets, quick actions, ad-hoc decisions and constant improvisation the focus was on developing fast and simple material solutions as an alternative to commercial products.

Each student researched their own “Guerrilla Material”, developed corresponding recipes and instructions for self-making, experimented with ingredients, substances and production techniques and eventually produced an illustrated and easy-to-follow step-by-step tutorial akin to a common cooking recipe.

<sup>1</sup> Rognoli, V., Bianchini, M., Maffei, S., Karana, E. (2015). DIY Materials. The Journal of Materials and Design, 86: 692-702.

# ORGANIC SOAP

MANUEL KRETZER

## FACTS

Duration: 50min  
Difficulty: medium  
Cost: 10€



## DESCRIPTION

Organic soap has a number of advantages including the relief of irritated skin, many times improving psoriasis and eczema. Commercially produced soap contains numerous chemical additives and harmful detergents that not only leave the skin overly cleansed and dry but also have a bad impact on the environment including carbon footprint, ecotoxicity, ozone depletion potential, and eutrophication potential.

## MATERIALS AND TOOLS

- 65g sodium hydroxide or lye in crystal form
- 175g olive oil
- 125g canola oil
- 75g shea butter
- 125g coconut oil
- 166ml water
- mold
- hot plate
- scale
- pots
- blender
- measuring cups
- gloves
- masks



## LYE

Put on gloves, mask and – if available – eye protection. Always be very careful when using lye. Measure the required amount of lye in a cup or glass. Add the necessary amount of water into a stainless steel pot. Then slowly add the lye into the water while continuously stirring. When mixing lye with water it will heat up and fume for about 30 – 60 seconds. It may cause a choking sensation in your throat, which however will go away after a few minutes. Always add lye to water (not water to lye), and start stirring right away. Lean back while you stir to avoid the fumes. When the solution begins to clear, you can allow it to sit while you continue with the next step.



## HARD OILS

Add the required amount of coconut oil into a glass beaker or similar and heat on a stove until it becomes liquid. Then pour it into another stainless steel pot. Repeat the same procedure for your shea butter and add it to the molten coconut oil.





## SOFT OILS

Measure the correct amounts of the remaining oils and also add them to the mixture.



## BLENDING

Finally add the liquid lye. To be more precise you might want to use a thermometer to check for the right temperatures, which should be about 120° C. Wait for both the lye and the oil mixture to cool somewhere between 95° and 105° C, then slowly add the lye to the oils, stirring until it's all mixed. Stir either by hand for a full 5 minutes or use a blender. The soap mixture will lighten in color and become thick. When it looks like vanilla pudding it's at "trace" and you're ready to go. This is the part where you might want to add certain colours or flavours to your soap.



## CURING

After about 24 hours, check if your soap is ready. If it's still warm or soft, allow it to sit another 12-24 hours. When it's cold and firm, remove it from the mould and let it dry in the open.

Allow your soap to cure for about 4 weeks. Be sure to turn it over once a week to expose all the sides to air. Once your soap is fully cured, wrap it in wax paper or keep it in an airtight container.



# BEESWAX GLUE

DENISE MOSER

## FACTS

Duration: 15min  
 Difficulty: simple  
 Cost: 15€



## DESCRIPTION

Glueing is one of the oldest and most important cultural techniques of mankind. Already during the Stone Age people used sticky materials, such as the resin of birch trees, to make weapons and tools. However, in addition to their poor resistance to heat and cold, the adhesives of that time were also an ideal breeding ground for bacteria and fungi, which made them a critical health hazard. Nowadays, synthetic resins are used to produce glues. There are many different types of adhesives that are specially adapted to their areas of application, such as wood, leather, paper, cardboard, etc.

## MATERIALS AND TOOLS

- 2 tablespoons starch
- 7 tablespoons water
- 1 tablespoon beeswax (<https://amzn.to/3e9XAcL>)
- 1 tablespoon vinegar
- container
- pot
- tablespoon
- whisk



## FIRST STEPS

First add the starch and water to the pot. Now mix this well so that no lumps are formed.



## HEAT IT UP

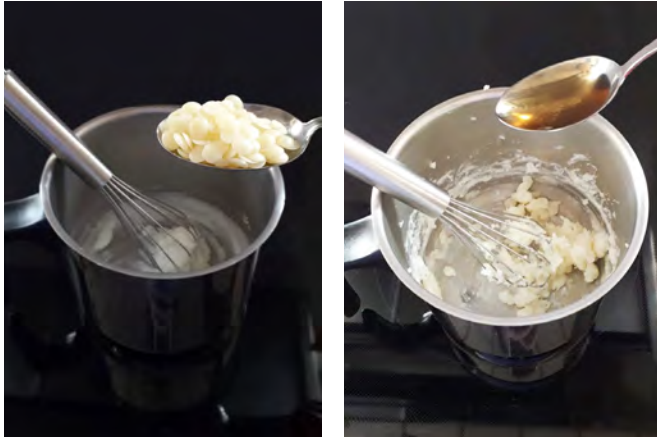
Now heat the mixture on the stove until a viscous and creamy mass is formed.





## BEESWAX

Turn down the heat and add the beeswax while stirring. Then add another teaspoon of vinegar and stir until the beeswax has melted.



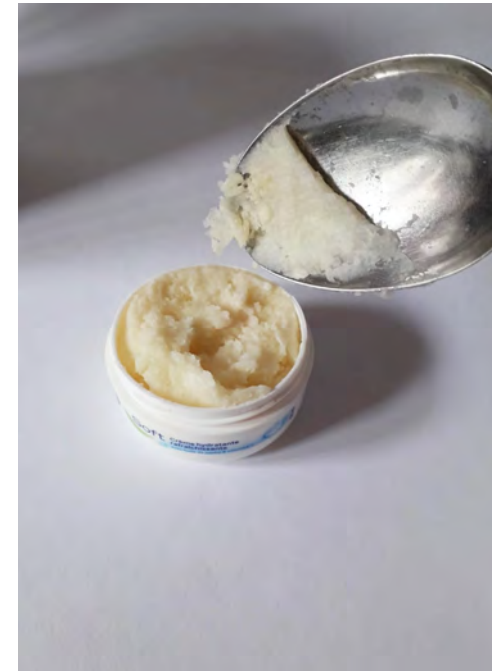
## FILL UP

Put everything into a crucible or a small can and let it cool down.



## CONCLUSION

A brush is required to apply the glue and it can be used without having to re-heat it. However, if in a hurry, the glue can also be applied by hand. Not too much glue should be applied at once, as this affects the drying process and can cause lumps. The glue has high adhesive strength and after five minutes it has hardened completely.



# UNIVERSAL PAPER

STEFANIE HUTSCHIG

## FACTS

Duration: 60min  
 Difficulty: medium  
 Cost: 23€



## DESCRIPTION

Today paper is taken for granted and indispensable in our everyday use. However, paper was once one of the most valuable materials in existence. The production of paper is a complex process that originated in ancient China. Paper was made from hemp and later from bamboo fibres, but with industrialisation and the increasing demand, the alternative raw material wood was used. Not only is the production of paper very harmful to the environment, due to the large-scale deforestation of primeval forests, but the ruthless corruption of the paper industry also allows the exploitation of regions where poverty and economic hardship are thus encouraged. It is therefore important to develop an understanding of paper as a material and resource by producing universal paper of a kind that can be used as kitchen roll paper, toilet paper and writing paper. You actually don't need hundreds of different kind of papers.

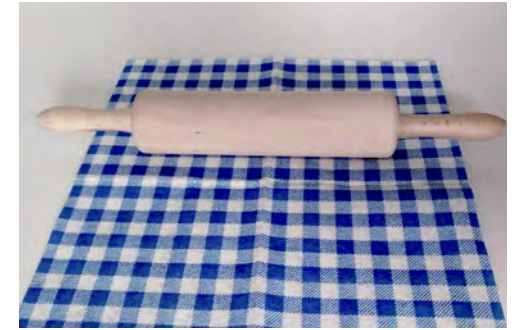
## MATERIALS AND TOOLS

- 35g birch cellulose
- 2 tablespoons wood glue
- 7l water
- sieve
- dishcloth
- scale
- box
- rolling pin
- measuring cups
- gloves
- masks



## GENERAL PREPARATION

First of all, put on the gloves and the dust filter mask and, if necessary, goggles, because birch cellulose is very fine and can irritate airways and eyes. Then fill 7 litres of cold water into a large container. Also prepare your paper pressing station by placing two different washcloths on top of each other. One of them will absorb the extra water and the other one will serve as a transfer medium.



## SCOOPING PREPARATION

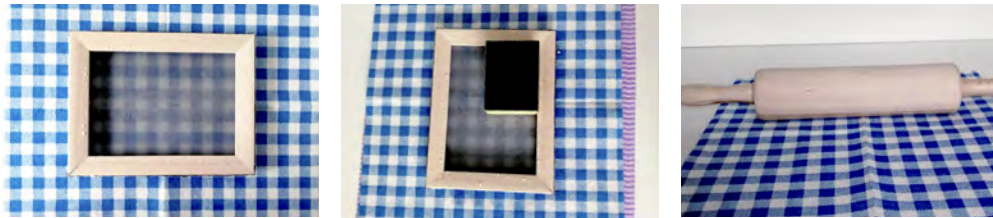
Measure 35g birch cellulose with a standard scale. It is best to do this with a tablespoon so that the fibres do not dust so much. If you like you can now dissolve the cellulose fibres in some water. You can also simply put it into your prepared big container. Now add 2 tablespoons of wood glue. This will serve as a binding medium.



## PAPER SCOOPING

Before you start scooping, spread the fibres in the water with your hands by running them through the water several times until all fibres are well distributed. Now insert the sieve diagonally into the water-cellulose-glue mixture until just above the bottom. Now guide the sieve very slowly upwards so that the fibres can settle on the sieve.

Then let the remaining water drain off well and carefully transfer the wet fibre pulp onto the dishcloth. Now lightly dab off excess water with a sponge. Loosen the sieve from the pulp and place a second cloth on top. Now you can squeeze the paper with a rolling pin.



## DRYING

The last thing you need to do is remove the top cloth and hang up your paper to dry. Drying will take about 24 hours. You can also take it off earlier while it is still slightly wet and iron it carefully.



## CONCLUSION

You can use this paper not only for cleaning surfaces, but also as toilet paper and stationery. It absorbs liquids excellently, yet you can still write on it. It is soft due to the fine, relatively small birch fibres, but has also gained sufficient stability due to the wood glue. Therefore it is very versatile.





# CASEIN PLASTIC

HENDRIK QUASTENBERG

## FACTS

Duration: 30min  
(a few days to dry)  
Difficulty: simple  
Cost: 10€



## DESCRIPTION

Casein plastic is not a new material. In the first half of the 20th century it was mass produced in many different forms, such as buttons, pens, and often for ornaments, including jewellery.

The name “casein plastic” comes from the casein protein which is available in milk.

Making plastic out of milk is very easy and you can use readily available equipment. The only other ingredient that is required is vinegar, which causes the casein proteins to polymerise and precipitate into a solid mass.

## MATERIALS AND TOOLS

- 200ml full fat milk or condensed milk
- 2 tablespoons vinegar
- stove
- pot
- measuring cup
- bowl or small pot
- spoon
- thin fabric or sieve



## MIX

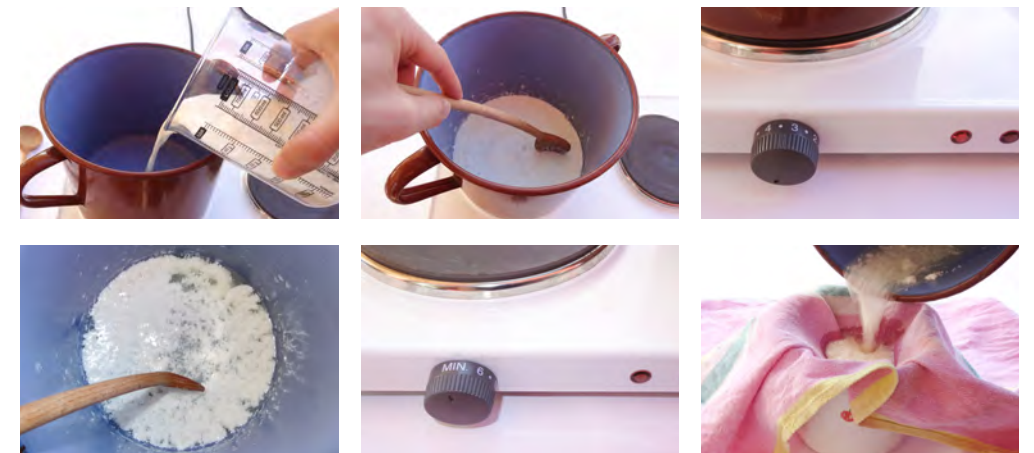
First of all I recommend to do it outside, because it smells a bit unpleasant.

Take 200 ml milk and add 2 tablespoons of vinegar. Stir it a little and then pour it into your pot.



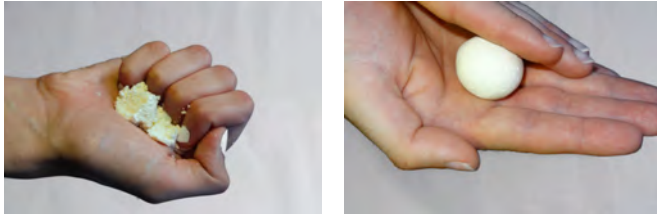
## HEAT

Put the pot on a stove and warm up the liquids slightly for about one and a half minutes. As soon as it starts flocking, it is ready. Take the pot from the stove and filter the mass through a tea towel or a thin sieve. Now you have separated your casein plastic from the remaining liquid.



## FURTHER PROCESSING

Let the filtered mass dry for half an hour. Drying outside works best. Then you should knead it into a homogeneous mass. Now you can put it into any shape you like and dry it on baking paper. I recommend to form balls, because these usually do not crack when drying. For this reason, I would only bring the material into the required shape after drying.



