

In my film and research, the overarching motif was learning the complex interconnections within social systems. As I looked closer at the topic I wanted to know how urban agriculture and its connection to economic systems might solve the problems of hunger and malnutrition, generational poverty and job loss. My work addresses what I think to be the best-possible outcome of the collaboration and inter-connection between science and gardening education.

While filming I had the opportunity to spend time at Connolly Ranch in Napa, a non-profit that aims to connect children and families with nature. I was able to contextualize the ideas that I had been researching and see how they might be applied. This short trailer for the documentary that I hope to finish creating over the summer, aims to share my exploration of urban agriculture wherein the viewer asks themselves the same questions as I ask of myself and, hopefully, goes on the journey of discovery with me. The message I hope to share is that finding creative solutions is imperative and that we can, by simply working growing food together, learning and sharing, create, I believe, a more holistically functioning society.

Trinity A.

How the implementation of collaborative technology¹ in gardening, can combat the education and poverty crises and as a result can produce a more holistic community environment.

Considering social systems, everything in this cosmos is intrinsically connected, from environment to economy. Because of the depth of these connections, there are a myriad of prevalent social problems that by nature are hard to solve. Every problem is inextricably linked to another. However; engineers, farmers, activists, artists, and executives, among others, can collaborate, finding solutions to the problems of this generation. This is where I fit into the puzzle of this social system. Finding solutions to social issues, including the common lack of resources in affected communities, such as fresh food, access to opportunity, and safe spaces to learn and play will likely be my career. Currently, my thinking is that the best solutions to these lack of resources do not necessarily derive from large investments of time and money, but from creatively re-evaluating existing resources as efficiently as possible. I am interested in finding solutions to combat global poverty, hunger, and faults in the modern education system creatively by researching gardening, web-based as well as aboriginal technologies, and the integration of these systems. This very integration can solve the problems of hunger and malnutrition, urban food deserts², generational poverty³ and job loss. Education through designing, growing, and learning about the cyclical nature of life, can perhaps solve these issues. I hope to answer: how are web-based technology, gardens, and the education, hunger and poverty crises connected? Why are they each an essential piece of the puzzle of solving aforementioned global social issues? My work will address what, to me, is the best-possible outcome of the collaboration and inter-connection between these disciplines; science and gardening education. The final goal is a working project that I will use the next 10 years to develop, just as my ideas have developed who I am.

Connecting to the earth was essential to my early development. Playing outside, gardening, and learning kinesthetically through those experiences, shaped who I am and how I see the world around me. As a young child living in the mountains, I played outside constantly. Nature always left me awestruck, fostered my imagination and creative spirit, and often was my teacher. I have many fond memories of building gardens or working outside with my family. My dad and I built green-houses out of straw-crete⁴ and recycled plastic sheeting, planted onion and flower bulbs, and my family has composted for as long as I can remember. I remember when I was 10 going to school on picture day with a messy ponytail full of dandelions, and dirt on my hands, because I had been out in the garden before sunrise talking to and watering my plants. Talking to plants has been proven to be beneficial to their growth because humans emit carbon, which feeds plants, but for me it wasn't about that so much as finding companionship. From my bedroom window in the springtime, I could see hummingbirds, hear wind-chimes, and watch my

¹ Technology, according to Google, meaning the application of scientific knowledge for practical purposes, which in the context of gardening can mean monitoring your plants with a camera and having a machine water them- a form of new age/ digital technology or simply indigenous/ ancestral methods used for planting with the sake of the earth in mind.

² The USDA defines as parts of the country vapid of fresh fruit, vegetables, and other healthful whole foods, usually found in impoverished areas. This is largely due to a lack of grocery stores, farmers' markets, and healthy food providers.

³ The ASCD defines that generational poverty occurs in families where at least two generations have been born into poverty. Families living in this type of poverty are not equipped with the tools to move out of their situations.

⁴ A material mixture of straw and concrete, which is a sustainable building material.

garden grow. Oftentimes, I would sit in the greenhouse for hours, feeling wholly entranced with the natural world. I loved harvesting seeds, trying to prepare food out of what I found in nature, and being able to connect to something that was so much bigger than me. Up until this spring, my family and I have had a garden that I would devote much of my time to taking care of. Since I was little, I have grown small herb gardens in my window-sill so that I would always be around nature. Gardens were always a safe space for me- they were sacred places where I felt at peace with the world around me. When I was 11 years old, my best friend and I read *The Secret Garden* in our Gifted class and, as a project, built a model out of cardboard and store-bought plants. This was a holy space where we would sit and dream about the world, and where we were free to be imaginative, curious, and full of joy.

