FUTURE FOOD HACK

JIMMY TANG

PREFACE

Eating is the most fundamental basic necessity after breathing. How do we envision feeding ourselves in the future?

The growing population and climate change have made us rethink what we eat and how we generate our food. The world's population will grow to more than 9 billion by 2050. Growing global populations and rising incomes will drive food prices higher by 40-50% (Winterman 2012). Further, because of environmental changes, we may experience a global food shortage in the near future. Floods and droughts are expected to become more frequent. Climate change is already having a domino effect on food and the nutritional security for the world's poorest and most vulnerable people (Vidal 2013). We must rethink over how we allocate our resources to produce food; we are entering a new generation of radical farmers, novel foods and innovative ideas.

Consumer demands also have a significant impact on how our food is made. There has been an explosion of consumer interest in the active role of food in well-being and life prolongation, as well as the prevention of chronic diseases (Granato 2010). Foods have become vessels of nutrients and curative substances; strong consumers' desires to eat healthy have encouraged manufactures to think of additional ways to invent novel foods with health benefits (Ohr 2003).

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1.

FOOD NOW. FOOD FUTURE.

HEALTHY FOOD

CONSUMER DEMAND

Consumers have become conscious of the correlation between diet and health. Some studies show that consumer acceptance of health-enhancing products is conditional on the specific health benefit claimed by manufacturers. Most people obtain information about diet and health from the media. These outlets get much of their information from research publications, experts, and the public relations representatives of food and beverage companies. (Nestle 2007). Although foods contain hundreds of nutrients and other components that influence health and people eat diets that contain dozens of different foods, reporters rarely discuss study results in their broader dietary context (Krebs 2013).

News sources and researches are putting a huge emphasis on single nutrients or so-called 'superfoods'. A story about the benefits of single nutrients can be entertaining, but "eat your veggies" is old news. It is easier to study the effects of vitamin E on heart disease risk than it is to try to explain how current dietary patterns are associated with declining rates of coronary heart disease (Hobbs 2014). Also, research on the effects of single nutrients is more likely to be funded, and the results are more likely to gather headlines, especially if they conflict with previous studies (Nestle 2007).

Furthermore, political issues play a significant role on our diet. Since dietary advice affects have a direct correlation to food sales, food and beverage companies demand a favorable regulatory environment for their products (Hobbs 2014). Food companies hold a strong power on influencing the decision of what people should eat and whether a given food is "healthy". Companies do this by spending millions of dollars lobbying in Washington; for instance the legislature surrounding the controversial subsidies of corn production (Nestle 2007).

INDUSTRY RESPONSE

New food technologies have enabled food manufacturers to craft and market health-improving food products with strong consumer appeal. Manufacturers are now taking advantage of the results of single-nutrient research to claim products containing the beneficial nutrient promote health. The health foods sector is now characterized by two broad categories of products: functional foods and nutraceuticals. The global market for the health foods sector in 2011 is estimated at US$151 billion, with the sector forecasted to grow to around US$207 billion by 2016 (Hobbs 2014).

The term functional food has become a fairly widely accepted term to describe enhanced foods. Functional food usually refers to food that is intended to be consumed as part of a normal diet and contains ingredients that have the potential to enhance human health or reduce the risk of disease beyond basic nutritional functional (Nestle 2007).

Nutraceuticals, also known as food supplements, or natural health products, are products that have been isolated or purified from food and may include ingredients such as amino acids or vitamins that are often marketed in the form of pills, powders, capsules or tablets. Nutraceuticals and supplements are intended to have a physiological benefit or to provide protection against chronic disease (Hobbs 2014).

2050

GROWING POPULATION

About six new babies are born in every second, so the world's population is increasing at about 180 mouths per minute. By 2050, the world's population is excepted to grow to more than 9 billion. The expanding human population may run up against environmental limit (Krebs 2013). Studies suggest up to 200 million more food-insecure people by 2050 or an additional 24 million malnourished children (Vidal 2013).

According to the United Nations we will have to nearly double our food production, and adopt new technologies to avoid waste. The oceans are now overfished, and much of the world faces growing water shortages. Climate change will only make farming harder to grow food in most places (The Observer 2012). Food, farm, and water technologists are finding new ways to grow more crops in places that, until now, were hard or impossible to farm. We must rethink over how we use land and water, and create a new generation of radical farmers, novel foods and innovative ideas.

CLIMATE CHANGE

It is now generally accepted that human activity, particularly burning fossil fuel with resulting release of carbon dioxide, has changed the composition of the Earth's atmosphere. The result being, the average global temperature is increasing. Climate models, based on an understanding of the underlying physical processes, predict that the average global temperature will rise by at least two degrees Celsius by the end of the 21st century. Possibly by much more if greenhouse gas emissions are not curbed (Krebs 2013).

Man-made climate change is also likely to result in a greater frequency of extreme weather events such as floods and droughts. Because of the climate changes, we may experience a global food shortage in the near future. Climate change is already having a domino effect on food and nutritional security for the world's poorest and most vulnerable people. Far more people are living in places with a higher climatic risk; 650 million people now live in arid or semi-arid areas where floods, droughts and price shocks are expected to have the most impact (Vidal 2013).

At the start of the 21st century agriculture and changes in land use accounted for about 25 percent of global greenhouse gas emissions. . If nothing is done to reduce the agricultural contribution, by 2050, it could account for more than 75 percent. Changes in land use are an important contributor to agricultural emissions, especially chopping down forests to make way for crops. This releases large amounts of carbon that have been stored in the trees and soil into the atmosphere. In short, whatever methods are deployed to increase food production will simultaneously need to reduce greenhouse gases if we are to curb climate change (Krebs 2013).

2.

FOOD FUTURISTS

MARIJE VOGELZANG

The world "needs a food revolution" according to designer Marije Vogelzang.

Marije Vogelzang is a Dutch eating designer who runs her own food-design laboratory, Proef. She is the director of the Food Non Food department at Design Academy of Eindhoven. She is a pioneer of applying a design-driven approach to food. According to Vogelzang, there is so much wrong with food at the moment and so much going on in the world of food that we need designers to start working on this in a serious way (Fairs 2014).