## USE

After about three days to one week, depending on form and thickness of the mass, it is fully dried and ready to use. It can now be processed similarly to other plastics. For example, you can grind it or drill it.

## CONCLUSION

I have experimented a lot with different amounts of milk and vinegar and different types of milk and different dairy products like whipped cream. I got the best results from organic full fat milk or condensed milk.

Casein plastic is a very simple method to produce plastic at home. It is durable and water-resistant. The potential of casein plastic is great. It forms a strong, solid and durable mass, which can be used for many different applications. In a pandemic situation you can use it for example to replace technical parts.

# GLOWING BIOPLASTIC

LARA LENZ

## FACTS

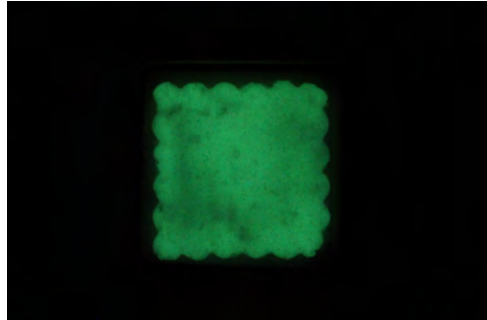
Duration: 30min  
 Difficulty: easy  
 Cost: 10€

## DESCRIPTION

Bioplastic is a great alternative to conventional plastic, which pollutes our entire planet due to its poor recyclability and toxic ingredients. Bioplastic is a material that is made from biodegradable ingredients, so it can be disposed with biodegradable waste. This bioplastic here is not produced according to the classic recipe, but with hand cream as a glycerin substitute. Since the hand cream makes the bioplastic greasy, craft glue is added, which also provides the special property of glowing in the dark.

## MATERIALS AND TOOLS

- 1 tablespoon starch
- 1 teaspoon vinegar
- 4 tablespoons water
- 3 teaspoons hand cream
- 2 teaspoons glow-in-the-dark craft glue
- pot
- whisk
- cooking spoon
- tablespoon
- teaspoon
- hot plate
- baking paper
- cookie cutters



## STARCH, VINEGAR, WATER

Prepare all the necessary utensils. As the first step you take the cooking pot and put 1 tablespoon of starch into it. To the starch you add 1 teaspoon of vinegar and 4 tablespoons of water. Mix these 3 ingredients in the pot with a whisk until you get a milk-like liquid.



## HAND CREAM, GLOW-IN-THE-DARK CRAFT GLUE

Now add 3 teaspoons of hand cream and 2 teaspoons of glow in the dark craft glue. Mix the ingredients again with a whisk until you get a homogeneous liquid.



## HEATING

The next step is to place the pot with the mixed ingredients on the hotplate and heat it up while constantly stirring it with a wooden spoon. During heating the liquid should become more viscous until it has a white glue-like consistency.



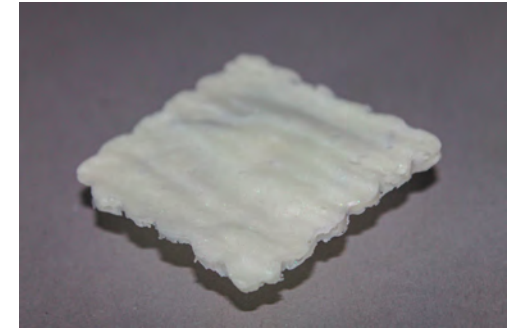
## SHAPING

After heating, you can shape the bioplastic into any form. For this you spread the bioplastic on a piece of baking paper, making sure it is not too thick. Now you can use cookie cutters or a knife to cut out the desired shapes.



## DRYING

The last step is to let the bioplastic dry, which can take several days.



## CONCLUSION

Due to the pandemic it is not easy to get glycerin, which is generally used to make bioplastics, at the moment, since this substance is also one of the main ingredients of disinfectants. Therefore, for the production of this bioplastic, glycerin was replaced by hand cream containing glycerin, which can be bought in drug-stores. The glow-in-the-dark glue was bought in a local crafts store. Alternatively, you can order glow-in-the-dark powder on Amazon, which costs about 15€. Due to its ability to glow in the dark, the bioplastic can be used as guidance at night, for example to find light switches or keys.





# MOLOTO

MAREK RUNDE

## FACTS

Duration: 60min  
Difficulty: advanced  
Cost: 0€



## DESCRIPTION

Fossil resources are shrinking while the piles of plastic waste are growing. Many fossil resources can not yet be replaced by renewable ones and the demand for Diesel fuelled combustion engines in the near future remains. At least during the transition phase to more sustainable sources of energy, substances like Moloto can provide a reasonable alternative, since plastic waste - its main resource - is abundantly available.

Moloto is a new material harvested from plastic waste of any kind. It burns when lit but smells awfully. Besides, it's combustion qualities the very viscose liquid might provide a valuable source of short chained carbon hydroxides for further processing.

## MATERIALS AND TOOLS

- used paint bucket
- water in any container
- cloth
- used gas line
- gas line connectors (double nipple)
- heater (electric or gas stove)
- drill that has the same diameter as the gasoline connector
- electric drill
- pliers
- angle grinder
- gas mask
- scissors
- jar (close-able)
- plastic waste cut into small pieces
- a little bit of old motor oil
- fire blanket
- laser thermometer
- blowtorch

All required materials can be found at your local junk yard.





## LID

First you need to bend the gas line and attach the gas connectors. There should be one union nut on both ends sitting on the connection cones of the line. Remove one end using the angle grinder. Keep the nut for later use. Dispose of the cone. The double nipple is now attached to the other end of the line. Lines for burning gases are produced with a left-hand thread. Now drill a hole in the lid of the paint bucket. This hole needs to be either the same diameter or a little smaller than the diameter of the double nipple. Punch the nipple through the hole and use the nut you saved earlier to screw it to the lid. The line is then sealed by brazing.



## GAS LINE

To set the distillery up you start by looking for a place where you will not bother anyone, that is well ventilated (do not do this indoors!) and that you can leave relatively easy without burning down a forest. Place the stove so it will not move or tip. Put the paint bucket on top and make sure that it remains there firmly. Now place the lid you prepared earlier and place the jar, you want your product to go into, at a lower position than the bucket. Now cautiously bend the gas line, about three fingers away from the connector by hand to avoid compression of the pipe.



## COOLER

The pipe needs to be cooled so that the fumes can condensate. An old T-shirt, or any other cloth will do the trick. Wrap it around the pipe, soak it in water and make sure to keep it wet at all times.



## WASTE

Collect some clean plastic waste and cut it into small pieces. The smaller the pieces, the more waste fits in the bucket. Put the pieces in the bucket and add a shot of old motor oil. The level inside the bucket must be low enough to ensure that nothing blocks the gas line's intake.



## DISTILLERY

Now close the lid of the filled bucket and place it on the stove. The Pipe with the cloth around can be quite heavy, so ensure everything stays where it belongs and nothing can tip or fall over. If anything catches fire, do not try to put it out with water since it might explode. Place the jar under the open end of the pipe to collect the liquid produce. Turn on the heater and keep a fair distance in case something goes wrong. Wait for the first steam to come out of the pipe, after a few seconds, liquid should start dripping. If it is mainly steam your cooler is not strong enough. You can fix this with a longer cooler or by lowering the heater. Try to find the right balance. The Bucket should be kept at around 360 °C - 380 °C. Check every now and then with the thermometer.



## RESULT

At peak efficiency a pyrolysis distillery should provide about 80ml liquid from 100g of plastic waste. Since this method is not even close to 100% efficiency lets estimate about 50ml — 60ml. This gives you a rough idea when your bucket will be empty. To test your product pour some of it on a cloth and ignite it. If it catches fire right away you made an excellent and clean product and it is closer to Benzine than it is to Diesel. If it burns like a candle you made something more like Diesel. Moloto is also fat solvent and usable as a cleaner.



# ORANGE JUICE PLASTIC

SOPHIE RÜDT

## FACTS

Duration: 20min (mass)  
3-4 days (drying)  
Difficulty: simple  
Cost: 7€



## DESCRIPTION

I experimented with starch, oil and water to create rubber. After many experiments, in which I changed the parameters or replaced certain ingredients, the result was Orange Juice Plastic. This bioplastic consists of three natural ingredients: Corn starch, corn oil and orange juice, which are all available at any supermarket. The plastic is relatively thin and not to be used in combination with water, since it is not water resistant. It is completely chemical free, vegan and sustainable. It offers a nice and really easy way to take care of one's green footprint and shows how uncomplicated it can be to replace chemicals and unsustainable ingredients with natural ingredients that surround us every day.

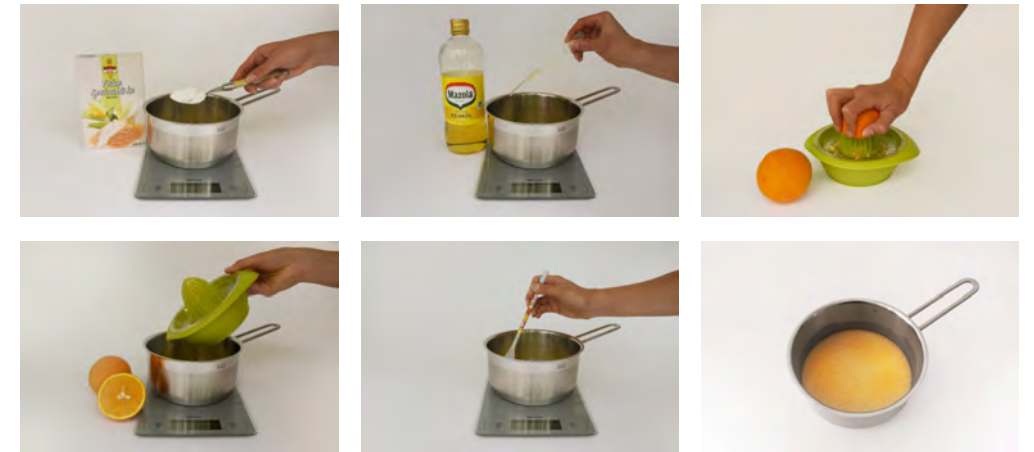
## MATERIALS AND TOOLS

- 42g corn starch
- 12 drops corn oil
- 168g orange juice
- pot
- scale
- spoon for stirring
- tablespoon
- pipette
- baking paper
- scissors
- knife
- tool for spreading
- flat lid
- press



## MIXTURE

Put the starch, the drops of oil and the orange juice in the pot one after the other and weigh the right amount. Using a spoon, mix the three ingredients together thoroughly until no more lumps of starch remain. Also make sure that no starch has settled at the bottom of the pot. If that should be the case, you will notice it to be very difficult to move the spoon over the bottom of the pot. In order to distribute the starch correctly, stir a few more times.



## HEATING

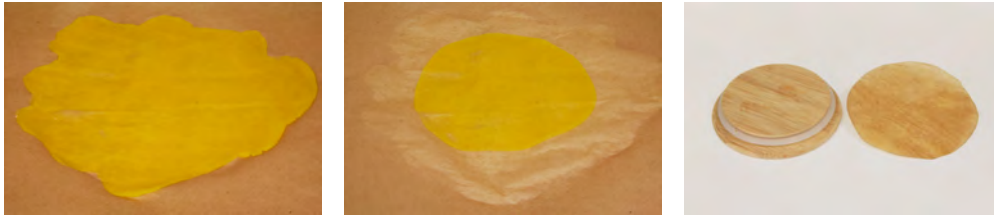
Now heat up the mixture while stirring continuously until a thick yellow mass has formed. Quickly place it on a piece of baking paper. Place another piece of baking paper on top and start to smooth out the mixture evenly between the two papers. The surface should not be thicker than 3mm, otherwise it will crack when drying.





## FORMING

Carefully pull off the top paper and cut out a circle. The size is not predetermined. Use the lid as a template to cut a smaller circle out of the parchment paper.



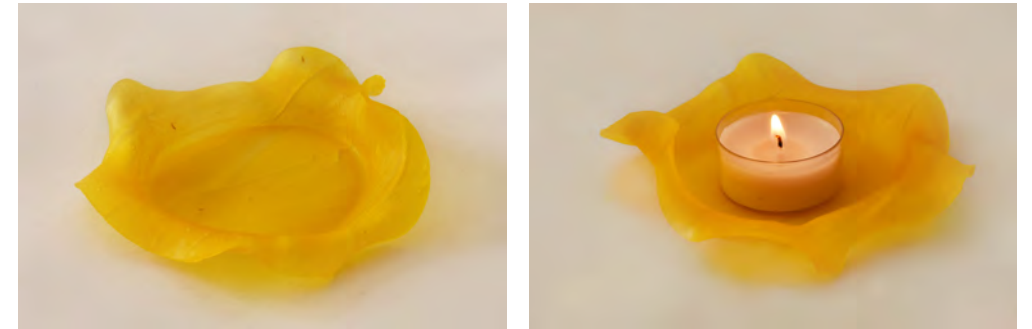
## DRYING

Place the parchment circle on top of the yellow surface. Then place the lid on top and lastly place a weight on top of the lid. Leave the plastic to dry. As soon as the mass begins to dry the liquid will evaporate, which will cause the plastic to curl. The template with the weight in the middle is preventing the centre to dry as quickly as the surface around it. Therefore the surface will dry from the outside towards the inside causing the edges to lift up into the shape of a bowl. During the drying process, take care to remove the weight, lid and stencil in time before the space surrounding them becomes too hard to be removed. Until the plastic has fully dried it will take 3 to 4 days, depending on the thickness of the surface. The thicker the surface, the longer it will take to dry, but the less it will curl. Also the risk of ripping during the drying process is higher. The thinner the surface, the quicker it will dry and the more it will curl.



## RESULT

If you don't want to create a bowl, you can cut the plastic into other shapes while it is still soft or leave it as it is. In both cases you can let it dry without a weight and a template. During the drying process it is difficult to influence the shape of the plastic. Depending on the result you can use it for many different things: As a tea light, as a bowl for small tools or even as a lampshade.



