TRASH MAGIC

BOOK I: MANIFESTO, ACTIVITY BOOK, AND COLORING BOOK

Figure 1: NO PROPERTY

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Trash Magic
Book I: Manifesto, Activity Book and Coloring Book

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Chapter 1

Capitalism

What is best in life?

To care for one another, and to have adventures.

Technology can help us do both of these things, building societies where all physical needs are taken care of as well as which preserve the adventure that makes life worth living. However, as technology has advanced it has increasingly served its own needs. Because it has had such a powerful overall positive effect on the human condition(in some material ways), we have allowed the rules of technical progress to dictate the rules of the rest of our society. In this chapter I discuss how I view capitalism as an underlying force which drives this process, creating great suffering for humanity and the rest of the living world.

What is Capitalism?

What is capitalism? This is something that critics of it avoid a lot of the time to their detriment. If you look up various definitions, it generally goes something like this: "Capitalism is the economic system in which the means of production are privately owned." I hate this definition, and I think it's held back our collective effort to fight it for the last 150 years.

What this definition implies is that the opposite of capitalism is someone other than "the private owners" or "the capitalists" owning the "means of production", and "economics" being based on something other than private capital. I put all these things in scare quotes because I see them all as subtle weapons to inject hidden ideology into peoples minds by the very wording of the definition. First of all, the anarchist rejection of capitalism rejects ownership of minerals, land, and machines. So any definition that talks about "who owns what" should already be rejected by the critic of capitalism, and we have already ceded a major point by allowing this definition to stand at all unexamined. Capitalism is a system in which some people, called "owners", claim to have power over certain things, which they claim the right to carry out by force if needed. Capitalism is also a system in which a military state exists which both feeds of the system of privately owned extraction and enforces the power structure that governs it.

The "means of production" is also a problematic phrase. While it is a bit ambiguous, I see this phrase as at least potentially implying that this the "means" is some sort of fixed infrastructure. The implication is that "the means of production" is a thing that exists outside of economic systems, which can be controlled by any of various types of government or state. This is false. The very structure of "production" in today's society is what I would call capitalism. The Soviet system, the various fascist systems, "democracies", dictatorships, monarchies, I would say every single one of them is capitalist. They all have this basic structure of military power creating a monopoly of force that protects a vast system to extract mineral wealth and destroy it as fast as possible by constant threat of violence. To me calls to "seize the means of production" sound like calls against a king to go seize the palace and tell the king what to do but to keep the palace and king in place. It's the same system, with slight changes. So to let the capitalists define these ideas gives them a victory before a debate even begins: it allows that the existing "means of production" should continue to exist without discussion. A true challenge to capitalism is one in which the very concept of production is reinvented. It means building industrial technology from the ground up around different values.

Another problem is with the notion of "economic system". I would argue that economics is again a part of the intellectual descendent of the basic idea of the One

God of monotheists. There is a Universal Hierarchy that exists, which allows numbers to be used to assign value to things. Human value becomes a number, always either less than or greater than or equal to any other numerical human value. Part of rejecting the basic ideas of capitalism is to reject this hierarchy cast down from God. But to even use the phrase "economic system" again lets capitalism be defined in a universe in which nothing other than capitalism exists.

Indeed in some of the definitions I've found online they even add phrases like "as opposed to State ownership of the means of production". In other words the supposed definition of capitalism used by most people is not a definition of capitalism at all, but a clever propaganda piece that creates a world in which the alternative to capitalism is another type of capitalism which is recast as the Socialist Enemy. Since I consider all the Soviet style "communist" countries to be capitalist in their philosophical worldview, I find it not surprising that they hold the same warped view of this false dichotomy. The communists can point to "capitalism" as their enemy, where "the ruling class" "own" the "means of production", rather than "the dictatorship of the proletariat". When this becomes a nightmare like it always does and destroys the environment even worse than "capitalism", people on the right say "I told you so" and people on the left say "it will be different next time! it's all Stalin's fault!".

So if we really want to move beyond capitalism, criticisms of it need to start trying to really see it for what it is, and see just how far the viral ideas about God that underly it have wormed their ways into the very language we use to describe it.

I will give capitalism the following definition:

Capitalism is a system of belief in which numbers are used to denote all value.

That, I believe, is the heart of the matter. And it points to why experiments like the USSR have ended up having problems so similar to those in the western capitalist world. In a word, money. Money is not just metal or paper or faith in a government, it is the idea that a number, specifically an integer number(money can usually be subdivided but only up to a point) can be used to denote all human values. This is why I believe the concept is so slippery, and so hard to break out of. You can replace dollars with time dollars, bit coin, gold, silver, bags of salt or gold-backed e-dinar and it's really all the same thing: numbers. Integer numbers. As long as there is an exchange rate between a system of value and an existing currency you have not really broken free of the current system.