One of the key projects from Vogelzang is Fake Meat. Fake Meat started as a Vogelzang's reaction to the meat substitute products that can be found in supermarket. In her opinion, tofu can be made in the form of cutlets that, with the addion of spices and are hardly distinguishable from the meat versions. She fantasized about the possibility of bringing food design and animal design close together (Vogelzang 2011).

She partnered with Katja Grunters and made a series of food products in response to meat substitutes. Each product was referred to a new species animal that does not exist. Vogelzang also coupled a fictional story about its life and natural habitat. One of them, for example, lives in volcanoes and has a slightly smoked taste to its flesh. It also has a stiff tail that is highly suitable as a party snack (Vogelzang 2011).

HOMARO CANTU

Homaro Cantu was an internationally recognized chef in the field of postmodern cuisine and an inventor of futuristic food delivery systems. Cantu was known for his use of molecular gastronomy and his innovations including: edible paper, ultra efficient indoor farm, and the use of miracle berry. He was the executive chef at Moto restaurant in Chicago where he melded food with science, technology, and art to create a unique dining experience (Wells 2015).

Cantu used technology to change the way people perceive and eat food. One example is his invention of edible photos. Cantu printed images of food on pieces of edible paper made of soybeans and cornstarch. The paper was fed through a inkjet printer filled with inks made out of food. It was then brushed with powdered seasonings to give it whatever taste Cantu wished to convey (Bernstein 2005).

Cantu installed the world's first ultra efficient indoor farm at Moto Restaurant, as he turned Moto's old office into a high-tech underground farm. He began with installing spinning towers of vegetables that thrived from the nourishment of Moto's very own fermented compost tea. Then he adopted vortex aerators that allowed the growth of a remarkable amount of fruits and vegetables, as well as micro-greens (Cantu 2013). The indoor farm was designed to eliminate food mile, and it provided a innovative way for sustainable agriculture in an urban environment .

NIKHIL ARORA & ALEJANDRO VELEZ

Nikhil Arora and Alejandro Velez are the cofounders of Back To The Roots. Back To The Roots offers 'ready-to-grow' products such as Grow-Your-Own Mushroom Farm, AquaFarm, and Garden In A Can. Their mission is to make food personal again and inspire families to ask "where does my food come from?"

Grow-Your-Own Mushroom Farm is a certified organic oyster mushroom growing kit. It provides a quick and easy way to grow fresh, gourmet food at home. The kit includes agricultural plant-based organic waste products together with oyster mushroom spawn. Users can harvest their first crop in as little as ten days and grows multiple crops using the same kit.

AquaFarm is a desktop aquaponic system that creates a closed-loop ecosystem right inside your home. The double-decker combination of garden and fish bowl creates a symbiotic ecosystem. In the top tray, basil, mint, spinach, baby greens, and other edible plants thrive as nutrient-rich water is circulated past their roots. That process purifies the water, which is then sent back to the 3-gallon tank below, creating a happy, healthy habitat for a pet fish.

3.

FUTURE FOOD HACK

FUTURE FOOD HACK

Future Food Hack is a series of DIY kits that experiment with new forms of food as well as new ways of agriculture. It encompasses the different aspects of future food, including functional food, techno food, soilless culture, symbiotic system and microbial cultivation. It aims to create a dialog on the question: how do we envision feeding ourselves in the future? The project began as my investigation of what our food has become and explores the future of our food. I adopted the findings to construct five kits that enable users to explore the topic of the future of our food through interactive experiences. It includes a fiber burger kit, a gluten-free snack kit, a soilless incubator kit, a wearable growing device kit, and Spirulina cultivation kit. Inside each kit ingredients and essential equipment for making an edible product are provided. Users are encouraged to utilize the materials creatively and construct their own versions of future food.

4.

FIBER FUL

FUNCTIONAL FOOD

A functional food is a food-based product with additional function by adding new ingredients or more of existing ingredients. This class of foods for specific health uses was originally designed to assist in the prevention and treatment of disease or to enhance and improve human capacities. They include products such as vitamin-fortified cereal, milk with added Vitamin D, iodized salt, and eggs enhanced with extra omega-3 fatty acids (McWilliams 2001).

Although the benefit of a healthy diet is due to the collective presence of many nutrients, there is a considerable ongoing focus toward research aimed at how individual nutrient can contribute to health benefits. Food companies are taking advantage of single-nutrient research to make claims that improve the marketability of foods; labeling them as 'healthy'. It has been shown that isolated ingredients in laboratories do not function in the same way they do in whole foods. The Center for Science in the Public Interest warns that too often food manufacturers claim about functional ingredients are "misleading and unsubstantiated by scientific evidence" (Nestle, 2001).

EXAMPLES OF FUNCTIONAL FOOD

Vitamin D Milk

Vitamin D deficiency causes bone softening, which leads to rickets in children and osteomalacia in adults. Few foods naturally supply this vitamin which aids in the absorption of calcium in the intestine. The United States population is largely dependent on fortified foods and dietary supplements to meet these needs. For example, most milk produced commercially in the United States is fortified with vitamin D (Calvo 2004).

Iodized Salt

Iodized salt is sodium chloride that fortified with a small amount of iodine. The American diet lacks many of the naturally occurring sources of iodine such as seaweeds, shellfish, and certain seafoods. Since over 90% cases of goiter are caused by iodine deficiency, iodized salt can greatly prevent goiter and other thyroid gland problems (Harvard Health Publications 2009).

Added Dietary Fiber

Dietary fiber aids in the elimination of waste and toxic materials; it reduces your risk of colon and rectal cancers. It is also essential in preventing and treating illnesses such as varicose veins, phlebitis, diverticulosis, heart disease, bloating, constipation and abdominal pain. Most average American diets only include about 10 grams of fiber daily, which is, less than half the amount recommended by the National Cancer Institute, which recommends 25 to 30 grams of fiber daily (Philadelphia Tribune 2010).

As emphasis on fiber in the diet has increased, the food industry has rallied its efforts to develop numerous products with increased fiber content. Fiber has emerged as a functional food favorite; it can be found in some unexpected places - ranging from yogurt, cottage cheese and ice cream to cookies, toaster pastries and snack bars. We can even drink fiber, as consuming fiber-fortified juices, powdered drink mixes and bottled waters, or sprinkling packets of Splenda with fiber in coffee (Helm 2009).