## CONCLUSION

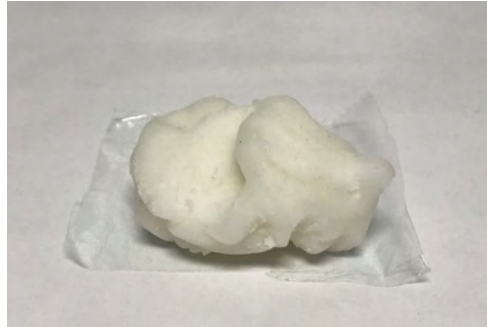
It is not the most sturdy plastic and is therefore rather to be used for decorative purposes. It is important that it is not used in combination with water, as it is not water resistant. Hence be advised not to use it to create tableware. Referring to decorative usage, the plastic's colour can be influenced by different liquids: Orange juice results in yellow, lemon juice produces white, the liquid from a glass of beetroot makes it red and the liquid from a glass of "Kaiser-Cherries" leaves a bright pink plastic.

# WAX PLASTICINE

CHARLOTTE GWENDOLINE QUANDT

## FACTS

Duration: 30min  
 Difficulty: medium  
 Cost: 10€



## DESCRIPTION

Wax plasticine has many advantages compared to conventional modelling clay. Conventional plasticine usually has the property of drying out and therefore does not last very long. In addition, it consists mainly of chemicals. This wax modelling clay does not dry out and is composed only of 3 natural components. It is very easy to make and will last for a long time. Because of its ingredients, the wax modelling clay is a very skin-friendly material. It is easy to form, keeps its shape and does not harden. In addition, it is washable due to its fat content and can therefore be used universally.

## MATERIALS AND TOOLS

- 2 tablespoons beeswax
- 1 tablespoon vaseline
- 60g potato starch
- some water
- heat-resistant bowl
- hot plate
- pot
- blender
- tablespoon



## HARD OILS

First, pour the required amount of vaseline and beeswax into a heat-resistant bowl, which should be a little larger than your pot. Next, bring water to boil in a pot. When the water comes to boil, remove the pot from the stove and place the filled bowl in the pot. The temperature causes vaseline and beeswax to melt together and form a liquid. This can take a few minutes.



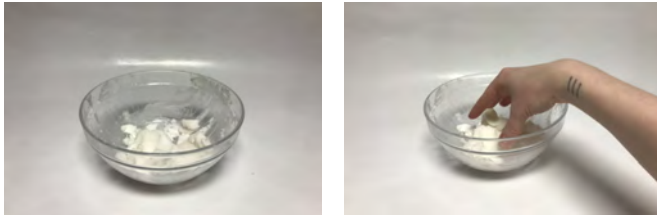
## MIX

When the two ingredients are completely melted and liquefied, remove the bowl from the pot. Now add the required amount of potato starch to the mixture. Fold it in carefully. Then you can mix everything together with a hand mixer until you get a homogeneous, slightly firm mass.



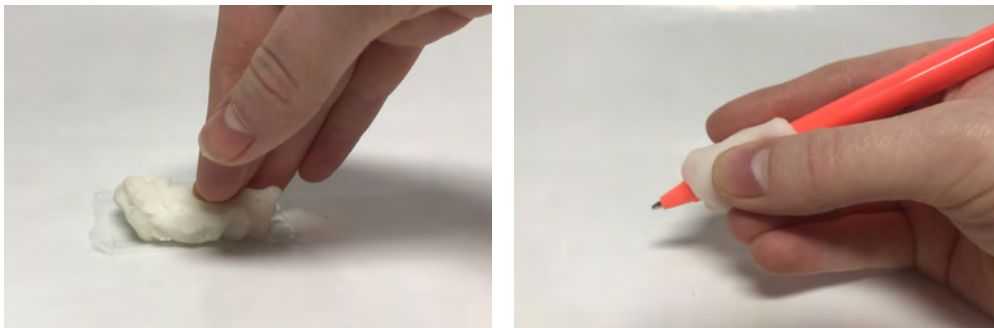
## KNEAD

Let the homogeneous mass cool down. When cooling down the mass becomes a little harder. After it has cooled down you can knead the mass and your wax plasticine is ready.



## FINISH

The self-made wax modelling clay is reusable, skin-friendly and water-repellent. It has no fixed use. Due to its durability it can be used over and over again. It could for example be used as earplugs or as a comfortable pencil cushion.



## CONCLUSION

On the whole, the wax plasticine is easy to make. It consists of just 3 ingredients. All ingredients can be bought in a drugstore or supermarket. When making the plasticine you have to take care that the melted vaseline and the wax does not harden again, because this happens very fast. That is why it is important to carry out each step of the recipe one after the other. To personalize the wax plasticine, it is also possible to add colour to the recipe. The colour should be added when mixing the melted ingredients with the starch. You can use food colouring or natural colouring. It is important to remember that you cannot add water to the ingredients. Because as soon as water is in the knead, the shelf life is no longer guaranteed. A small problem is the cleaning of the used additives. To free them from wax and vaseline you need patience and a lot of soap.





# SOFT PLASTIC

LENNERT RÖDEL

## FACTS

Duration: 20min  
Difficulty: simple  
Cost: ca. 2€



## DESCRIPTION

“Soft Plastic” is a form of bioplastic with one big difference - the water is replaced with milk. That way the result does not get completely hard and remains flexible. The surface is also rougher, so it feels pleasant to touch.

## MATERIALS AND TOOLS

- 100ml 3,5% long-life milk
- 30g gelatin powder
- 7g glycerin
- flat mold (e.g. a plate)
- hot plate
- pot
- egg whisk
- scoop
- thermometer
- scale
- measuring cups
- small bowls

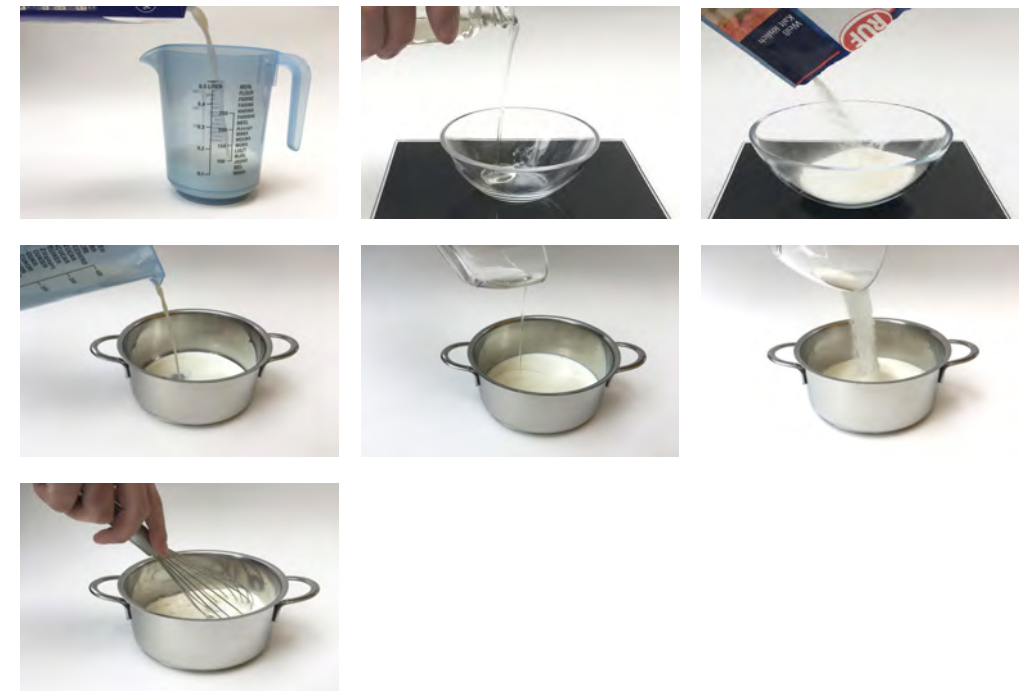


## PREPARATION

Collect all the necessary ingredients and tools which can be bought at a supermarket except for glycerin, which you can get at your local pharmacy. Put the scale, the pot, the egg whisk, the thermometer, the measuring cups and all ingredients next to your hot plate. Lay the scoop to your sink or an empty bowl.

## MIXING

First, fill 100ml of milk in your measuring cup and weigh out 7g of glycerin in a small bowl. Weight 30g of gelatin and pour the ingredients in any order in the pot. Stir it with the whisk until the gelatin has completely dissolved.



## HEATING

Keep on stirring while you heat up the mixture on the hot plate. Measure the temperature simultaneously until the liquid reaches 90 to 95°C. Then take the pot off the plate.



## POURING AND DRYING

There will be foam on top. Skim the foam with the scoop and then pour the liquid in the mold. The mold should be as flat and even as possible, so your dried plastic will not be thicker than four to five millimetres. The measurements of this recipe should be enough to fill a medium sized dinner plate. Place the mold with the hot bioplastic in a room with preferably dry air and let it rest for five to seven days. Make sure to turn it upside down after a couple of hours.



## CONCLUSION

The striking advantages of this slightly modified plastic are its softness, flexibility and nice comfortable feel. It is interesting, that the plastic gets slightly softer as you knead and bend it – reminiscent of beeswax, even though the effect is way lesser. It also does not dissolve in water as fast as normal bioplastic.





# DIY BIOMATERIAL

## INTRO

With the continuation of the global Corona pandemic, almost twelve months after its first occurrence, re-rising infection rates and a satisfying vaccine being far from applicable, the world remains under pressure. Since the present situation still feels alien and largely restricting, it is easy to forget about another - even more important - global challenge we're facing. But only since we cannot yet physically experience climate change or because substantially higher temperatures seem far off in the future does not make it less acute. The only way to prevent the worst is to radically increase our efforts now and build upon the current situation to rethink our behaviour and implement new strategies and technologies. In a recently published article Bill Gates stresses the urgency of immediate action:

*If you want to understand the kind of damage that climate change will inflict, look at COVID-19 and spread the pain out over a much longer period of time. The loss of life and economic misery caused by this pandemic are on par with what will happen regularly if we do not eliminate the world's carbon emissions.<sup>1</sup>*

One important point Gates addresses is, that "the relatively small decline in emissions this year" makes it clear that we cannot solve this problem only through reduction, like driving or flying less.

Instead we should "let science and innovation lead the way." One of the major contributors to global CO<sub>2</sub> emissions is the production and lifecycle of plastic materials. A 2019 report from the Center for International Environmental Law (CIEL) estimates that

*if plastic production and use grow as currently planned, by 2030, these emissions could reach 1.34 gigatons per year — equivalent to the emissions released by more than 295 new 500-megawatt coal-fired power plants. By 2050, the cumulation of these greenhouse gas emissions from plastic could reach over 56 gigatons — 10–13 percent of the entire remaining carbon budget.<sup>2</sup>*

## TASK

In this course we wanted to tackle some of the problems related to plastic materials and explore and develop sustainable and biological alternatives following an idea of DIY material making. Parallel to guided making of a selection of novel biological materials, each student was asked to research their own "DIY Biomaterial", find corresponding recipes and instructions for self-making, experiment with ingredients, substances and production techniques and eventually develop an illustrated and easy-to-follow step-by-step tutorial akin to a common cooking recipe.

<sup>1</sup> Gates, Bill. (2020, August 4). COVID-19 is awful. Climate change could be worse. Retrieved October 08, 2020, from <https://www.gatesnotes.com/Energy/Climate-and-COVID-19>

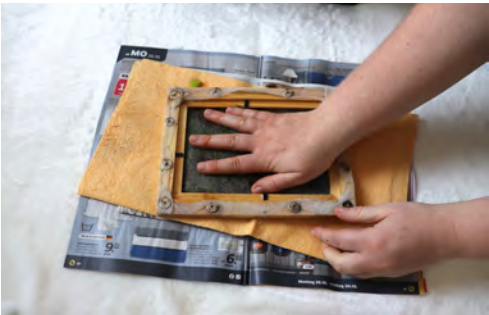
<sup>2</sup> Hamilton, Lisa Anne and Feit, Steven. Plastic & Climate: The Hidden Costs of a Plastic Planet. May, 2019, from: <https://www.ciel.org/wp-content/uploads/2019/05/Plastic-and-Climate-FINAL-2019.pdf>

# LEEK PAPER

TABEA BUSLER, ALEXANDRA FRANKE

## DESCRIPTION

Leek is an everyday vegetable. It can be bought reasonably and in large quantities at the supermarket and is easy to use in the kitchen. Leek has a lot of sheets and because of the fibers an interesting surface. We wondered how leek can be turned into a suitable material outside of the kitchen. Especially we wanted to focus on the green leaf part, which mostly only ends up in the garbage. Our goal was to create an aesthetic sustainable paper-like material. Each of the following experiments does not take more than 60 minutes. They are easy to imitate and require nothing more than usual kitchen utensils and leek.





# LADLE LEEK

## MATERIALS AND TOOLS

- 280g leek
- 1 mixer
- 1 pot
- 1 tub
- 1 ladle frame
- 1 cotton cloth
- paper and books to press



## PROCESS

Cut the dark green leaves of the leek into small pieces. Boil 1 liter of water in a pot and cook the chopped leek for 5 minutes. Drain the water. Puree the leek into a thick paste.



Put 3 liters of water in a tub and add the leek mash. Immerse the scoop frame in the tub. After this press the frame onto the cotton cloth. Press the leek between paper and under pressure of books for two days so it can dry.