From gardens, I have learned; empathy and caregiving, math and science, and they have been safe spaces for my creativity, curiosity and imagination. Every child should have the same opportunities that I did to experience teaching gardens where they can feel safe to play and explore, feel joyful about the world they live in, and can grow to be whomever they want; too often this is not the case. My community involvement grew, tethered alongside my childhood of gardening and spending time outdoors with family and friends. From a very young age I felt a strong sense of purpose and responsibility to the greater community. At age 11, I organized my classmates to fund-drive for the Haitian disaster relief. I had never been to Haiti, nor had I ever left the United States, and before doing some research for the project, I couldn't point to the country of Port-au-Prince on a map, but still felt a deep sense of caring for affected victims of the disaster. Giving up the money I had saved for an iPod to donate to people I had never met across the world, defined who I was and who I would become. Someone who didn't see sacrificing what I had as taking away from myself, but rather as what I was meant to do for others. This shaped my morals, actions, and attitude, as well as what I plan to do for the rest of my life as a social entrepreneur and leader. Additionally, my love of science and learning was inherent as a young child. I was constantly inventing, innovating, building, designing, and exploring. Many times I could be found using house designing software to manipulate 3D space digitally, creating a project that would help solve world problems, and for my science fair project in elementary school, my dad helped me to build an engine that ran using clean energy.

From a young age I appreciated how science and technology could strengthen efforts to help with ending world hunger by creating technology to maximize food production. By utilizing the wisdom and scientific intelligence of thousands of years of human evolution and innovation and applying that to today's advances in technology, we can now solve a myriad of global issues. With recently developed systems like Edyn, or Soil IQ⁵, soon to reach the mass agricultural market, IOS (Internet of Sensors)⁶ has offered a method of combating world problems. An idea that I find intellectually stimulating is being able to use these sensors to combat hunger and malnutrition, and other widespread issues that I am committed finding a creative solution to. These web-based technologies could be used to aid local gardens that have been shown to improve the vitality of impoverished communities. An Albuquerque non-profit, East Central

⁵ According to their early Kickstarter, the Edyn Garden Sensor gathers and analyzes data about changing weather and soil conditions. The Edyn App displays this data as a real-time snapshot of a garden, and pushes alerts and suggestions to maximize plant health. A separate component, the Edyn Water Valve, uses the data collected by the sensor to smartly control an existing watering system, watering plants only when needed.

⁶ According to *Wired Magazine*, IOT/ IOS revolves around increased machine-to-machine communication; it's built on cloud computing and networks of data-gathering sensors; [and has] mobile, virtual, and instantaneous connection.

Ministries, which I assessed on a board of donors, was able to help a co-op of low-income high-risk residents by integrating a local garden and health clinic. By creating a national movement of integrating small scale farming into poorer urban neighborhoods, managing and aiding the movement through IOS technology, problems with city pollution, not having access to fresh produce, and issues with city-water conservation can be solved productively and sustainably. Numerous positive outcomes include; improving the health of a community by producing fruits and vegetables, where the soil is monitored against chemicals and pollution, producing jobs for small scale farmers and technicians, and assimilating low-income communities with wifi-based technology while promoting education in science and mathematics. I hope to employ my fervent ideas for creating a social business dedicated to using a knowledge of systems and ancient methods of farming, promoting education in under-served communities and a love of mathematics and sciences, all while creating sustainable social change.

For this project about I am curious as to how technologies (both indigenous and contemporary digital/ web-based) are interconnected with gardening, and in what ways do nature and technology inform one another while looking at transcendentalist ideals, modern urban - agriculture, and biomimicry/ bioengineering. This led me on the path to wondering how the two types of technology (soil vs. silicon) can be combined to be the apex of human evolution and create the ultimate model of a community garden that could solve many of the world's problems. I will follow 3 projects to lead my field of inquiry; project tech-garden, project teaching garden, and project prototype.

To further investigation into my lines of inquiry I studied technology's role in the natural world, different agricultural models, and how urban agriculture can unite and strengthen communities.