FIBERFUL

Fiberful is a kit for making a handcrafted hamburger patty that contains the full recommended daily intake amount of dietary fiber. The kit provides all the dry ingredients to make a fiber-packed hamburger patty at home. The kit includes various dried herbs, seasonings, and wheat dextrin (a soluble dietary fiber).

Fiberful explores and challenges the concept of functional food; it is aimed to inspire the audience to question if novel food products with enhanced health benefits is the future of our food. Is consuming a high-fiber food product equal to eating fiber-rich fruit and vegetable?


FI
FIBERFUL


ALLIUM CEPA
TRITICUM AESTIVUM DEXTRIN


SODIUM CHLORIDE
ALLIUM CEPA
OCIMUM BASILICUM
ORIGANUM VULGARE
PIPER NIGRUM
CAPSICUM ANNUUM
THYMUS VULGARIS
ALLIUM SATIVUM
TRITICUM AESTIVUM DEXTRIN


ALLIUM CEPA
CAPSICUM ANNUUM
THYMUS VULGARIS

FIBERFUL TUTORIAL

1. For making the fiberful burger patties, you will need ground meat (beef, pork, chicken, or turkey) or meat alternative, and an egg.

2. Place a desirable amount of ground meat and the egg in a large bowl.

3. Put 20g of Triticum aestivum Dextrin, Piper nigrum, Sodium chloride and other seasoning in desirable amount.

4. Combine all the ingredients..

5. Form the mixture into a patty.

6. Lightly oil a non-stick skillet; fry the patty for about 3 to 4 minutes per side, or until cooked through. Be careful when turning it.

7. A high fiber burger patty is made.

8. Prepare other ingredients; slice cheese and tomato.

9 . Serve on bun with tomato and cheese.

10. Enjoy.

5.

PAPIER

TECHNO-FOOD

Marion Nestle's Food Politics coins the term 'techno-food'. Techno-food are foods and beverages that have been constructed to confer health benefits beyond the nutritive value of the food themselves by adding nutrients or other supplements or by subtracting undesirable components. Techno-food includes "lesser-evil" foods that have been formulated to be low in calories, fat, sugar, salt, caffeine, or allergens. Techno-food often contains artificial substitutes for unwanted ingredients such as sugar and fat.

However, the techno-food approach may miss the point that the best health outcomes are associated with good dietary patterns that follow recommendations. Since messages to eat less fat and sugar are so well recognized by the public, potato chips, sugared cereals, and candies can appear to be healthful because they are low in fat or contain added vitamins or minerals.

As a result, techno-food may lull consumers into a false concept of nutrition by just eating or avoiding one or another single food. The food market has been flooded with exaggerated claims and products of dubious benefit. Many "nutritionally enhanced' foods are marketed as low in fat, cholesterol, salt, or sugar, or as higher in fiber, calcium, or vitamins (McWilliams 2001). Such products as non-fat cookies, vitamin-enriched cereals, and calcium-fortified juice drinks, contain a large amounts of sugar, 10 - 20g per serving.

EXAMPLES OF TECHNO-FOOD

Gluten -Free Products

A gluten-free product is a product that excludes gluten, a protein composite found in wheat and related grains including barley and rye. Some people believe that there are health benefits to a gluten-free diet. However, there is no published experimental evidence to support such claims. Yet, for those diagnosed with celiac disease, eating gluten-free is the only medically-accepted treatment. In order to produce gluten-free products, manufacturers may substitute wheat with other gluten-free grains, such as rice, quinoa, or buckwheat. Additives are often used in gluten-free baking, in order to give a more fluffy texture, such as xanthum gum, guar gum, and hydroxypropyl methylcellulose.

Trans Fat-Free Products

Trans fats are a type of unsaturated fat which are uncommon in nature but became commonly produced industrially from vegetable fats for use in margarine, snack food, packaged baked goods, and frying fast food. Researches have shown that artificial trans fats can increase the risk for heart disease by increasing "bad" LDL cholesterol and decreasing "good" HDL cholesterol. Food manufacturers that used the unhealthy fats have scrambled to find alternatives so they can boast of their new "trans-fat-free" foods. For example, the spread section of supermarkets are now filling with many brands of lighter margarines and those reduced in trans fatty acids. Light margarines are a stabilized mixture of oil and varying amounts of water. Trans fat-free margarine are made from vegetable oils that have not been hydrogenated. The mixtures are not particularly stable and these product cannot be used in standard recipes for cooking and baking.

PAPIER

Papier is a kit for making gluten-free, low calories snacks. The snacks are made from an all-natural vegan ingredient. It is also sugar-free and fat-free. The kit includes edible rice papers, edible color makers, and a circle shape template. Users can create low calories snacks by tracing the template and cutting the desirable shapes from the edible paper.

Papier is aimed to push the boundary between real food and food-like products, while criticizing the phenomenon of techno-food. It illustrates an extreme case of techno-food; food-like products with no significant nutritional value that can still be labeled as healthy.


PA
PAPIER

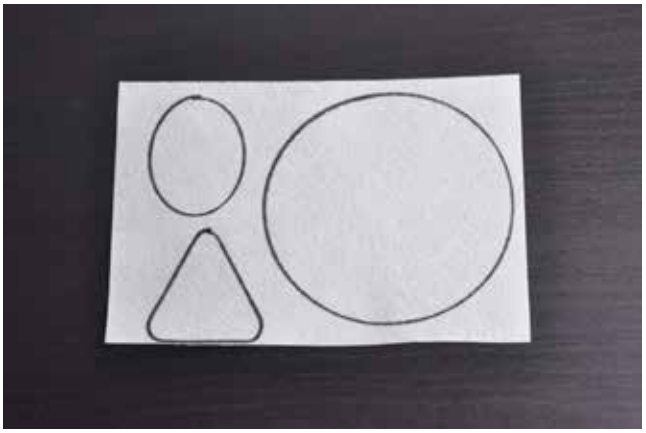

EDIBLE PAPER


After use, wipe tip with a clean paper towel.
Luego de usar, seque la punta con una toalla de papel.
MANUFACTURED FOR/FABRICADO PARA WILTON INDUSTRIES, INC.
BY/POR PRIVATE LABEL PRODUCTS, INC.
After use, wipe tip with a clean paper towel.
Luego de usar, seque la punta con una toalla de papel.