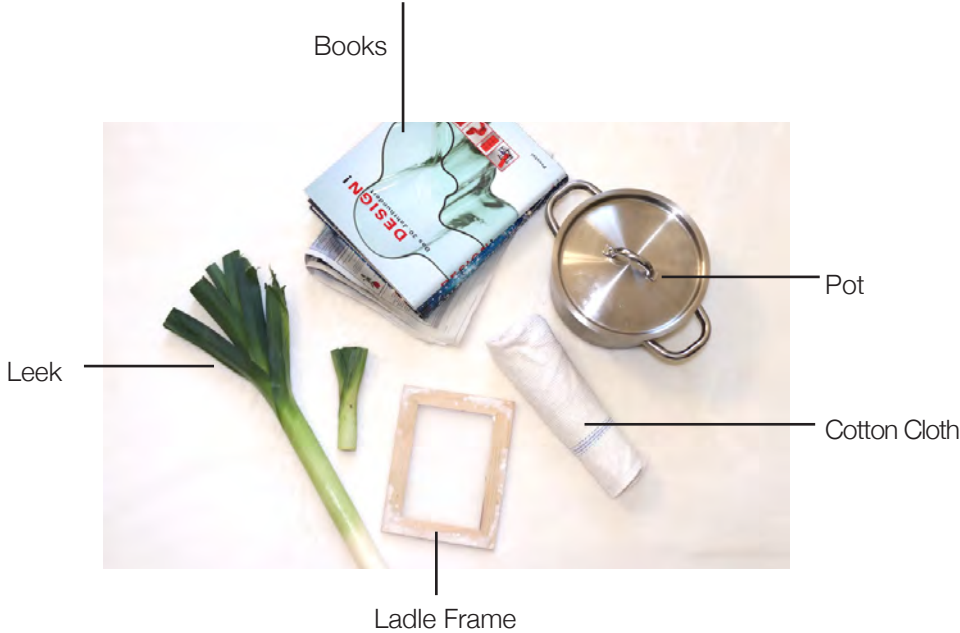
## CONCLUSION

In our experiment we really made paper. The leek pieces stick together well. The result is a thin and opaque material. It is a light material with an interesting structure, which, despite its fragility, is well suited for sheathing smooth surfaces. But you have to make a thick layer, otherwise it is too fragile. To make it more stable and thicker, we wanted to work with coffee grounds, but the two components did not bind.

# LEEK PAPER

## MATERIALS AND TOOLS

- 280g leek
- 1 pot
- 1 cotton cloth
- 1 ladle frame
- paper and books to press



## PROCESS

Remove the stalk and the dark green leaves from the leek. Cut the leek on one side and peel off the leaves, halve the leek rolls again in the middle.



Fill the pot with 2 liter water and cook the leek in it for 5 minutes. Drain the water. Weave the leek on the ladle frame in a checked pattern. Press the paper between paper under pressure from books for two days.



## CONCLUSION

The leek strips hold together very well due to the interweaving. The result is a thin, translucent material. At first it is still very flexible, but after 3 days of drying it starts to become stiff and fragile. In other experiments we wanted to try bleaching the leek with chlor and soda in order to obtain transparent material. The result was a pile of mud that has no use, it did not work. In another experiment we tried to model the leek. It stuck too much to the peels and did not stay stable.



# BIO NETTLE LEATHER

COSIMA MÜLLER, RICHARD KLIMA

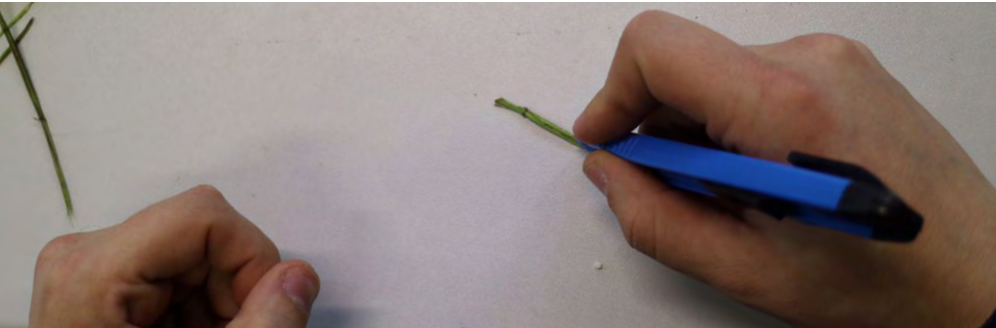
## DESCRIPTION

We wanted to produce a leather that isn't made of animal skin - because animal leather is no longer appropriate. So we developed a recipe for organic material made from nettle leaves. The nettle plant is on the one hand good for the leather's appearance and on the other hand necessary for the solidity of the material.



## FACTS

Duration: 250min  
Difficulty: medium  
Cost: 15€



## EXPERIMENTS

In the following test series we want to find out more about the ‚right‘ mixture for the nettle leather so we vary with different amounts of ingredients. To see a clear impact we only vary one ingredient per experiment. At the beginning we want to find out how to produce the bio leather and get to know more about the flexibility. In the following test series we try to find out the necessity / impact of nettle and glycerin.

## MATERIALS AND TOOLS

- Dried nettle leaves
- Sodium alginate
- Glycerin
- 50ml Water
- 2ml Olive oil
- Pot / Bowl
- Something to stir
- Scale
- Casting mould
- Rolling pin
- Baking parchment



## FIRST TEST SERIES

For this experiments we wanted to find the ideal amount nettle grains - so we varied the amount with 2,5g, 5g and 10g nettle grains. „Urtica dioica“, wild grown wild in the North of Leipzig (Abtnaundorfer Park), harvested by hand. After the separation of the leaves from the stalk, they got dried immediately in a dehydrator for 4 hours. After this the nettles get pulverized in a mixer until you get a very fine powder.



## INSTRUCTION

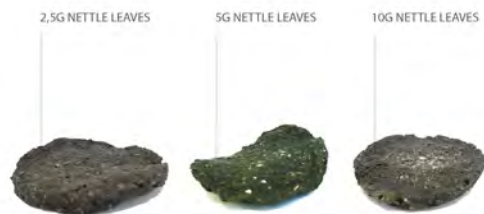
First weight all ingredients. For the first experiment mix 2,5g nettle grains with glycerin, olive oil and sodium alginate. Add water and mix it all up to a homogeneous mass. Pour the final mixture into a flat mould and wait 1-2 days till it is completely dried. It is very important that you dry the material in a dry and warm place. The time may vary depending on the thickness of the leather and temperature of the place where you dry it.

For the second experiment use an amount of 5g nettle and for the third 10g. You will see that the flexibility varies depending on the amount of nettle.



## CONCLUSION

After the first three experiments we figured out that especially the material with 5g and 2,5g nettle grains are more flexible. In total, it can be determined that as less nettle grains you use the more flexible the material becomes. So we decided that 2,5g nettle are the ideal amount for our leather. The nettle is especially good for the leather look and also makes the material more stable. Unfortunately the leather molds quickly due to the high humidity and thickness of the material.



## SECOND TEST SERIES

We wanted to make a more flexible and thinner leather - so we decided to roll out the material with a rollin pin this time. Also we wanted to check the necessity of the nettle grains in the leather. In the last experiment we checked the stability of the leather by adding only nettle fibre:

## INSTRUCTION FOR THE FLAT NETTLE LEATHER

Mix the water, grains, olive oil, glycerin and sodium alginate until a homogenous mass is created. Put it between two sheets of baking parchment and roll out the mixture. Remove one of the baking parchments and let the material dry in a dry and warm place.



## INSTRUCTION FOR THE LEATHER WITHOUT ANY NETTLE

Mix the water, olive oil, glycerin and sodium alginate. Roll out the mixture again and let it dry.



## INSTRUCTION FOR THE NETTLE FIBRE LEATHER

Mix the water, olive oil, glycerin and sodium alginate. Roll out the mixture again and let it dry.



## CONCLUSION

The material we rolled out is definitely more flexible. The material without any nettle is super fragile and very easy to tear in two pieces. Also we can determine that the leather with the nettle fibre is super strong and robust and stable and more durable than the other materials - it is not possible to tear in two pieces.

### THIRD TEST SERIES

In this test series we wanted to check the influence and importance of glycerin on the material. So we added different amounts glycerin to our nettle leather.

### INSTRUCTION

First weight all ingredients. We made one experiment with 10g glycerin and another with only 2,5g. After this, mix all ingredients like in the experiments before and roll out the mixture between two sheets of baking parchment. Let the material dry out again.



### CONCLUSION

The material with 10g is more porous and not as tear-resistant as the one with only 2,5g glycerin. So one can conclude that the more glycerin you use the less tear-proof the material you get.

### FINAL CONCLUSION

To summarize we can say that the rolled out and thinner material is definitely more flexible and stable than nettle leather from the first experiment. And that the biomaterial doesn't need that much glycerin or nettle grains. Also it is very fascinating how stable and robust the leather made out of the nettle fibre is. In order to improve the material we could try to distribute the fibers more evenly. Also we could try to make the fibers even finer and smaller for the optimization.

The leather could be used in the fashion industry for accessories like wallets, bags etc. When we think about the future of our bio leather it could be very interesting to develop the nettle fibre material way more - as it is particularly impressive in terms of durability and stability.





# MYCELIUM FIBRE COMPOSITE BRICKS

SIMON HOCHWALD, JAN STACKFLETH

## DESCRIPTION

Mycelium has a number of advantages over commonly used materials such as stone or wood. It is lighter, non-flammabale, can be harvested 5 days after the start of the growing process and has a less harmful impact on the environment since mycelium can be grown almost all around the world. Through the combination of mycelium with jute fabric, the brick will be more flexible and durable than common mycelium material. Therefore it can be used specifically in more physically demanding situations.



## MATERIALS AND TOOLS

- 3L GIY Hemp Kit from grown.bio
- 30g Flour
- Jute fabric
- Ethanol
- Cling film
- Scissors
- Molds
- Gloves
- Oven
- Bowl
- Tape

## FACTS

Duration: 45min  
Difficulty: medium  
Cost: 50€



## PREPARATIONS

Cut out pieces the size of your mold from your jute fabric. To eliminate all bacteria on the jute fabric, put the pieces in the oven for 15min at 100°C. Put on gloves, mask and – if available – eye protection. Disinfect all surfaces, tools and your gloves with ethanol. Open the mycelium-hemp bag from grown.bio, pour it in a bowl and add 30 grams of flour. Mix it with your hands for 5 minutes and make sure you crumble all lumps in the filling material.



## FIRST GROWING PROCESS

Now continue to fill the mold. Firstly place a cut-out piece of jute fabric in the mold and cover it up with the filling material. Then place another piece of jute fabric on top of it and gently sprinkle some more filling material over it. Wrap the mold in cling film and tape it down. Now poke roughly three holes in the cling film. Place the mold in a box and let it grow in a warm (20-25°C) and dark environment for at least 5 days.



## SECOND GROWING PROCESS

After 5 days cut-open the mold and place the mycelium-fabric composite brick in a slightly opened zip-bag. Place the zip-bag in the box again and let it grow for another 2-3 days.



## BAKING

When the former mold-covered parts of the mycelium-fabric composite brick turned as white as the upper surface remove it from the zip-bag and place it in the oven. Bake it at 75°C for 3 hours to stop the growing process of the mycelium. Your mycelium-fabric composite brick is now ready to use.



## CONCLUSION

The reinforced mycelium structure you crafted and grew with this experiment is the perfect foundation for a new world of crafting and building. With mycelium-fibre composites you can dive deeper in the development of durable furniture, packaging and maybe even buildings. Since you used two completely biodegradable materials for the composite-brick, the future-crafted objects are way more economic than common objects which are build out of stone-, metal- or plasticparts. The short growing time of the mycelium is also an advantage in terms of experimenting with the material and its structure.

# BANANA PEEL BIOPLASTIC

ELISA BOLTE, LAURA GREINER

## DESCRIPTION

The usage of banana peels as base material for the production of bioplastic can be explained by many circumstances.

First of all in terms of environmental problems - it is a great, sustainable replacement for materials made from fossil resources (such as mineral oil). Banana peels offer a large potential in their chemical and physical characteristics: they consist of starch (18,5%) which is a bio polymer macromolecule out of two glucose units namely amylopectin and amylose. As a result, it provides a high mechanic stability. Aside from that, it can be easily modified in its flexibility by the addition of sugar alcohols like glycerol or sorbitol which make banana peels usable as base for thermoplastic too. Furthermore, banana peels contain cellulose being also a polysaccharide having properties that are similar to the starch features.

Further, banana peels represent a problematic constant as by-products existing in great quantities because of cultivation farming and processing industry. Thereby, banana peels being disposed as landfills lead - besides other organic waste - to an increased emission of methane which is 25 times stronger than carbon dioxide referring to the impact on the greenhouse effect.



## EXPERIMENTS

With banana peels it is possible to create different versions of a bioplastic which is contingent on the ingredients that are used. We tried both ways, chemicals as well as conventional home remedies. At last we decided for the home remedies method because ingredients are easily available and less dangerous. Also, the chemical alternative is more complex in its realisation according to mixing proportions.

It is not coercively necessary to wear gloves or a mask as well as eye protection as opposed to the chemical version. Although glycerol is not classified as dangerous chemical product, be aware of its flammability at higher temperatures. Avoid contact with eyes and skin. In case of contact with areas of your body, you can easily wash up the glycerol with clear water.





## FACTS

Duration: 3-4 h  
 Difficulty: simple  
 Cost: ca. 15€

## MATERIALS AND TOOLS

- |                               |                |                   |               |
|-------------------------------|----------------|-------------------|---------------|
| - 70g banana peels            | - knife        | - coffee filter   | - rolling pin |
| - 160ml cold water            | - scale        | - sieve           |               |
| - 5ml vinegar                 | - blender      | - old towel       |               |
| - 1,5g cinnamon               | - small pot    | - oven            |               |
| - 0,5g thyme                  | - hot plate    | - parchment paper |               |
| - 6ml glycerol (or 10g honey) | - wooden stick | - baking tray     |               |



## PREPARATION & MEASURE

Cut 70g of banana peels into small pieces. Add 160ml of water and blend it together. Add 5ml vinegar, 1,5g of cinnamon, 0,5g thyme and 6ml glycerol. Blend it again.



## COOKING & COOL DOWN

Pour the mix into a small pot and put it on a hot plate at medium heat until it starts to boil. Stir all the time.  
 As soon as it starts to boil turn down the heat to low and continue stirring for another 5 minutes. Let the mix cool down for 10 minutes. Put a coffee filter into a sieve and pour the mix into the filter. Let the water drain.