Recent technological developments pose viable solutions to problems of contamination and destruction of the earth, and show technology's role in the natural world. Bioremediation is the process in which microorganisms are introduced to a polluted site to clean it by consuming and breaking down pollutants, and restoring the land. Bioremediation is the future of Earth stewardship, and is how we can use indigenous and more modern technologies, in conjunction, to heal the planet. Paul Stamets- mycologist, author, and bio ambassador⁷ explains that mushrooms can be used for medicinal purposes, as insecticides, to restore habitats, prevent eco-damage, and can restore the natural harmony and balance of the world in which we are just one part of. Indigenous technologies are most eloquently defined as being, "coherent with the natural order. Indigenous technology has a different life trajectory than a fax machine. Indigenous technologies have the obligation to come into existence, to be used and to transform within an ethical space that is responsible to life in all its forms."⁸ Otzi, an early hominid found in the Austrian/ Italian Alps was discovered to have used mushrooms to sustain fires, and as medicine when he was alive circa 3,300 BCE. Mankind has been using mushrooms for thousands of years, and now we must use them to heal the planet. Mushroom-specific functions are as varied as the different species of mushrooms. Oyster mushrooms, for example, can break down petroleum and hydro-carbons in oil spills/ contaminated soil or ground water. They act as environmentally restoring key-stone catalysts: starting the process of bioremediation by inviting bacteria, maggots and insects, birds, and larger plants to come to a contaminated area and revitalize the land. Fungi build up the nutrients in the soil, repair toxins and chemicals, and can restore habitats with "tree-stump-inoculation" methods where chainsaw-oil has mycelia in it and spreads spores to cut down

⁷ Self proclaimed, he speaks for the earth.

⁸ As described by an unnamed poet for the Native American IT Academy

trees. Mushrooms, especially in conjunction with other bioremediation methods pose a viable solution to the problem of environmental destruction. There are other methods of bioremediation in addition to mushrooms which include bio solvents and bacteria. Randall Von Wedel, a natural systems “real world” applicator uses CytoCulture⁹ to assimilate aerobic bacteria to biodegrade different types of toxic fuel, pollutant, and oil waste in the soil and groundwater. Techniques such as situ- remediation can deal with catastrophic spills and contamination quickly and effectively. On site biosolvents (made from recycled vegetable oil) are among the best methods of treating carbon and nitrate based contamination. Using the “lift and float” method CytoCulture, is able to pull out crude oil from beaches, collect it in nets, and recycle it to become a biosolvent instead of a bio contaminant. John Todd – biologist, and alternative technology specialist, in 1990 innovated using ecological design to purify and expedite waste treatment using “living machines”, proving to the world that it was possible to solve global problems with sustainable practices. He explains that, “the difference between the eco-machine and the inert... is that the living one is made up of hundreds, occasionally thousands, of species of life forms...all these species work together symphonically as part of a dynamic integrated system,”¹⁰ Many civilizations try to remove waste management from being a part of the cyclical systematic organization of nature by putting it into treatment plants to burn or be chemically treated. From a native perspective, removing nature from the equation is impossible, can never be sustained, and this model will never work. “In the indigenous paradigm, all things are interrelated; this would tend to suggest that interfaces that enable interaction on multiple sensory levels would be most appropriate.” There is an apex of technology that can be reached if there is a drastic shift from separating from nature to having it inform the technology. The combination of indigenous and modern technology results in a new way of life that is sustainable, more productive for managing resources such as food, land, and water, and as a whole benefits so many aspects of society.

In studying urban agricultural models like Growing Power¹¹ in Chicago, Illinois; East Central Ministries¹², and the Desert Oasis Teaching Garden¹³ in Albuquerque, New Mexico; I hope to create a new model with a focus on knowledge and the best use of existing resources, community, education and growth; instead of, perhaps, a single focus on food production. In the aforementioned models goals of the programs include; sustainability, community involvement and education, and the use of technology such as solar, aquaculture, and rain collection, among others. Permaculture, permanent or sustained agriculture, is the development of agricultural ecosystems intended to be self-sustainable and could be a strong working model for how urban agriculture can be in the future. Once I understood permaculture and how mankind must be stewards to the Earth I realized that, “life is intimately interconnected, and as a culture we’ve made a basic systems error in believing that we exist somehow separate from nature or from one

⁹ CytoCulture is a Bioremediation service founded in Richmond, California by Todd.

¹⁰ Kenny Ausubel and J.P Harpignies, *Nature's Operating Instructions* (San Francisco: Sierra Club Books, 2004)

¹¹ Growing power Chicago Urban Farm Iron Street Farm website states that it is a 7-acre farm and warehouse with eight hoop houses for year round production, vermicompost, mushroom production, an apiary and urban pygmy goats. Iron Street Farm is also one of two composting facilities in Chicago, recycling over 450,000 lbs of “waste” each year.

¹² East Central ministries is a community co-op Growing Awareness Urban Farm is a micro-enterprise of East Central Ministries. We grow seedlings from seed and make ollas to sell, raise chickens and bees, and engage in work and conversation together - for the benefit, beautification, and growth of the community.

¹³ The DOT Garden teaches how growing food can sustain our bodies, our minds, and our planet.