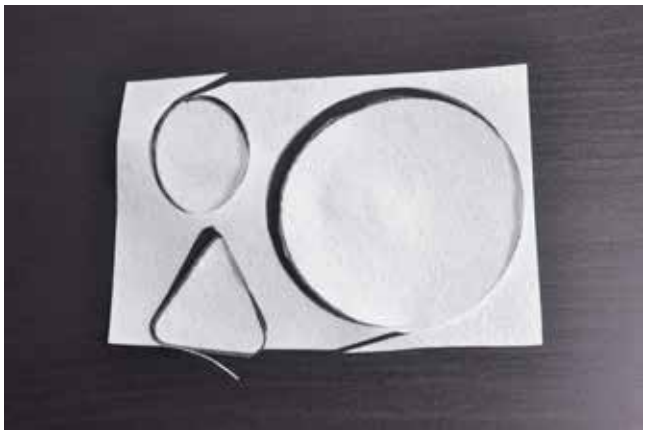
PAPIER TUTORIAL

1. Take out one piece of edible paper.

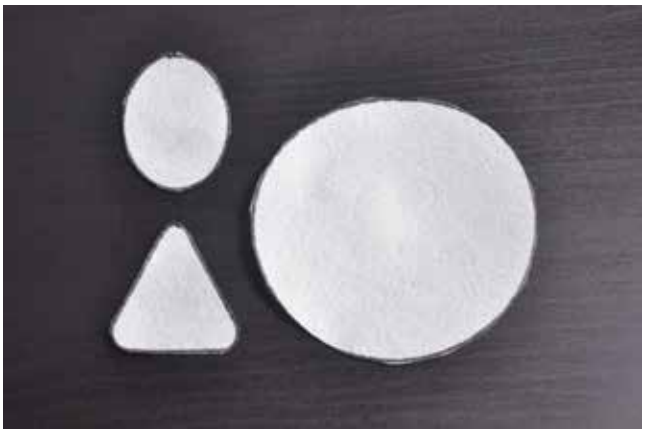
2. Place the template on top of the paper.



3. Trace the shapes with a edible maker.



4. Cut out the shapes.



5. Low-carioles, gluten-free snacks are made.

6.

AGARA

SOILLESS CULTURE

Agriculture is among the greatest contributors to global warming; emitting more greenhouse gases than all our cars, trucks, trains, and airplanes combined. Agriculture is the thirstiest user of our precious water supplies and a major polluter. Runoff from fertilizers and manure disrupts fragile lakes, rivers, and coastal ecosystems across the globe. We have cleared areas of grassland and forest for farms. We have already cleared an area roughly the size of South America to grow crops. Trading tropical forest for farmland is one of the most destructive things we do to the environment. Agriculture is a major driver of wildlife extinction as we destroy their natural habitat. Agriculture's footprint has caused the loss of whole ecosystems around the globe (Foley 2014). We can no longer afford to increase food production through agricultural expansion.

Soilless production has been adopted by the agriculture industry to increase production. Soil was replaced by various substrates, such as stone wool, polyurethane, perlite, scoria and so on. Since they are virtually free of pests and diseases due to their manufacturing processes, they become ideal substitutes. Also in reuse from crop to crop, these materials can be disinfested between uses to kill any microorganisms. This shift to soilless cultivation is also driven by the fact that, in soilless systems it is possible to have better control over several crucial factors, including physical and hydraulic characteristics, and nutrient availability, leading to greatly improved plant performance (Raviv 2008).

EXAMPLE OF SOILLESS CULTURE

Hydro-ponic

Hydroponic refers to the cultivation of plants by placing the roots in nutrient-rich solutions, instead of soil. All nutrients are supplied directly to the plant through static, continuously aerated nutrient solution, a continuous flow, or mist of nutrient solution. The growing medium can be inorganic substances (such as sand, perlite, gravel, rockwool) or organic matters (such as peat, bark, coir or wood fiber). With hydroponics, crops can be grown in areas where no suitable soil exist, or where the soil is contaminated. Hydroponic systems can also conserve and reuse water and nutrients, thus leading to a reduction in water usage and pollution of land and streams.

AGARA

Agara is a kit for constructing a plants growing incubator that is designed for growing food in a soilless environment. With Agara, users can germinate and sprout various seeds inside sterile test tubes. It includes various types of seed and all the ingredients for making an agar growth medium. It provides an innovative perspective on raising food other than through conventional agriculture.

In Agara, the user can reimagine the ways we generate food through soilless culture. It also provides a very minimal way to grow food in a small and enclosed environment. Agara aims to create a change in awareness affecting individual habits and indirectly impacting how we interact with agriculture.


AG
ASARA


TRITICUM AESTIVUM
X AMARANTUS SATTIVUS


SALVIA HISPANICA
GLYCINE MAX
TRIFOLIUM PRATENSE
AGAROSE

AGARA TUTORIAL

1. Mix 5g of agarose with 100 ml of hot water.

2. Take out a test tube.

3. Pour the agarose mixture inside the test tube. Wait until it solidifies.

4. Place a seed inside the test tube, using a tweezer.

5. Wait until it grows and start harvesting.

7.

SKIN SEED

SYMBIOTIC SYSTEM

Symbiosis comes from two Greek words that mean “with” and “living.” Symbiosis describes close interactions between two or more different species. It is different from regular interactions between species because, in a symbiotic relationship the two species in the relationship live together. Many organisms are involved in symbiotic relationships because this interaction provides benefits to both species. In agriculture, there are many examples of symbiosis. For example, mutualistic relationships are established between food crops and livestock, as livestock fertilizes crop plants and crop plants become feeds in return (Moore 1988).

Some designers and artists are also currently working with the concept of future farming by establishing a symbiotic relationship directly with our food. Michael Burton and Michiko Nitta are two designers who look at food sources of the future in a new way. They have a strong interest in farming on the human body. They speculate on the future of humans and our mutually beneficial interactions with bacteria, algae ,and biological systems. Their Algaculture proposes that humans become like plants, receiving nourishment from photosynthesis. The algal suit is a tubular exoskeletal network of veins that intersects with the body to become a wholly new organ. In another version, Near Future Algae Symbiosis Suit, a tubular mask is worn on the face, as user can inhale the oxygen released from the live algae culture. Algae and humans have mutual benefits in these systems, existing symbiotically (Schwartzman 2014).