## WATER DRAINING

Put the mix into an old towel and wring out remaining water.



## BAKING

Lay out parchment paper on a baking tray and place the mix on it. Put another parchment paper on top and use a rolling pin to thin it to 4mm. Put the tray into the oven for about 2 hours at 80-100 degrees.



## CURING

After baking, let the bio plastic dry air dry for a few days additionally.



## CONCLUSION

The banana peel plastic proves to be a suitable material that synergises diverse positive characteristics; it offers tensile strength, stability due to the rearrangement of glucose and cellulose compounds and is elastic because of addition of glycerol/ honey. In case of using honey, the bioplastic is not as tear resistant as the alternative with glycerol even it makes only a marginal difference. Besides that, the material is water repellent, homogenous and has a handy surface. Spicery in the plastic cause an odorant smell and permanency.

Regarding to these qualities, the banana peel bioplastic provides a large spectre of applications. E.g., it would be appropriate as packaging material in (food) industry as well as primary material for e.g. commercially used coffee mugs that are mostly laminated with a plastic foil which causes inappropriate and fragmentary waste recycling.



# WILLOW BARK FIBRES

LENA SEIDEL, VIKTORIA FRANKE

## DESCRIPTION

Willow bark is a very useful natural material. Willows are used as ornamental plants, in medicine, in engineering biology and for wood production. In medicine, it is used against malaria, because it has many healthy ingredients. But these fibres can be used for other things too. We tried to use the flexibility of the bark, to create different three-dimensional shapes.



## EXPERIMENTS

We cooked the rind with baking powder according to the instructions. The result were dry fibers that stick together and break easily.



In a second experiment, we pressed the fibres after cooking. We have laid the fibres in top of each other and let them dry. We used the outer bark too. The superimposed fibers produce a stable network. The outer bark has a darker colour but the result is the same as that of the inner bark.



We cooked one package of gelatine according to the instructions. Then we added the inner bark and cooked it for ten minutes. We placed the gelatine on a plate and placed it in the refrigerator for fifteen minutes to cool. The fibres do not change their properties. They are only enclosed by the gelatin. So we focused on the adhesive properties of willow fibres.



## MATERIALS AND TOOLS

willow branches (or other tree species; number depends on the pot size)  
 1 pot water  
 1 kitchen scale  
 1 pot  
 1 stovetop  
 1 sharp knife  
 1 pack baking powder

## HOW TO

Remove the dark outer bark from the branches with a sharp knife. Leave the inner bark intact to cut it in stripes of fibres.



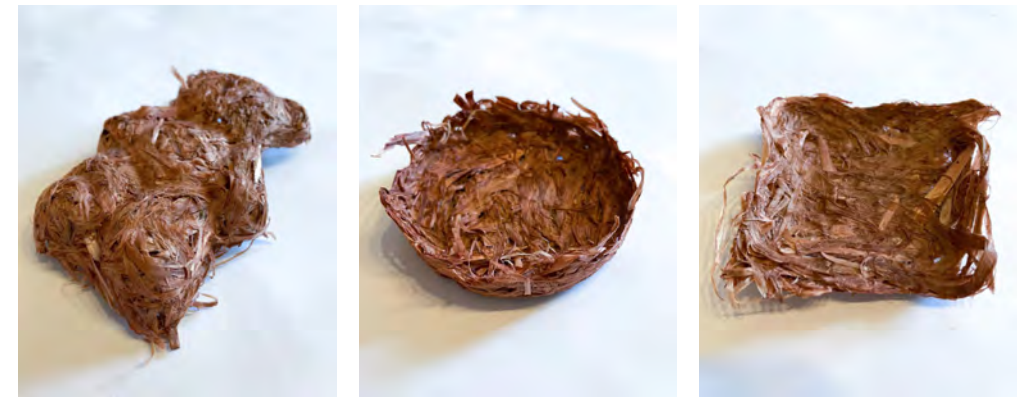
Weight the fibres and place them into a large pot. Add enough water to cover it. Add baking powder (one tenth of the weight of the bark). Heat to boiling and cook for one hour.



Take the pan off the heat and add cold water to cool and wash the bark. Drain the water and put the fibres in molds to dry.



Let it dry for three days. The bark retains the shape after drying.

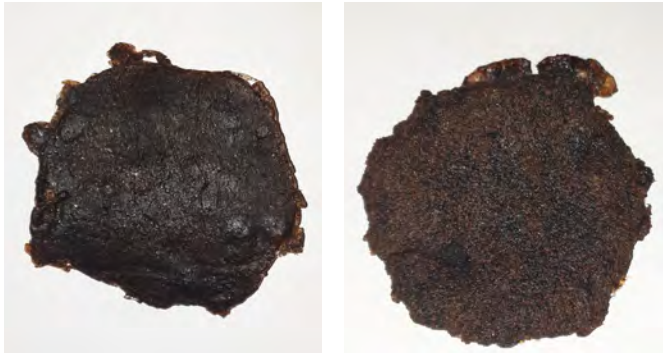


# COFFEE-LEATHER

YANNIK BEYER, JORIS GRABA

## DESCRIPTION

Coffe is an important part of our daily lifes. It's made out of coffe-beans which are grinded up and get processed further after that. During that process, a waste product is created which gets thrown away without being used any further. We had the idea to use this product and to create a new one. This new product will be biodegradable. We were hopeing to create a new substance that can be used to enhance the environmental friendliness of "every-day-objects". We carried out a few experiments in hope too further develop this product and optimise the end result.  
As an alternative to coffe it is possible to use pulverised common reed.



## EXPERIMENTS

Put on gloves, mask and – if available – eye protection. Be sure to clean every container or other device you use. Be careful to not get any of the used chemicals into your digestive system.





## FACTS

Duration: 40min  
 Difficulty: easy  
 Cost: 20€

## MATERIALS AND TOOLS

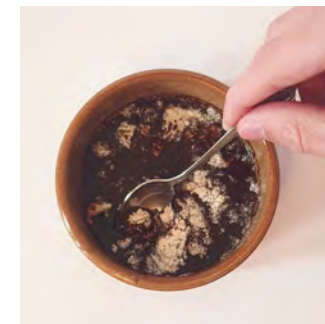
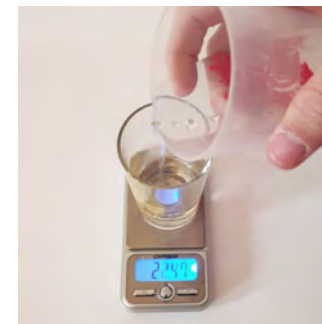
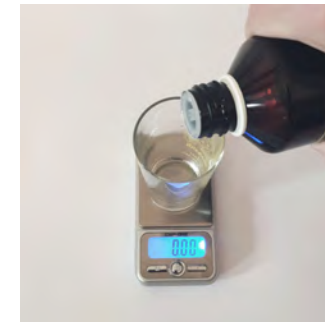
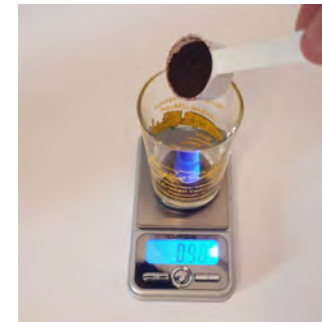
- 2g coffe powder
- 1g reed fibers
- 2g glycerine
- 7g calcium chloride
- 133g water
- 2g sodium alginate
- bowl
- spraying bottle
- spoon
- knife

## CALCIUM CHLORIDE SOLUTION

For our experiment it is really important to mix a calcium chloride solution. To do that we have to mix 7g of calciumchloride with 100g of water. After mixing the solution pour it into a spryying bottle. Make sure to desinfect and clean everything you use beforehand.

## THE MASS

Weigh all the ingredients necessary to the exact amount needed. Mix everything together. You must have 2g of coffe powder, 2g of glycerine, 2g of sodium alginate and 33g of water. Mix all of this together and distribute it evenly in a small bowl. Again make sure everthing you use is desinfected and cleaned properly.





## SPRAYING THE SURFACE

After finishing to mix the ingredients together we must spray the prepared calcium chloride solution onto our material. It is important to fully cover the surface. Wait five minutes. After five minutes turn the mass around and spray the surface from the unused side. After another five minutes take out the mass and clean the surface by pouring water over it until the solution is washed off.



## DRYING

The last step of our process is the drying of the finished product. To do that put the mass into kitchen paper. Then put it with the kitchen paper into an old newspaper. Apply constant pressure by putting something heavy like a bunch of books on top of it. The process of drying takes up to a few days. Alternatively you can also dry the mass in a microwave. Be careful not to leave it too long in the microwave. It is advised to dry it 30 seconds, take it out for the same amount of time and put it back in until most of the moisture is gone. When it is dry it should look like in the picture below.



## CONCLUSION

The endproduct is extremely flexible and if it has the right thickness it is also very tear-resistant. The "leather" is waterproof and water-repellent. This makes it suitable for products like raincoats or umbrellas. The only downside is the fact that our mass, when dried in a microwave shrinks very strongly. We are yet to find a solution for that problem.

# MUSHROOM MATERIAL

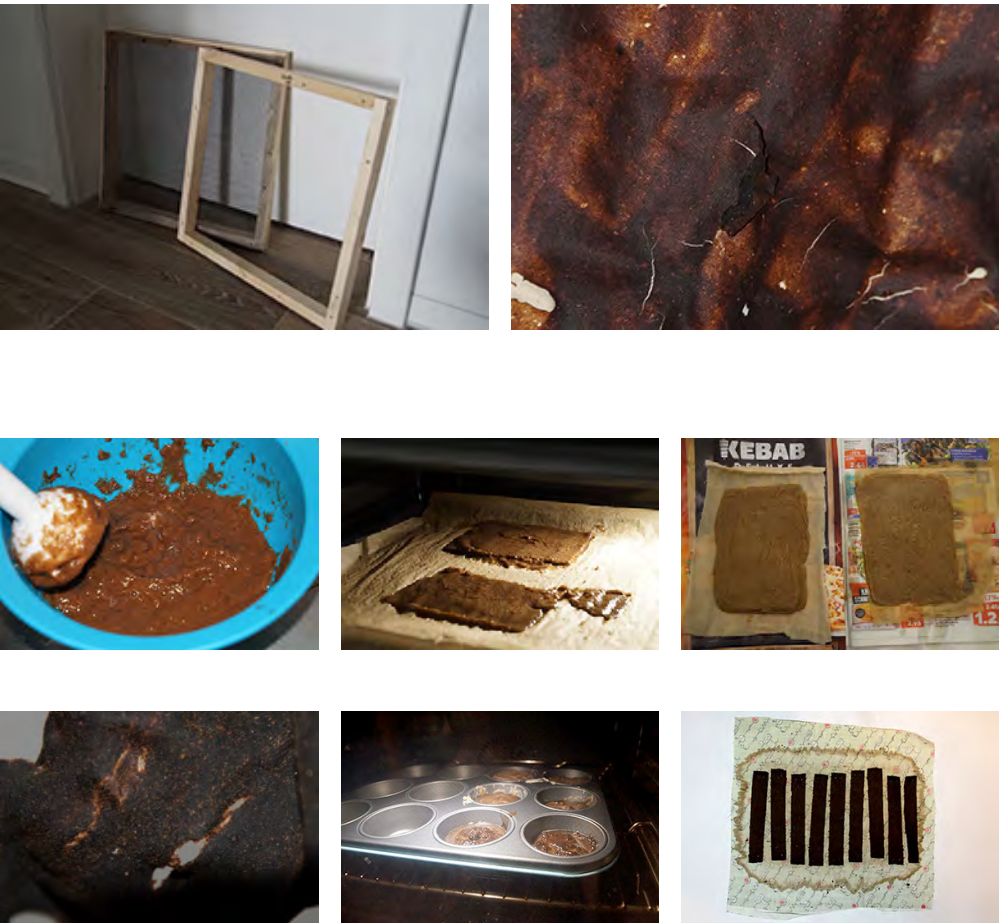
JASMIN FISCHER, KAROLIN BURKHARDT

## DESCRIPTION

Our goal was to make a material from mushrooms and water that is tear-resistant. In the first experiment we used a frame with tight mesh. Unfortunately, the material was very thin, too dry and torn. In the second experiment we took a smaller frame and made the mass thicker than before. Here we have tested 3 types of drying. Unfortunately everything took a long time to dry. The material became very cracked again in the end. In the last two experiments we tried to shape the material. In the first experiment we tried to bake it in the mold in the oven. We made 3 attempts. Once with just water, once with water and flour and once with water and starch. The shape with the starch is a success. In the second experiment we pureed the mushrooms without water and also baked them in the oven. However, we kept the mass flat and cut it into strips in between.



## PROCESS



EXPERIMENT 1

In experiment 1 we made a material that is in a solid and stable form.



FACTS

Duration: 2 h  
Difficulty: easy  
Cost: 10 – 15 €



MATERIALS AND TOOLS

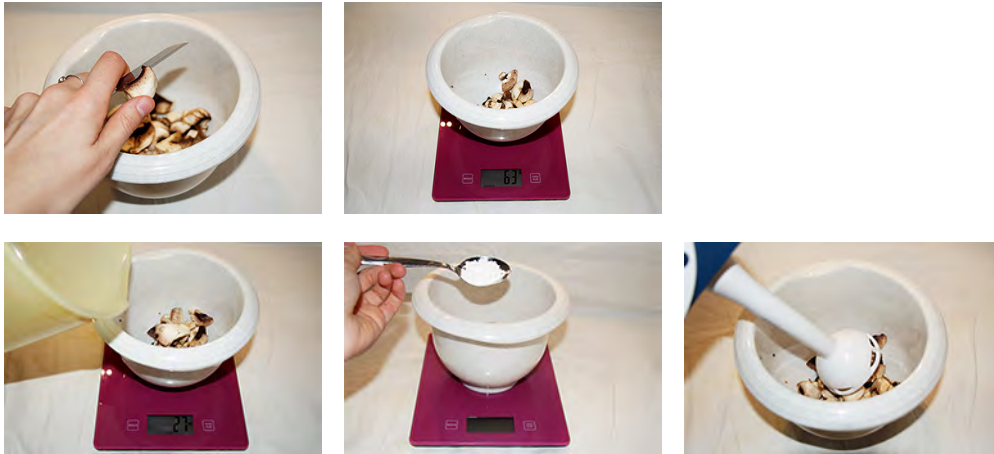
- 60 g mushrooms
- 25 ml of water
- 30 g food starch
- scale
- measuring cup
- bowl
- blender
- rame with tight mesh





## MUSHROOM PULP

Clean and cut the mushrooms into smaller pieces. Then weigh the 60 g mushrooms and place them in a bowl. Now add 25 ml of water. Then weigh the starch and add it to the mass. Now puree the mixture to a pulp.