Our blossoming experiment in ecological restoration and locally adapted agriculture thrives on one acre of recovering high desert land on Albuquerque Academy's campus in Albuquerque, New Mexico.

another,”⁹ This model of agriculture puts an emphasis on the native principles that we must practice sustainability and realize this greater connection that we all have to the earth.

Urban agriculture has the power to unite and strengthen communities when it is acknowledged that mankind is simply a part of a greater hierarchy organized from the macro cosmos to the smallest infinity of subatomic life, we can all begin to confront impossible problems. It is this community ownership that is lacking, but compulsory. Nick Saul, director of Davenport West community Food center in Canada, clearly states how importance ownership is to, “anyone who spends time [at The Stop], [they] understand that it is a kind of village...[with] A share of difficulties...[and] a true spirit of generosity and connections,”¹⁴ More than money, or laws, or programs, a community with a common goal to support one another, is stronger than any beaurocratic system. A community who takes care of its own is a force to be reckoned with. Places like The Stop, “are proof that we are all connected, and that we are better for these bonds.”¹⁰ If a strong community is already present, then a deep and profound knowledge of systems is all that is needed at this time to solve unsolvable problems. John Todd’s aforementioned project’s obstacle was the “bureaucratic mentality” of the EPA who adapted a “much more expensive conventional dredge-and-incinerate-the-waste-solution”. Creative systems could easily be put into place to solve global problems, but oftentimes the ego of various groups leads to societal detriment as a whole. Eco sensible buildings, like the one at the Environmental Studies Center at Oberlin University, employ green architecture techniques. Models may include the use of hydraulic cycles, or mycelium for building. Many groups who think that environmental stewardship is valuable, practice what they preach by building in ways that are eco-friendly. I wholly agree that this generation, as Saul says, should create, “a culture where vibrant wilderness permeates every locale, even urban settings...[it] should be the challenge and the opportunity of the twenty-first century.” There are strong benefits to using this model that because of the nature of everything being interconnected would potentially benefit economy just as it benefits environment.

In conclusion, I propose using my conclusive research and experimental data, to create a global start-up organization. I plan to expand my thesis to stretch over the next decade. My research, and field studies have lead me to several conclusions looking forward towards creating a larger body of research. First, that there is an immense amount of technology and wisdom that, if properly utilized, can solve many of today’s problems and possibly prevent the problems of the future. Second, that there are current models utilizing this indigenous wisdom for modern day technology that we can look to and see their successes. Finally, this culmination of technological resources is important to all of us because it strengthens our communities and the very fabric of our society.

¹⁴ Nick Saul and Andrea Curtis *The STOP* (Brooklyn: Melville House, 2013)

End Notes

1. Technology, according to Google, meaning the application of scientific knowledge for practical purposes, which in the context of gardening can mean monitoring your plants with a camera and having a machine water them- a form of new age/ digital technology or simply indigenous/ ancestral methods used for planting with the sake of the earth in mind.
2. The USDA defines as parts of the country vapid of fresh fruit, vegetables, and other healthful whole foods, usually found in impoverished areas. This is largely due to a lack of grocery stores, farmers' markets, and healthy food providers.
3. The ASCD defines that generational poverty occurs in families where at least two generations have been born into poverty. Families living in this type of poverty are not equipped with the tools to move out of their situations.
4. A material mixture of straw and concrete, which is a sustainable building material.
5. According to their early Kickstarter, the Edyn Garden Sensor gathers and analyzes data about changing weather and soil conditions. The Edyn App displays this data as a real-time snapshot of a garden, and pushes alerts and suggestions to maximize plant health. A separate component, the Edyn Water Valve, uses the data collected by the sensor to smartly control an existing watering system, watering plants only when needed.
6. Self proclaimed, he speaks for the earth.
7. As described by an unnamed poet for the Native American IT Academy
8. According to Wired Magazine, IOT/ IOS revolves around increased machine-to-machine communication; it's built on cloud computing and networks of data-gathering sensors; [and has] mobile, virtual, and instantaneous connection.
9. Cytoculture is a Bioremediation service founded in Richmond, California by Todd.
10. Kenny Ausubel and J.P Harpignies, *Nature's Operating Instructions* (San Francisco: Sierra Club Books, 2004)
11. Growing power Chicago Urban Farm Iron Street Farm website states that it is is a 7-acre farm and warehouse with eight hoop houses for year round production, vermicompost, mushroom production, an apiary and urban pygmy goats. Iron Street Farm is also one of two composting facilities in Chicago, recycling over 450,000 lbs of "waste" each year.
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15. Nick Saul and Andrea Curtis *The STOP* (Brooklyn: Melville House, 2013)

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