EXAMPLES OF SYMBIOTIC SYSTEM

Aqua-ponic

Aquaponics is a term describing the integration of aquaculture and hydroponic techniques in a symbiotic environment. Aquaponics utilizes the fish wastes that commonly accumulate and cause problems in aquacultural systems. In an aquaponic system, water from an aquaculture system is fed to a hydroponic system where the by-products are broken down by nitrification bacteria into nitrates and nitrites, which are utilized by the plants as nutrients. The water is then recirculated back to the aquaculture system (Storey 2009).

C.E.L.S.S.

Scientists and engineers within NASA are conducting research that will lead to the development of advanced life-support systems that utilize higher plants in a unique approach to solving long-term life-support problems in space. NASA's Controlled Ecological Life Support System (CELSS) is a system that would provide basic and continuous life-support requirements, including food, drinking water, and breathable atmosphere, by using plants as the central recycling component. Higher plants in CELSS will be utilized in food production, recycling carbon dioxide to oxygen, and purifying water when concerting with microbial systems. It also breaks down human wastes and integrates the processed products back into the ecological system (Chamberland 1992).

SKINSEED

Skinseed is a kit for making a wearable device that allows for growing food directly on our skin. The device has an absorbent layer that captures moisture and heat from our body and the seeds are placed inside. It also includes an adhesive coating that can bond to our skin and securely seal the seed patch. It is aimed to explore the possibility of establishing a symbiotic relationship between the human body and the food we eat.

Skinseed allows us to work with our physical body to generate food. It prompts the audience to rethink our relationship with our food. With Skinseed, we can draw the relationship closer to us by completing the cycle of the food chain on our skin.


SK
SKINSEED


TRANSPARENT DRESSING
GAUZE SPONGE
SUCROSE
MEDICAGO SATIVA

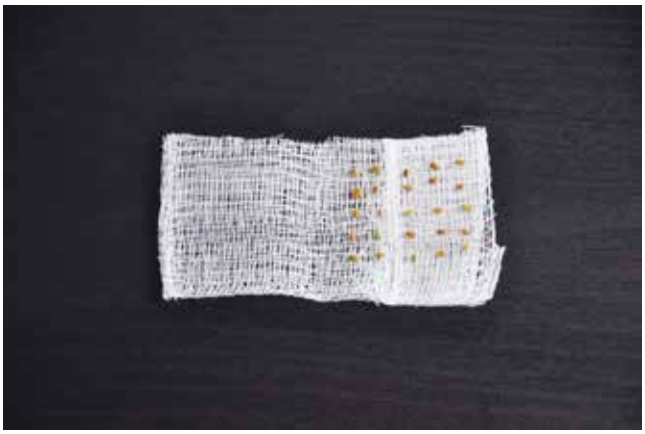

SUCROSE

SKINSEED TUTORIAL

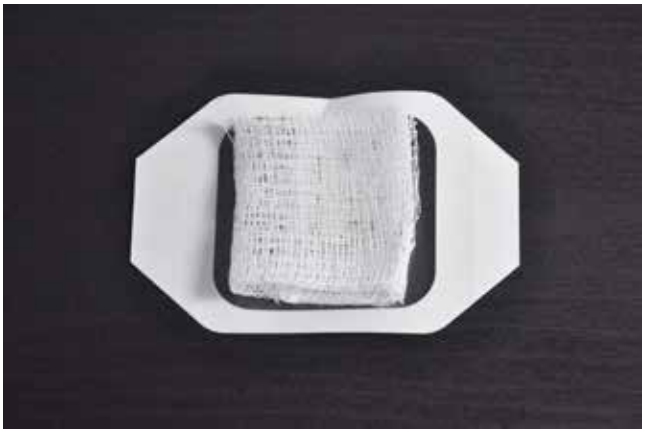
1. Cut a gauze sponge into a 1.5 inch square.

2. Take out a transparent dressing.

3. Peel away the cover of the dressing.



4. Place 10 - 15 Medicago sativa in between layers of the sponge, using a tweezer.



5. Place the sponge onto the middle of the dressing.

6. ill the dropper with water, and mix in some sucrose.

7. Drop a few drops of sucrose mixture onto the sponge.

8. A wearable food growing device is made. It is ready to be placed onto your skin.

8.

SPIRU BREW

SPIRULINA

Spirulina is a cyanobacterium that can be consumed by humans and other animals. It is now expected to become a “food of the future”, as it is packed with high quality nutrients. Spirulina contains a high amount of protein; over 60% of the dry body weight and all 9 essential amino acids that a human body needs. It is considered as one of the fastest reproduced protein sources in the world. According to the USDA, Spirulina also contains significant amounts of calcium, niacin, potassium, magnesium, B vitamins and iron. Furthermore, Spirulina contains a medicinally active ingredient, β -carotene, which might have potent antioxidant and anti-inflammatory activity. (Schafer 2002).

With optimal conditions Spirulina can double every 24-48 hours. Spirulina is a cyanobacteria that obtains its energy through photosynthesis. It has a photosynthetic conversion rate of 8 to 10%, compared to only 3% in crop plants such as soybeans (Sharma, Rai, and Stal 2014). Since Spirulina cultivation shows less dependency on seasonal variations and requires less freshwater than conventional agriculture (Mata 2010), it shows a good potential for growing Spirulina as a food source in an indoor urban environment.

EXAMPLE OF MICROBIAL CULTIVATION

Micro-algae

Micro-algae cultivation is a form of aquaculture involving the farming of species of micro-algae. Water, carbon dioxide, minerals, and light are all important factors in micro-algae cultivation. It is also possible to grow algae in darkness, using sugars (such as glucose) to feed the algae directly, in which case they do not use carbon dioxide. This is called heterotrophic growth. Micro-algae cultivation does not require herbicide or pesticide applications. Micro-algae can fix CO 2 efficiently from different sources, such as industrial exhaust gases, and can use nutrients contained in wastewaters for their growth. Micro-algae can synthesize oil and bioethanol, and many other valuable products, such as, proteins, vitamins, hormones, polyunsaturated fatty acids that can be commercialized to integrate foods and feed.