## POUR OFF THE WATER

Now put the pulp on the stretched frame and let the water drain off. Then put the pulp in a mold and place an absorbent cloth lightly on top to soak up the remaining water.



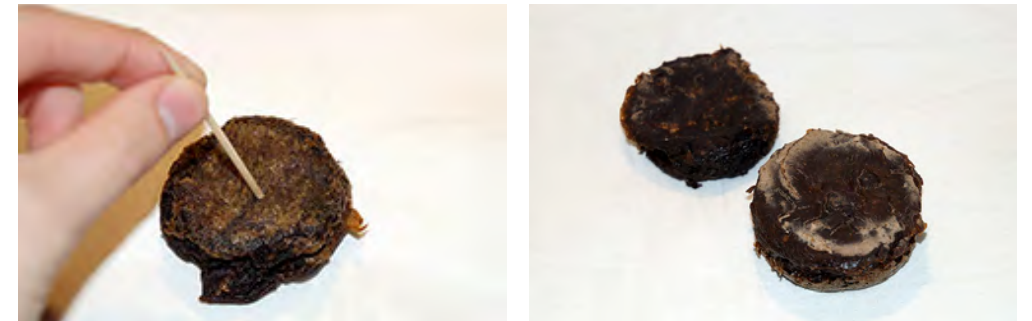
## TO BAKE

Preheat the stove to 130° C. Now put the mold in the stove. The total baking time is 1 1/2 hours. Halfway through the process, take a absorbent cloth and soak up the excess water.



## THE RESULT

Use a skewer to check if the form is firm inside. There may be differences depending on the stove. If necessary, keep the pastry in the stove for an additional 15 minutes. The shape should be solid at the end.





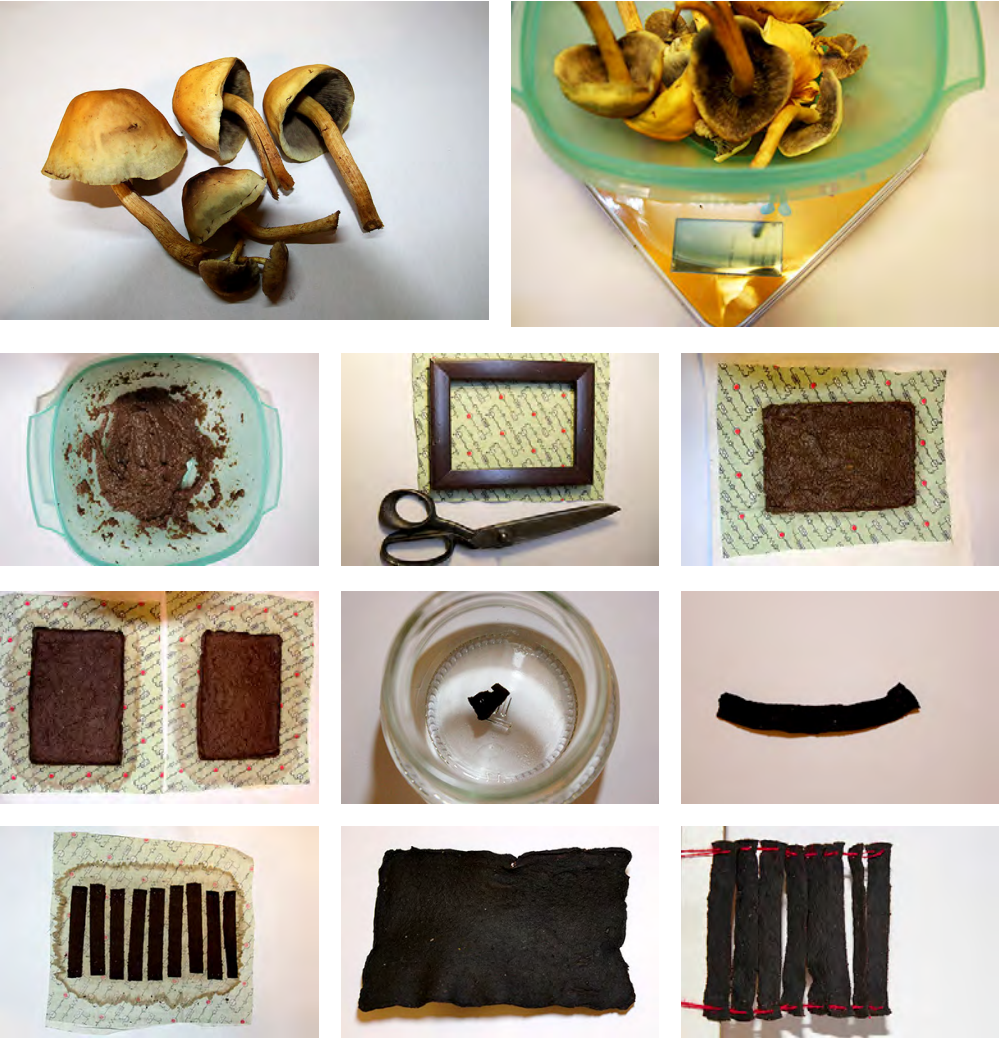
CONCLUSION

In the future, one could continue to experiment with making larger shapes and using them as a replacement for, for example, styrofoam in packaging. Maybe you can also make furniture if it could withstand weights in a larger form. So you can use mushrooms for various things that can replace plastic and other environmentally harmful materials.



EXPERIMENT 2

In experiment 2 we made a material that was processed into thin strips.



## FACTS

Duration: 8 h  
 Difficulty: medium  
 Cost: ca. 10 €

## MATERIALS AND TOOLS

- 110 g sulfur mushrooms
- scale
- blender
- 4 pieces of cotton
- 2 frames
- 2 wooden boards



## PREPARATION

At first collect the sulfur mushrooms in the wood. Then clean it up and mash it. After that put the mixture (110g) in two frames with a cotton piece under anyone. At next take the frames away.



## IN THE STOVE

With a cotton piece over any puree grab it in the stove with 70°C circulating air. Put a wooden spoon between the stove flap and the stove, so there is a gap. After 40 minutes turn around the mushroom pieces for the first time, from now put one of the wooden boards at each of the pieces.

## MUSHROOM STRIPES

Cut one of the Pieces in 1,5x9cm stripes after 1h 40min and prick two holes at each side of them. Let the Stripes stay in the stove for 6 hours to dry, the mushroom board need 1 hour more. At the end connect the stripes with a thread, so you get a small blind.





## THE RESULT

From the beginning to the result the mass shrinks by 20%. But it is a very stable and thin material. Put a little part of the organic mushroom material in the water to test the water solubility.



## CONCLUSION

In our opinion there is a great chance to use a resource which is not needed for anything else. You can use it in different areas, for example the furniture industry.



# LOWPOLY FACEMASKS

## INTRO

The coronavirus SARS-CoV-2 not only has an impact on where and when we are ought to move in public but also defines on how we are supposed to behave while doing so. The World Health Organization recommends to wash one's hands frequently, maintain at least 1m distance to others, avoid touching eyes, nose and mouth and practice respiratory hygiene, meaning covering one's mouth and nose with the elbow or a tissue when coughing or sneezing. Wearing facemasks, although according to the WHO is only necessary if one already feels sick, some believe might help further prevent and slow down the spread of the virus.<sup>1</sup> While the usefulness of people wearing masks in public is debatable it certainly has an impact on how we experience the current situation. Vanessa Friedman argues in a recently published New York Times article, that the surgical facemask has become

*"a symbol of the current confusion and fear, the misinformation and anxiety, generated by the spread of the new coronavirus."*<sup>2</sup>

At the same time the fashion industry has already picked up the trend and we see more and more amendments to the classical design further increasing its role in becoming a fancy accessory symbolizing the present time.

## TASK

Another trend, which independently from the pandemic can currently be observed is a retreat from high resolution and complexity towards more simplistic, reduced shapes and forms, something commonly referred to as lowpoly design. Whilst the necessity for less polygons in a 3D model originates in an effort to decrease render times for game engines, its particular aesthetics have now even made it into the world of car design.

Considering our role and abilities as designers paired with tools in computational design we wanted to explore these two developments, which might have more in common than we think. Using the 3D modelling software Rhino6 each student was asked to design and produce a lowpoly paper mask, similar to those by the company Wintercroft. Things to consider were:

- size and fitting of the mask
- producability using available printers or other means
- uniqueness, individuality and overall aesthetics
- usability, functionality, durability, sustainability

<sup>1</sup> World Health Organization. Coronavirus Disease (COVID-19) Advice for the Public: When and How to Use Masks. [www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public/when-and-how-to-use-masks](https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public/when-and-how-to-use-masks).

<sup>2</sup> Friedman, Vanessa. "The Mask." The New York Times, The New York Times, 17 Mar. 2020, [www.nytimes.com/2020/03/17/style/face-mask-coronavirus.html](https://www.nytimes.com/2020/03/17/style/face-mask-coronavirus.html).



# FRACTAL HEAD

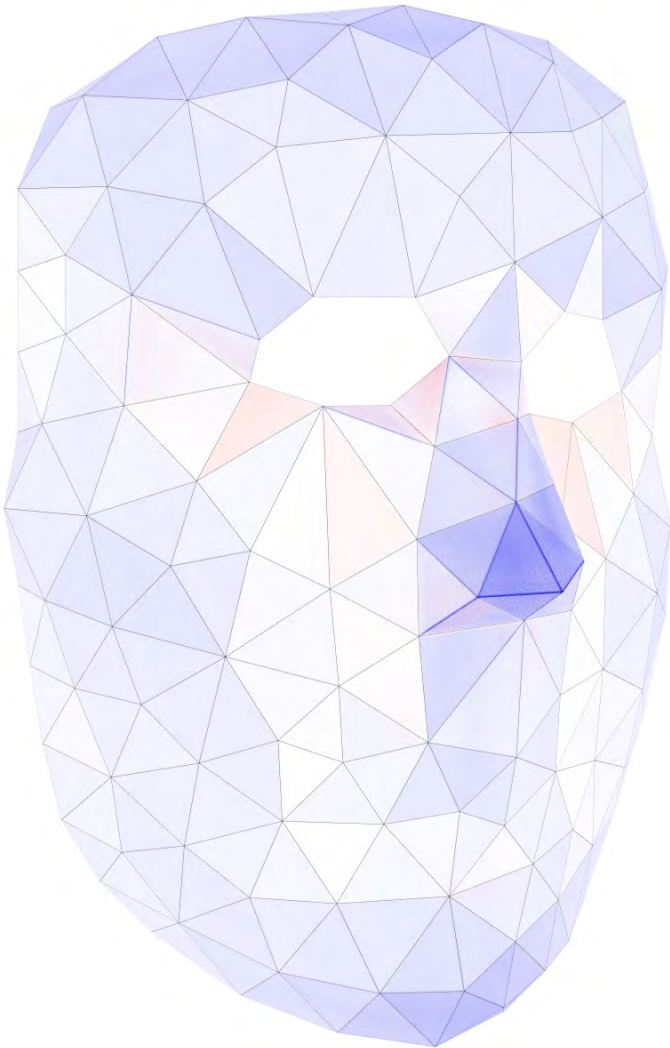
MANUEL KRETZER

## FACTS

Build Time: 2h  
Difficulty: medium

## DESCRIPTION

Print the following pages unscaled at actual size on sheets of A4 paper. Having printed the templates on paper, trim them roughly to the approximate size. Glue the paper sheets onto thin cardboard. Cut the cardboard according to the templates. Score the fold lines marked on templates with something blunt like an old ball point pen. Assemble and glue the pieces following the printed labels.



CUTTING PATTERN DOWNLOAD

<http://materiability.com/wp-content/uploads/2021/10/Fractal-Head.pdf>

# SEKHMET

LARA LENZ

## FACTS

Duration: 2h  
Difficulty: medium

## DESCRIPTION

With the following pages you can create a face mask in the shape of the Egyptian goddess Sekhmet. Sekhmet is said to have many powerful qualities and abilities, among others she was considered the goddess of healing diseases. First print all pages unscaled onto A4 paper. To make the mask more stable, glue all sides on thin cardboard or thicker paper. Then cut out each piece along the outermost line and fold it along the black lines. Finally glue the parts together. Some arrows help you with the first steps and you can orientate yourself by the colours shown below. When you have glued everything together, you can attach a rubber band with the help of a stapler or through holes in the desired place, so that the mask stays on your head.



LOWPOLY FACEMASKS



CUTTING PATTERN DOWNLOAD

<http://materiability.com/wp-content/uploads/2021/10/Sakhmet.pdf>

# WHAT THE DUCK ?!

MAREK RUNDE

## FACTS

Duration: 4-5h  
Difficulty: advanced

## DESCRIPTION

Ruler by air and by sea. Restless travellers between the continents. Superficially calm and invisibly always in motion. Awake and walk in the path of the duck. Leave your old self behind and accept the teachings of the mighty duckling in your heart. Seek the duck, feel the duck, become the duck. The path laid out for you is not an easy one but one full of enlightenment. Merge with nature's spirit to forge an alliance with its forces to face the dreadful invisible airborne enemy. No boundaries and no borders, go wherever you want to go and fly. Lay your fate in the hands of this noble Animal spirit.