And what is money? The purity of numbers has proven to be incredibly powerful. Users of the number based values have literally moved mountains with the power they have been able to deploy using money. In particular money based values have been excellent at

Figure 1.1: Line of tiny subjects worshipping a giant monument to the Number One

several things, some of which are good but most of which are bad. I will now explore the nature of money more specifically.

The Nature of Capitalist Money

Our currency is based on two things:

1. suffering
2. and minerals

Turning minerals and human misery into numbers is capitalism in a nutshell, and is the basis of our monetary system.

Capitalism is an industrial system in which all value is based on human misery and minerals. By creating misery, some people use threats of violence to control land. They use more minerals, fire, and misery to create minerals ordered with a precision based on their belief in violence and control through military order(square arrays, long lines of useless pillars, etc.). The threat of inflicting misery using military technology(not only is our technology military, our concept of military is based on our technology as well, and both are based on the One God beliefs) is how some people known as capitalists claim "ownership". Ownership is a complex network of violent threats which allow threats of future misery and benefits

Figure 1.2: Bearded Man-God Looks down on the suffering and minerals in satisfaction

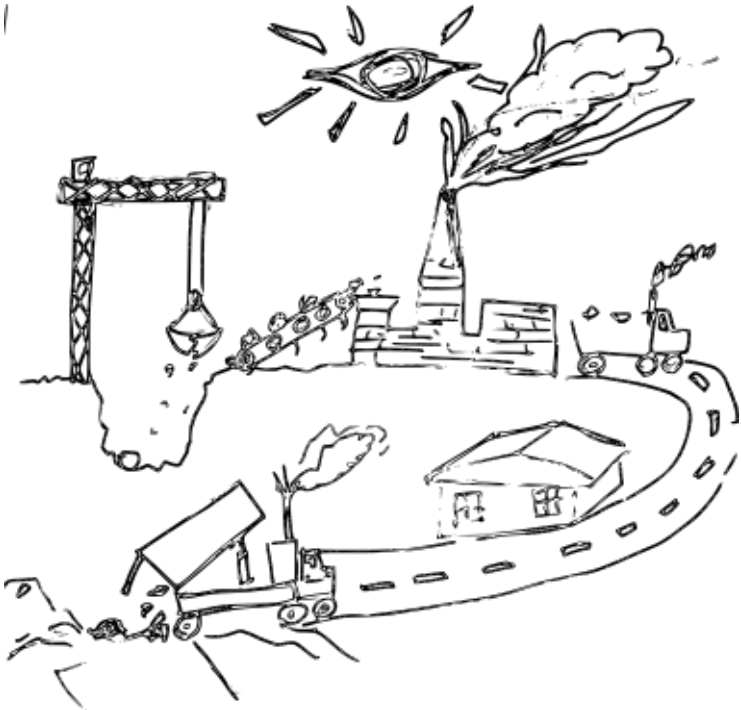

Figure 1.3: Dig it up, set it on fire, and bury it. That is our economic system in a nutshell

paid from past misery to be added up numerically, building a ladder of power down which the physical benefits of mineral wealth slowly trickle, with the most landing at the top.

Any proposal to reform capitalism that maintains concept of numerical adding up of suffering and minerals is just capitalism with a new mask on. True reform means finding a set of moral values that informs technological figures of merit which are based on human joy, adventure, hilariousness, beauty, or other things that actually have positive value for everyone, and then re-builds our whole concept of what it means to have a technology up from scratch.

To repeat: to attempt to reform capitalism while continuing to use any of our current technology at all is a lost cause. The ideas of capitalism are built into the position of every atom in a modern technical artifact. If you want a world without capitalism you must re order every atom, completely re design how atoms go together from the bottom up. And in building this it makes sense to acknowledge that 300-400 years of industrial capitalism gave us the gift of minerals, which we can now live on forever.

Every atom. Every atom changes in how it relates to the whole. Same physics, same atoms, but new ordering principles, breaking out of the military design concepts. No more are the ideal shapes always planes, circles, and perfect grid arrays of objects. No more are tech artifacts

locked into a centrally controlling clock that tells them when to work and what to do. No more is there a wall between engineer and customer, where some things are known and some are secret: all information on construction is physically encoded in the artifact, and updated as more edits are made, even if the user does not document(data stream into the dataverse).