SPIRUBREW

Spirubrew is a kit for making a Spirulina growing system that provides the optimal environment for raising Spirulina for food in an indoor environment. It includes live Spirulina culture, growth medium starter mix, and essential nutrients. Users have an option of upgrading their kit to include an Arduino board and various digital sensors for making a digital data tracking system.

Spirulina farming poses an opportunity of introducing a new form of food and a new way of urban agriculture to the general public. SpiRuBrew creates an innovative way to interactive with the cultivation of personal food sources. The system allows for a continued cycle of data analysis, evaluation, and adaptation in an effort to maximize harvest. Engaging the user in the otherwise unknown science of food cultivation.


SP
SPIRUBREW


SPIRULINA
CHELATED IRON
MEDIUM STARTER


SPIRULINA
DIELATED IRON
MEDIUM STARTER
MEDIUM STARTER
MEDIUM STARTER
TARTER


SPIRULINA
CHELATED IRON

SPIRUBREW TUTORIAL

1. Fill a container with water. A preferable container should hold at least 2 gallon of water.

2. Mix in the 30g medium starter.

3. Drop a few drops of the chelated Iron.

4. Pour in the live Spirulina culture.

5. Place a aquarium heater and a air diffuser inside the container.

6. Connect it to an digital data tracking system if desire.

9.

INTER VIEWS

JESSIE HO

FALL 2014

Jessie Ho is a graduate student at University of Memphis, with a major in clinical nutrition. She was a graduate assistance at a local clinic that specialize inborn errors of metabolism. She holds a bachelor degree of dietetics from Purdue University.

Jimmy: Have you heard of functional food? Do you think it is common?

Jessie: Yes. It is very common, and it is getting more popular in recent years.

Jimmy: What is your opinion on it? Do you think that we should obtain all the nutrients from natural sources? Or do you think it is ok to add extra nutrient to our food?

Jessie: The reason why we are functional food is making nutrition more accessible to the general public. So the public buy affordable food that rich in nutrient. I support functional food. Other people may think food with added nutrient is not natural. But I think functional food can help prevent disease. Take iodine-added food as a example. It can help prevent goiter, specially for those lining inland who has no easy access to seafood.

Jimmy: You support functional food because it can make nutrition more affordable. What if a product with added nutrient that would sell for a higher price? What do you think about it?

Jessie: Selling for higher price?

Jimmy: Yes. I am referring to designer food. Some food manufacturers add extra fiber or protein to their food products, and they are using it as a selling point. Do you think those are still functional food?

Jessie: I think some of these health claims made by food manufacturer are gimmick or advertisement. Take gluten-free as an example. Some potato chips are labeled as gluten-free, but potato chips are gluten-free naturally. Some people are mistaking gluten-free products can help losing weight. Gluten-free products should only targeted for celiac disease patients. Having gluten-free labels on food package is helping people who has celiac disease to make safer food choice. But some people are considering gluten-free is healthy.

Jimmy: What is your opinion on organic food?

Jessie: I think organic food is safer to consume because it contains less pesticide and chemical fertilizer. Since most our patients are coming from low-income families, we don't usually recommend organic food to them. Our goal is to educate them to include more fruit and vegetable in their diet, regardless if it is organic or not, and also consume less fast food.

Jimmy: Have you spotted any food trends lately?

Jessie: I think gluten-free is one of the biggest food trend lately.
Yes. It is very common, and it is getting more popular in recent years.

Jimmy: How about high protein food?

Jessie: I think high protein diet is not for everyone. It is good for athletes, but if your body cannot consume all the proteins you took, your body will simply discharge it. Just a waste of money.

Jimmy: Last question - what do you recommend if someone want to improve their diet? Do you recommend them to see a nutritionist instead of buying health food products in the market?

Jessie: If someone are truly planning to eat healthy, I really recommend them to see a nutritionist in order to get some professional advices.

NEVIN COHEN

FALL 2014

Dr. Nevin Cohen is an Assistant Professor of Environmental Studies at The New School, where he teaches courses in urban food systems, environmental studies, environmental planning, and environmental policy analysis, including cross-disciplinary courses that connect the fields of urban policy, planning, and design. Dr. Cohen's research focuses on the development of urban food policy, the use of urban space for food production, and planning for ecologically sound urban food systems. He has been involved in food policy development in New York City, and recently co-authored a study (Five Borough Farm: seeding the future of urban agriculture in New York City) to support and strengthen New York City's urban agriculture system. He has a PhD in Urban Planning from Rutgers University, a Masters in City and Regional Planning from Berkeley, and a BA from Cornell.

Nevin: Looks like you already have a project, right?

Jimmy: Yes.

Nevin: So what were you thinking when you doing the project?

Jimmy: I had different faces during my project. I went through different modules. In the beginning, I worked with functional food. It is food that formulated to bring nutrition to the general public. So I did a fiber burger. I mixed fiber powder with burger meat. I wanted to address the issue that food companies are now abusing the use of functional food as making a healthier version of everything, even junk food. I also wanted to criticize this

phenomenon of tech-no food. Tech-no food is food with added or subtracted nutrients. I invented my own version of tech-no food. I made it out of cardboard so it is vegan, zero calories and gluten-free.

Nevin: Food companies are now selling 'products' instead of actual real food to people. So I want to bring the consumer back to real food. I am interesting on growing our own food. And I want to know what is the simplest way for people to grow their own food in a urban environment. Is it easier to grow food in a window farm or joining a community garden?

An issue that I am focusing on right now is how to get people to engage in food practices that can change the food system. I had this project and some papers that I written about 'fooding the city' . The idea that everyday practices around food are supporting the current conventional food system and one way the city can affect the bigger food system is by affecting everyday food practices. That means everything from growing food, shopping for food, cooking, disposing waste. All of those practices that we don't even think about very much. They are almost habits, but they actually structure and support the big food system. Choosing to shop at a supermarket automatically supports the whole economy. The food distributing system is designed for supermarket distribution. That's making more difficult for other types of distributing systems, like CSA, and farmers markets. If we change those practices, if we make it more normal to shop through CSA or farmers markets, what will it do to the bigger system? It is the question I am trying to answer. Maybe as a product designer, thinking about are there design solutions that can help us to change the everyday practices that we engage in about food.

Jimmy: Basically, you are saying that we don't have to go that far to grow our food. By choosing the right type of market can already make a difference.