### WHAT THE DUCK?!

Everything is different in times of the corona crisis. The relationship with amongst one another and the reality of life has changed significantly. After we all had to stay in our apartments while the weather outside got better and better, we now have to wear masks to protect ourselves and each other from the invisible danger. Emotions and small gestures of kindness disappear behind the protective mask. In these times it is not only difficult to live a normal life, but also to be in a good mood and not to lose your sense of humour. Many of us wonder what this is all about; What the duck is going on? This project has the goal to break through the bitter seriousness of the crisis and face the virus with humour. During the research for this project I have been dealing with what is more or less universally perceived as „funny“ or „witty“. The answer was absurdity.

„What the duck?!“ is a giant duck that people can wear on their head. I recommend a blue or green scarf for the right duck pond look.



CUTTING PATTERN DOWNLOAD

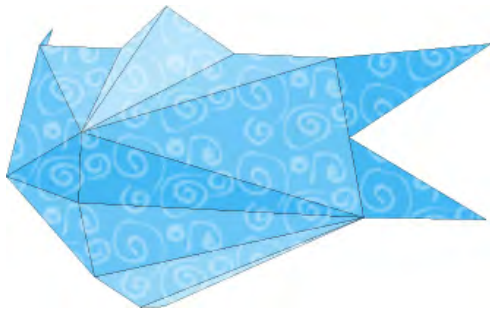
<http://materiability.com/wp-content/uploads/2021/10/Duckmask.pdf>

# AIRY MASK

DENISE MOSER

## FACTS

Build Time: 20min  
Difficulty: simple



## DESCRIPTION

Most conventional masks are tight in the face, making it hard to breathe. As a result, many people are not very happy to wear masks. I would like to help this problem by providing more space in the mouth and nose area. Wearing the mask for a particularly long time becomes much more comfortable. The large hollow space also offers the advantage that the face does not come into contact with the material of the mask. This has a positive effect on the humidity of the air and the material. Thanks to the symmetry of the mask, it is also easy to fold up and therefore good to transport.



CUTTING PATTERN DOWNLOAD

<http://materiability.com/wp-content/uploads/2021/10/Airy-Mask.pdf>





# PINEAPPLE

HENDRIK QUASTENBERG

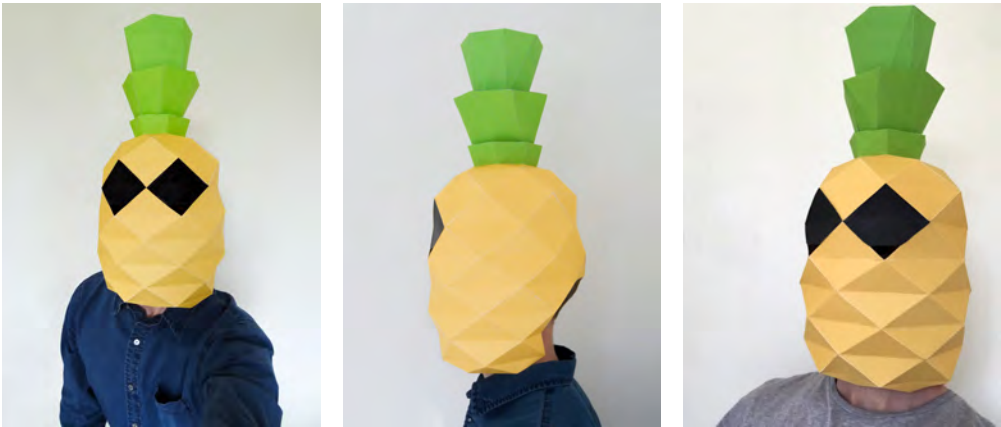
## FACTS

Duration: 5h  
Difficulty: advanced

## DESCRIPTION

Imagine you're walking down the street and see fruits all around you. Wouldn't that be fun? The COVID-19 pandemic has affected us all very hard and therefore it is time to spread joy again. Just build your pineapple mask and have fun while protecting your fellow humans. It is a simple design, but the effect is enormous.

It is intended for single use only. You only need some thin cardboard to reinforce, scissors/cutting tool and glue. Glue the parts on a thin cardboard to reinforce them. Simply cut out the parts with the gluing flaps. Pay attention to the notes and markings on the parts. Pre-bend the parts at the visible edges. Glue them together according to the markings.



CUTTING PATTERN DOWNLOAD

<http://materiability.com/wp-content/uploads/2021/10/Pineapple.pdf>

# CRUSADER

LENNERT RÖDEL

## FACTS

Duration: 2h  
Difficulty: medium

## DESCRIPTION

Wanna look cool and mysterious? No Problem! Just try on this facemask and you will instantly become the infamous crusader in your neighbourhood. The mask also works as protection against droplet infection for your surrounding and yourself. The intention behind the design is, to give the wearer self-confidence trough the dangerous look, even though it also takes some confidence to put it on in public.



CUTTING PATTERN DOWNLOAD

<http://materiability.com/wp-content/uploads/2021/10/Crusader.pdf>

# SMILER

STEFANIE HUTSCHIG

## FACTS

Duration: 2h  
Difficulty: medium

## DESCRIPTION

In times of a corona pandemic, it is important that we show facial expressions, especially a smile. It is difficult not to be anonymous in this crisis. This mask allows you to show a nice smile in the colour of happiness.



CUTTING PATTERN DOWNLOAD  
<http://materiability.com/wp-content/uploads/2021/10/Smiler.pdf>



# PIMP MY SANITIZER

## INTRO

One of the main measures to preventing the spread of infectious diseases is rigorous and frequent hand-washing. However if water and soap aren't available, the next best option, according to the Centers for Disease Control and Prevention (CDC),<sup>1</sup> is to use an alcohol-based hand sanitizer that contains at least 60 percent alcohol. Recent panic buying over the pandemic has led to a worldwide shortage in a variety of household items including toilet paper, soap and also hand sanitizer. As Tom Huddleston Jr. reports, sales of the disinfecting gel have sky-rocketed in the United States of America ever since the first case of COVID-19 hit the country. During the last week of February 2020 U.S. hand sanitizer sales were up by 300% and in the first week of March by 470% compared to the same weeks a year earlier, according to market research from Nielsen.<sup>2</sup>

Luckily, as with many other commercial products, there is a do-it-yourself solution.

## RECIPE

- 2 parts of isopropyl or rubbing alcohol (99 percent)
- 1 part of aloe vera gel
- a few drops of clove, eucalyptus, peppermint, lavender or other essential oil

Pour all ingredients into a bowl, ideally one with a pouring spout like a glass measuring container. Mix with a spoon and then beat with a whisk to turn the sanitizer into a gel. Pour the ingredients into an empty bottle for easy use.

## TASK

During this final exercise we not only wanted to make our own hand sanitizer, following the above recipe, but also design and produce a series of custom-made containers using Rhino6 and its parametric modeling plugin Grasshopper. Each student was asked to develop their own algorithm from which a "family" of similar, yet unique objects could be extracted. From these sets of flasks, which should be able to contain a volume of about 150ml, one each was selected and 3D printed.

Things to consider were:

- ergonomic and futuristic shape of the design
- uniqueness, individuality and overall aesthetics
- ease in handling and refilling
- material cost and print time

<sup>1</sup> Handwashing and Hand Sanitizer Use at Home, at Play, and Out and About, <https://www.cdc.gov/handwashing/pdf/hand-sanitizer-factsheet.pdf>

<sup>2</sup> Jr., Tom Huddleston. "The History of Hand Sanitizer-How the Coronavirus Staple Went from Mechanic Shops to Consumer Shelves." CNBC, CNBC, 28 Mar. 2020, [www.cnbc.com/2020/03/27/coronavirus-the-history-of-hand-sanitizer-and-why-its-important.html](http://www.cnbc.com/2020/03/27/coronavirus-the-history-of-hand-sanitizer-and-why-its-important.html).

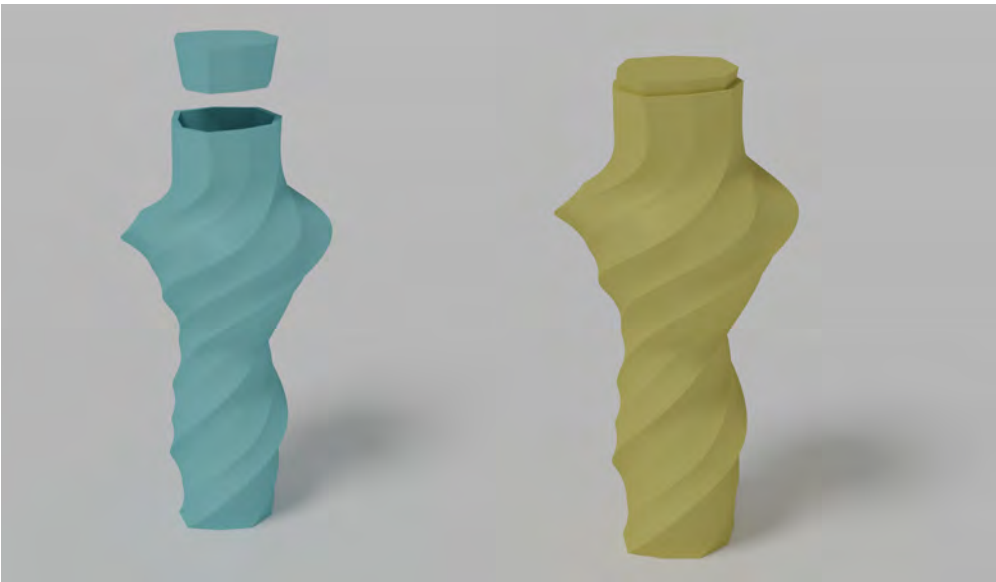


# SWIRLIETIZER

HENDRIK QUASTENBERG

## DESCRIPTION

At the moment it is more than ever necessary to disinfect our hands regularly. But most dispensers are anything but attractive. Thus I decided to design a disinfectant dispenser that should look less technical and medical and at the same time fit well in the hand. The body is constructed from a polyline with 10 points. This line multiplies seven times upwards, varies in diameter and twists with each level into a swirl-like structure.



# STONEMAN

LARA LENZ

## DESCRIPTION

I wanted to design an organically shaped sanitizer that was reminiscent of structures from nature. I came to the final form through much experimentation with the different components in the Grasshopperscript. By changing the graph mapper, a structure developed more or less by chance, which reminds me a lot of the so-called stone men. Stone men are stones stacked on top of each other. The reasons why people stack stones are mainly culturally and religiously motivated. They can be found in many countries in many places, both in water or on land, and most of the time they are supposed to inspire to continue the pile when you find one. For me personally, such stone men have always had a very calming and relaxing effect due to their aesthetics and balance. I find the resulting structure fascinating and beautiful to look at, as it is something that is always repeated, but because of the organic nature of the stones it still doesn't seem as perfect as, for example, a geometric form. After exploring various shapes, I created a sanitizer that reproduces the relaxing effect of the repetitive, but not perfect, organic shape of the stone men, while offering pleasant indentations for easy use and slip resistance.



DESCRIPTION

My sanitizer connects practicality with an unconventional nice look. Because of the slim shape the bottle does not need much room on the side of your sink. The design imitates a calyx. In general sanitizers are something clean, clinical an unnatural. But with my sanitizer I want to give it a natural and organic character. It works as alternative draft to the chemical image of other sanitizers. In cosmetics often fruits and flowers are used to create a mood of freshness and nativeness, which explains the chosen special form.



DESCRIPTION

Power Plant is a plant based disinfectant, that comes in a cute little cooling tower. The corners created by the polygon base make it easy to pour out the contents. Because there are always two edges parallel to each other, many of the small towers can be placed next to each other, which not only looks good, but is also practical when packing larger quantities. Due to the large footprint and the upwardly tapering shape, Power Plant stands securely without looking clunky. The convex curves, which make the tower waist give the design a certain lightness and present a contrast to the angular base. In addition to the design, practicability is also important, which is why the edges provide a good grip. The large flat surface is easy to keep clean from bacteria and germs. The additional lid has a small rim and prevents the disinfectant from escaping or evaporating.

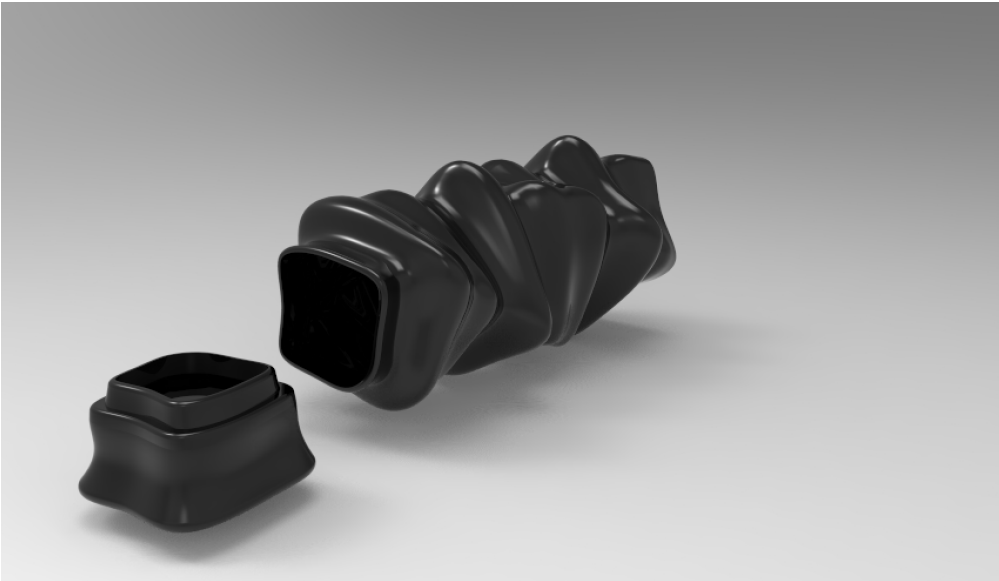


# CALMING STONES

DENISE MOSER

## DESCRIPTION

This abstract-looking bottle for a sanitizer, was designed to fit the hand well. The curves on the bottle make it easy to hold in both dry and wet conditions. The cap has also been designed to give the fingers a good grip with its curved, concave shape. It is worth noting that the shape is reminiscent of river stones stacked on top of each other. This shape has a calming effect, which additionally underlines the safe feeling of the sanitizer during the corona pandemic.