Capitalism as Religion

Capitalism is the hidden religion. It does not admit to being a religion and its believers(at this point almost all humans) do not realize they are in this religion but they are. Even members of various other religions decry people leaving their flocks for the "secular" world but won't directly name this as a competing religion. But a religion it is, complete with odd beliefs of all kinds.

In my observation, the beliefs of capitalism include:

1. Private property is sacred
2. All value can be added up using numbers
3. All value must be extracted from the Earth or from human misery
4. Human society is described by something called an "economy", which is a system for laundering mine products and human misery into numerical media of exchange
5. Hard work is an intrinsic good

6. Our world can all be described by a giant hierarchy, people, animals, objects, gods, ideas, all are always ranked and this ranking is ordained by the highest authority, whatever that is.

I believe that number worship is an underlying hidden religion that is integrated into all other modern mainstream capitalist religions. What is monotheism? It is the belief that there is only one true god. But this implies that you can count gods. That is the underlying assumption. It separates parts of the universe that are god from non-god in a rigid way, breaking up gods or potential gods into discrete numbers that one can count, rank, and ultimately then put one on top of all others. From this we get hierarchy of all kinds down through the ages and all the horrors of capitalism. But if you are a monotheist note that your One True God is almost certainly also a universal part of your world. So what makes you believe you can count gods? This other, hidden, religion that is required to phrase the questions and answers about your god using numbers. So do not take my attacks on the structure of industrial monotheism as an attack on your One God–I do not deny your god, merely your ability to count gods.

That being said, I do think this counting has led to other problems in industrial monotheism which must be combated, namely patriarchy. Monotheistic religions have a strong tendency to extend the counting hierarchy

from their bearded man-god down to all Things, building an instant patriarchy into their world view. Don't do that!

Professionalism: A Capitalist Cancer

I am against professionalism in all forms. Professionalism divides us. We have split up philosophy, physics, chemistry, biology, design, manufacturing, theology, art, and technology, and very much to the detriment of them all.

I'm against engineering and design as professions. While specialization can be useful, I believe our society has created a soul-less techno-priest class which is evil enough in its very nature that technology needs to be re-built from the ground up outside that system. If your technology needs the techno priests to function, it means your technology is bad and needs to be replaced. If it needs extraction of raw materials from the earth or any control over large tracts of land in a centralized way to function it is bad technology and needs to be replaced. If it requires secrecy or proprietary control of information and use it is bad technology. If it can't function without capitalism it is bad technology and needs to be replaced.

Specialization is fine up to about 100 people then it is a luxury for special projects. If you need someone who makes up less than 1% of the population to do something your technology needs a reset and it is bad. Our goal is total freedom for 100 people.

We need to start over from scratch and build a technology without the existing techno priests which can be built and maintained by anyone with the desire to do so, using waste streams of the old system. This has to happen in thousands of parallel tracks in many different fields of applied science and technology. I will focus on the parts relevant to my area of expertise: applied physics.

Capitalism Stifles Innovation

Part of what has led me to write this work is my frustration as a professional scientist with how capitalism has, in my view, held back scientific, technical and cultural innovation by decades if not centuries.

There are several aspects of capitalist ideology which have had devastating effects on science. The first is the obsession with novelty. This is probably the largest problem, which I would say has gotten progressively worse as science has gotten more advanced over the last 100 years or so. The problem is that in order to be seen as a success in science you need to prove that what you did is really new, and that newness takes priority in value over almost everything else. What this does is create a very broken ladder of importance of things to study. If you have the choice between two experiments which both show the same science, and one involves just seawater, dirt, and a mobile phone, and the other involves

a 1 million dollar machine, a trendy new molecule, and some advanced math using a new computer algorithm, the latter is considered vastly superior. And this is based on the ideology of private property, even when legal intellectual property is not involved. Even in the public domain, when a researcher publishes a sufficiently new thing, that thing is attached to their name, and can be turned into real tangible monetary value.

All the elements I describe in the example above should be called out for causing problems with science progress. First of all, the use of expensive machines. This not only makes sure there is a barrier between the work of the lab scientists and the general public, it usually increases the distance between the researchers themselves and the subject matter. I believe that the purpose of all science is to create the closest possible link between the human mind and the world we live in. The more expensive your machine, the larger the barrier between mind and world. Expensive machines are great for building capitalist jobs(I've had these jobs!) But this is at cross purposes with what should be the goal of simplification. To eliminate a machine is to eliminate a high paying technical job, which hurts us as workers in science. Thus the incentive is opposite of what we want to do, which is always cut down the the size and number of machines needed to interact with our world.