Nevin: No, it is not about every individual can make a difference by buying different food. It is not even look at the individuals; it is looking at the practices. So the practice itself is the unit. In public health, public policy and environment policy, a lot of focuses are on changing individual behavior. And economists also focus on changing the prices so people will make different choices. Assuming that all those individual behaviors will add up to something significant. That has been unsuccessful. I mean you can't encourage people to turn off the light switches when they leave a room, or take shorter showers, or do any of the things on their own to make a big difference. The practices are different, because they are not just about individual choices that people make; they are about the system that make certain choices - the normal, acceptable, easy choices.

If you look at practices rather than people, you begin to see that material dimensions are really important, and there are meanings to make a difference of what people choose to do, and a knowledge that people need to do practices differently. Those things, meanings, materials, and knowledge, make up practices. Give you an example, choosing how to get back and forth from your house to work. It is not that you choose to take the subway or choose to drive your car. You are doing that because there is a certain normal way that people are tend to believe that you are supposed to get from your house to your office. And riding a bicycle is never in the U.S. a normal way to do that. So the practice might be mobility, and specifically bicycle riding. And the idea is not to convince people that it is better to ride a

bicycle, but rather to look at all the different things: how you can change the meaning of how to get to work, how can you change people's knowledge about the different ways that they can choose to get to work, and then providing the material dimensions, like bike lanes and city bike shares, that enable people to use that engage in that specific practice. Do you see the distinction?

Jimmy: Yes, I see the difference now.

Nevin: With food, it is like how do you make shopping at farmer markets the normal thing. And maybe shopping at Costco is the outliner and the unusual thing to do.

Jimmy: Interesting. I never saw the issue this way. I always think that growing your own food can help change the food system. I even grow food on the human body.

Nevin: I saw that. I think it is more like an art project or a publication.

Jimmy: At this point, it is turning into a bio-art project. That is why I want to talk you so I can keep my feet on the ground.

Nevin: I think those things are really important. Have you looked at the work of Tattfoo Tan? He is based in New York, and he does a lot of work on food issues. So he has this thing that he raises chickens and he has a twitter feed for his chickens that let you know whenever they laid egg.

Jimmy: That is very interesting.

Nevin: He also designed a uniform for children, kind of like the boy scout uniform, that encourage children on sustainable food.

Jimmy: I will definitely look it up.

Nevin: He had this baby carrier that he turned into a planter. Basically, he walked around the city with the vegetable garden as a baby carrier.

Jimmy: That is very similar to one of my prototypes. I made a mobile food lab that people can carry around.

Nevin: He also did a very interesting project. It was up at the port authority bus station for about a year. It was that billboard that had the Pantone color chips; instead of the colors, they were vegetable that were the same color as the color chips. The idea was to choose the diet that is the most colorful.

How that idea you had can change what it means to people to grow your own food.? There are lots of meanings associate with growing your own food. African American people might associate it with slavery. Other people think of it as something liberating, an activity, a pastime. Hipsters in Brooklyn think of it as something that challenges the system they oppose. I guess what I am trying to think though is how do you as a product designer make growing your own food into something thats is a normal, everyday thing for people to do, so that it is not considered as something you only do when you in your 20s, or a very unusual group of people do in a neighborhood in a particular side of public land.

Same thing with cooking; that is a big thing. Mark Bittman is a writer for New York Times. He writes on food issues. And he has written a lot of essays about why it is important for people to just begin to cook. The practice of cooking can connect people to

food. Once you begin to cook food at home, you begin to think more about what food you are buying to use for ingredients, and it is coming from. And it makes you feel more in control of food, maybe not just a passive consumer of food that Whole Foods Markets cook for you.

Jimmy: True. These are very good point. In the beginning of doing my thesis project, I though of different ways to help everyday people to cook, but I moved away from that direction. After listening to your points, It makes me realize that cooking is an important part of gaining more control over the food system.

Nevin: I mean the other option that the industry prefers would be you let them to do everything to make food nutritious - to do the whole chemical process that add nutrient and remove bad things. I think Kraft, General Mills and all those companies would prefer you leave it up to them to do that, because they can charge you for it. They are in control of it. Once people resume the practice - cooking for themselves, it changes the power dynamic. It is also much less expansive.

Jimmy: Definitely.

Nevin: Just buy some vegetable and cook them for your family; even counting the time it takes. But maybe part of that is thinking through the obstacles of people cooking or growing food. How do you actually make the practices easy, everyday and normal?

Jimmy: Basically, you are saying that we don't have to go that far to grow our food. By choosing the right type of market can already make a difference.

Nevin: No, it is not about every individual can make a difference by buying different food. It is not even look at the individuals; it is looking at the practices. So the practice itself is the unit. In public health, public policy and environment policy, a lot of focuses are on changing individual behavior. And economists also focus on changing the prices so people will make different choices. Assuming that all those individual behaviors will add up to something significant. That has been unsuccessful. I mean you can't encourage people to turn off the light switches when they leave a room, or take shorter showers, or do any of the things on their own to make a big difference. The practices are different, because they are not just about individual choices that people make; they are about the system that make certain choices - the normal, acceptable, easy choices.

If you look at practices rather than people, you begin to see that material dimensions are really important, and there are meanings to make a difference of what people choose to do, and a knowledge that people need to do practices differently. Those things, meanings, materials, and knowledge, make up practices. Give you an example, choosing how to get back and forth from your house to work. It is not that you choose to take the subway or choose to drive your car. You are doing that because there is a certain normal way that people are tend to believe that you are supposed to get from your house to your office. And riding a bicycle is never in the U.S. a normal way to do that. So the practice might be mobility, and specifically bicycle riding. And the idea is not to convince people that it is better to ride a bicycle, but rather to look at all the different things: how you can change the meaning of how to get to work, how can you change people's knowledge about the different ways that they can choose to get to work, and then providing the material dimensions, like bike lanes and city bike shares, that enable people to use that engage in that specific practice. Do you see the distinction?

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Nevin: He had this baby carrier that he turned into a planter. Basically, he walked around the city with the vegetable garden as a baby carrier.