# QUADRUM

STEFANIE HUTSCHIG

## DESCRIPTION

This sanitizer bottle impresses with its minimalistic and practical design, which gives seriousness and safety. What is more important than practicality in times of corona virus? In addition, the bottle looks very chic with its simple lid, which is easy to use due to a knob.



# HANDS-FREE DOOR OPENER

## INTRO

The current situation, being exposed to a formerly unknown, globally spreading virus, has forced us to quickly adapt to a number of new habits. We are encouraged to maintain a minimum distance of 1.5m from each other, wash our hands frequently, use disinfectants and sanitizers, wear facemasks wherever possible, sneeze and cough in our arms and ventilate closed rooms regularly. These measures are effective in helping us to reduce the risk of spreading the virus from one person to another.

However COVID-19 can also be transferred through surfaces and objects, where - depending on the material - it can last from several hours up to a few days. Door handles are amongst the most germ-infested objects and research shows contamination of just a single doorknob can cause the spread of germs throughout office building, hotels, schools or health care facilities within hours.<sup>1</sup> By using one's elbow or arm instead of the hands, the dissemination of germs can be effectively reduced. A hands-free door opener is one solution to remove the need for direct contact.

## TASK

Considering our role and abilities as designers paired with tools in computational design and digital fabrication we wanted to provide our own solution to address this problem. Using the 3D modelling software Rhino6 each student was asked to design and produce a hands-free door opener with an internal diameter of 20mm to fit on round door handles.

Things to consider were:

- ease of production and amount of material needed
- ergonomics and functionality
- simplicity of assembly and application
- durability, sturdiness, uniqueness, individuality and overall aesthetics

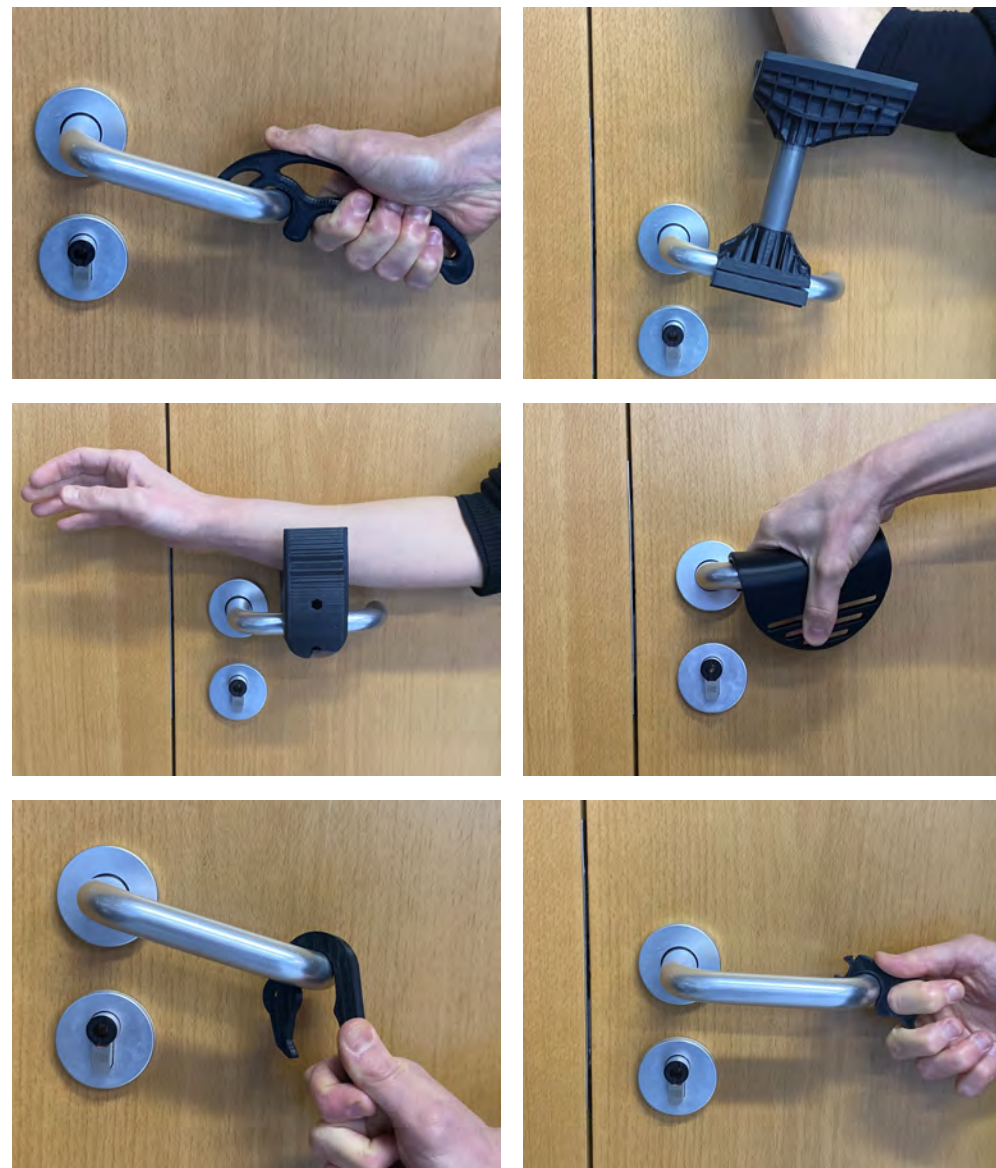
<sup>1</sup> Agata Blaszczyk-Boxe, One germ doorknob can infect half your office within hours, CBS News, September 8, 2014. <https://www.cbsnews.com/news/one-germy-doorknob-can-infect-half-your-office-within-hours/>

DOWNLOAD 3D PRINTER FILES

<http://materiability.com/wp-content/uploads/2021/10/handsfree-dooropener.zip>



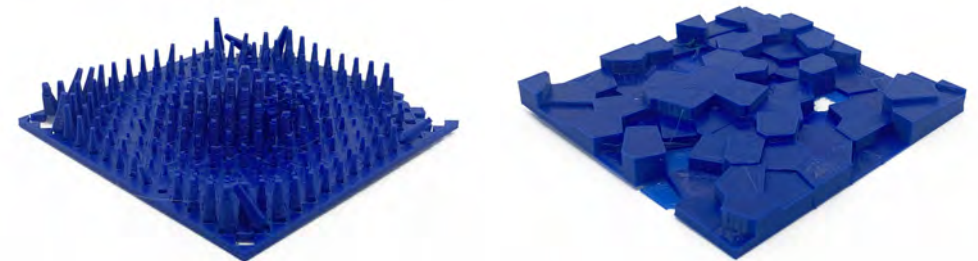
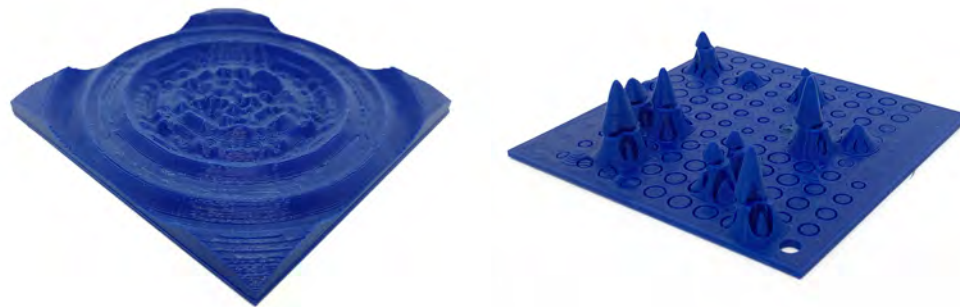
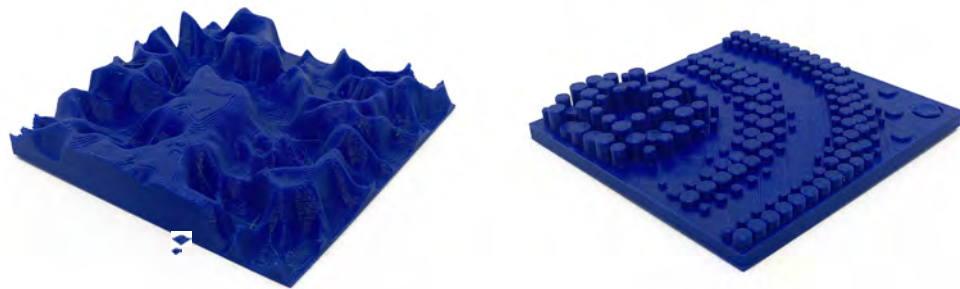
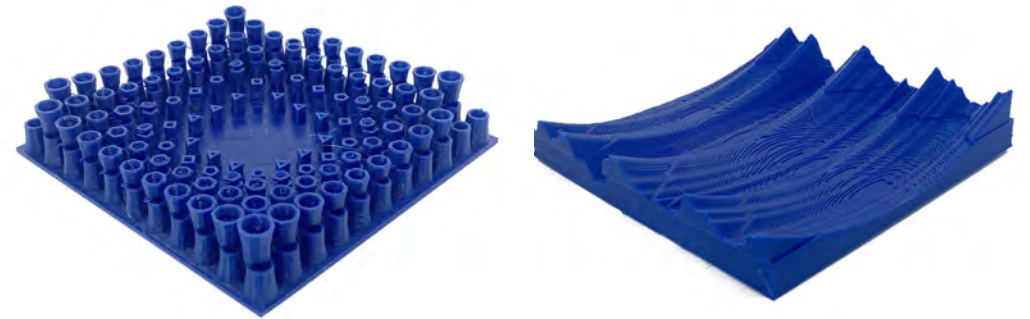
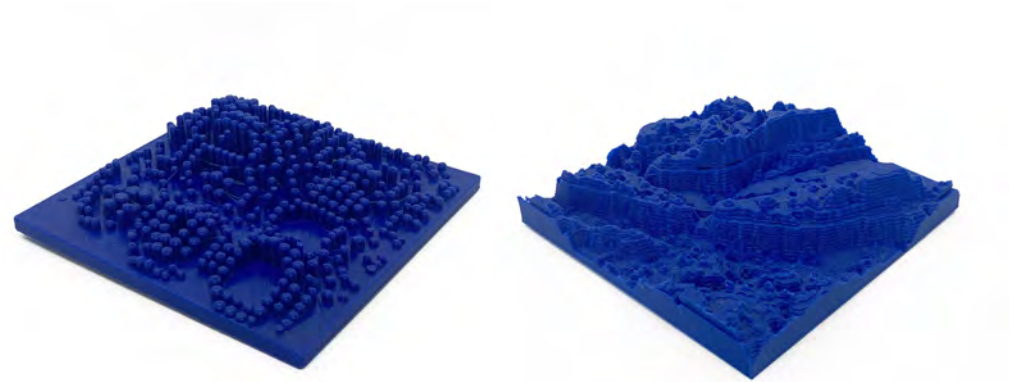




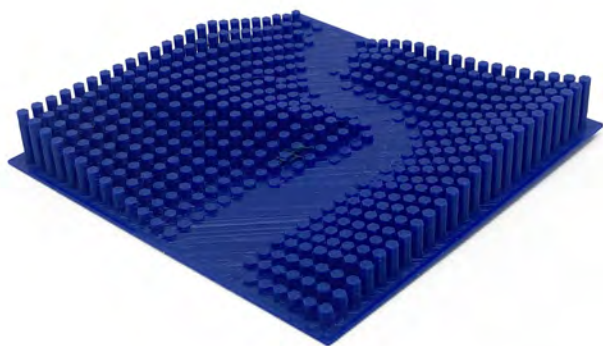
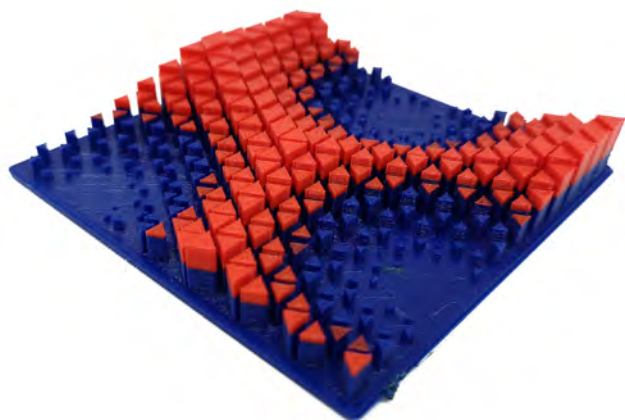
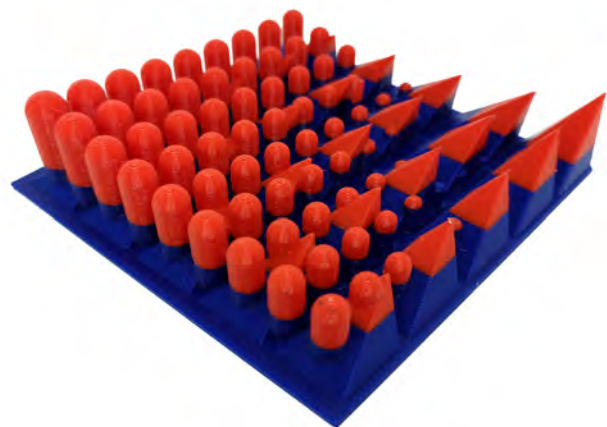
# ORGANIC TILES

## TASK

Due to the current situation we are forced to spend an increased amount of time indoors. Using the novel possibilities of parametric design we wanted to bring some of Nature's complexity back into the private space through organic tiles. Using Rhino and Grasshopper, each student was asked to create a set of three-dimensional patterns, which were 3D-printed.







Never before have self-sufficiency  
and education been so important,  
and they are virtually inseparable  
from survival.

William Powell,  
The Anarchist Cookbook, 1971



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