DON UNDEEN

FALL 2014

Don Undeen is the director of the MediaLab at the Metropolitan Museum of Art. He is a creative technologist and maker. He is a passionate supporter of emerging models of creative production, and an enthusiastic facilitator of cross-domain communication. He enjoys making things and helping others to unleash their potential to do the same. He believes in open sharing policies whenever possible, and he likes helping large institutions adapt to change. He holds a Bachelor of Science degree in Computer Science from University of Florida.

Jimmy: Do you think a art projects that uses food as a medium can live inside a museum?

Don: Yes. There is social art that involves eating or the production of food as an artistic process. With 3D printing food, it opens many opportunities for art that is food based. It can make really interesting shapes of food. That will take food as art into another level, and I can see that can exist in a museum. It can also enable molecular-based food construction. What will happen if we can print a petit burger? Or a chicken leg that tastes like broccoli. Can the aesthetic of eating food become an art form?

Food is an art form already. A big question should be how come food is not already in a museum. Or how come we don't already have a department of food in this museum. We should preserve historical artistic tradition of culinary practices.

Jimmy: Have you encountered with any art project that works with food?

Don: I got a call from Henry Yoo at Pratt. He is interested in a bunch of food based stuffs that doing for a project. It involves of the ChefJet. It is food-based 3D printer. I haven't had a chance to work with it yet.

Jimmy: Do you believe in 3D printing food? Do you think it is practical?

Don: There are two ways when we talk about 3D printing of food. One way is making neat shapes out of food, like printing a sculpture in chocolate. It is not 3D printing food; it is just 3D shaping food. Another way is printing food by taking all the basic ingredients and combining them together. It is like a bread machine. 3D printing food in that sense can enable one single machine to make up a variety of food products.

Jimmy: So in the future, we only need one appliance in our kitchen - a 3D printer.

Don: For that to work, we will have to already enable to print tissue and print in a cellular level. The only way to print a steak is if we can already print muscle.

Jimmy: How do you perceive bio-art, and the combination of art practice and science?

Don: I am for it. My first reaction of bio art is what it is really and how new it is. Is it a totally new way of thinking about art and science? Or is it just using new tools that enable us to drive into areas that we haven't dig into before? We have been practicing artificial selection for a very long time. We have been breeding

animals and plants to get certain characteristic for a long time. To call it art, that just means we are doing it for something other than the most practical reason.

To which, you can look into show dogs as an example of breeding animals for purely aesthetic purposes. Bio engineering accelerates and expands on what we can do now.

Jimmy: What do you think of the future of food?

Don: I think it is awesome. I definitely think that we will figure out how to grow food in another medium, like algae-based food and bacteria-based food. I think genetically engineered algae and bacteria is more the way to go. We should able to grow houses, and make bacteria-based machines and nano level machinery. The real future is in unlocking the code of life, because we will able to alter organism in molecular and quantum level.

FELIPE ORTIZ

SPRING 2015

Felipe Ortiz is the co-founder of Spirulina Systems. Spirulina Systems was launched in 2013 through a successful Kickstarter campaign. Spirulina Systems is a small group of proud spirulina farmers located in southern California. Their focus is on helping people like you get started in the wonderful world of spirulina cultivation.

Jimmy: What gave you the inspiration to start Spirulina Systems?

Felipe: I was researching sustainable agriculture at the California State University Los Angeles when I came across the efficiencies of algae. Much of my interest was reducing my impact, but also having access to higher quality food so I began growing it personally. During this time I was a serial entrepreneur developing different business ideas not related to Spirulina, but in a few years it hit me that Spirulina was a truly remarkable food source. You also have to understand that during this time the open-source software revolution was happening, I was very much influenced by this idea and realized that creating a platform for open information and hardware development would make Sspirulina accessible. I partnered with my brother Oscar Ortiz, self taught computer engineer, and that was the beginning of Spirulina Systems.

Jimmy: For my understanding, raising Spirulina for food in a urban

environment is a relatively new concept. What gave you the confidence to introduce Spirulina cultivation to the general public?

Felipe: When you are starting something completely new, there are many doubts that cross your mind. You have to suppress those thoughts of failure and just try it. I had never grown anything in my life. I tried but failed numerous times. Spirulina is so easy to maintain and grow that I was able to do it with little effort and time so this gave me the confidence to try and development a business model around it. The time was also right in the sense that many people were already looking for alternative food sources for many reasons.

Jimmy: Spirulina is packed with high-quality nutrients and very high in protein - over 60% of the dry body weight, with all 9 essential amino acids that a human body needs. Most Spirulina products on the market is in supplement form, and they are not very common. What is your opinion on that? Is your company making efforts to make Spirulina more popular for the average consumer?

Felipe: There are two things that make powder Sspirulina unpopular: taste and cost. Store bought Sspirulina tastes like dead fish, not even I could eat it. You can overcome that by putting them in capsules. Then you run into cost. Organic Spirulina costs between 15-30 dollars per pound. This makes it impossible for the average consumer to eat it on a daily basis. One the other hand, we were able to offer Sspirulina cultivation at a cost of $1.75 dollars per pound of live Spirulina, a price that we hope to keep lowering as volume purchasing increases. All of our efforts are to make Spirulina more available to anyone.

Jimmy: What breakthrough technology you would like to see for growing Spirulina?

Felipe: The breakthrough technology was developed this past year. Our automatic harvesting system simplified the process by using the same hardware to aerate and harvest spirulina with materials that keep the culture clean. We started back when harvesting was a process of siphoning and physically moving water, not user friendly at all. It was the biggest obstacle for the adoption of spirulina cultivation.

We have developed Arduino based technology that can make Spirulina cultivation more robust, but it is a luxury rather than a necessity at the moment.

Jimmy: What is the next step for Spirulina Systems?

Felipe: The next step is improving operational efficiency that will drive the price of our products down by 30%. One research arm is looking into growing spirulina with grow lights for those living in colder weather. Another great project that we are developing is creating the support and tools necessary to make artisan spirulina farms possible in local communities. Not everyone can grow spirulina, but why not have access to it at a local farmers market at a reasonable price.

We operate out of the Mojave dessert and can see the inefficiency of water and fertilizer use in conventional farming. So we ask ourselves, why don't we just grow Spirulina? Uses a fraction of water, requires no fossil fuels for equipment and does not leak fertilizers into the environment. Spirulina really is the Food of the Future.

10.

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