Another element of the problems I've listed here is the "trendy material" problem. That is, science is strongly

biased in favor of newly "discovered" materials over those we all know and have access to. This is created by capitalist ideology because we all need to try to own the property, both legally and intellectually, of "new" things in order to get the fame required to advance in our careers. If you prove that "your" substance has a different chemical structure than any that someone else has studied, and publish something not very impressive, you can get famous, and name the molecule. But if you do something impressive, but not really new, on something common like tap water or ground up moss or a soda can, you have to call it "educational demonstrations" and will not be taken seriously in high level research circles. But again, this is creating an incentive to do the opposite of what is good for science. Someone who interacts with tap water or pavement has a connection to much larger fraction of the world than someone who interacts with an obscure form of soot made in a special chamber that only exists in their lab. If our goal is to connect our minds to the world as well as possible, it's always better to follow the most common elements of that world, then things we find around us. Capitalism pushes the researcher away from those things both because of the need for novelty and also because the more obscure a molecule is the more likely it is that a capitalist can make a profit on it. A product based on a simple recipe with tap water and gravel is worth infinitely less money than one based on a complex and expensive process.

The ephemeral concepts of "ownership of ideas" above pale in evil compared to legal intellectual property. This could be a whole polemic work of book length on its own but suffice it to say that the corrosive effects of excessive patent and copyright are now so severe that anyone who's worked at all in science in the last 10 years is already pretty upset about this issue. Even those who claim to support the system agree that it's now so far beyond even the twisted intent that originally existed that they are against it in its current form. However, for the record, my position in this work is that it is pure evil to claim the concept of ownership over science or technology. The scale of the evil is partly escalating as the technology becomes more personal. As our technology becomes more a part of not just our lives but our selves, we find corporations claiming to legally own parts of our lives and even our bodies with their patenting of genes both in humans and in our various bacterial neighbors we carry on our bodies. Eventually, the property ideologues will, if left unchecked, build a world where humans are all owned by a consortium of corporations, where we are all literally the property of corporations and machines. Science fiction warns of the possibility that a "rise of the machines" will cause us all to become slaves to artificially intelligent machines, but I would argue that AI is not needed for us to become slaves to machines: humanity is in the process of enslaving ourselves to non-intelligent machines.

I touched on the problem of professionalism already

but I need to elaborate on this in the context of science specifically. We have always claimed in philosophy and science that unification is a goal. Unification of electricity and magnetism into one theory and then the weak force in with that are all seen as great triumphs of physics. Bringing all the atomic elements together into a single unified periodic table is rightly seen as a great triumph of chemistry, etc. But in modern applied science we find huge incentives in the opposite direction of unification. Because we are all forced to carry out science in the professional system, and there are never enough professional positions to go around, those with the good professional jobs must all jealously guard our positions. This means a biologist who can do good physics or a physicist who can do good biology are both potential threats to each others' jobs. Whereas the biologist who creates an even more obscure form of biophysics that gets its own whole new department is the most powerful of all: the unique specialist who owns their field entirely. The highest salaries and most honored and secure positions will go to those who do the opposite of unification. And sure enough, the last few decades have seen a proliferation of tiny sub-fields with their own jargon no one else can read in all fields of science. This has coincided with the rise of extreme market ideology since the 1970s which drives universities to behave more like businesses and research departments to behave more like marketing departments. The corrosive force of capitalism has inflicted a sort of Babel curse

on all science, making it impossible to talk to each other anymore.

This concept of unification applies in particular to building the tools we use for science. The most useful tools are the most universal: razor blades, tweezers, optical microscopes, or pliers. And yet no professional scientist can make a living selling any of those, so we're not incentivized to make more tools like those. We can make them for our own use in our labs, but capitalism directs those types of tools to be made by the cheapest possible labor, so building them is avoided by the professional classes. Conversely, the tool which only does one thing extremely well can be a perfect monopoly on that thing, creating a large markup and building a comfortable place for the professional. Again this is a case of capitalist ideology constantly pushing us all to build the opposite tool from what would benefit our fellow scientists or the rest of humanity.

These claims are just claims when stated in a a manifesto like this. I state them without extensive proof because the proof that abandoning capitalism can push science and technology forward much faster has to be by example. We must actually go out and do this, build science and technology up from scratch on non capitalist principles, without professionalism and without property. Ultimately this ends up looking more like an artistic movement(for which a manifesto would be a normal part of the creation process) than a part of science. Trash

Magic will take many forms in the future, but its initial form will indeed be that of an artistic movement, because that's the simplest way to build things while casting off the old figures of merit used by engineers and the rest of the technocratic priesthood.

Death to Capitalist Math!

Math is not objective reality. This is obvious to most people who don't do math, as well as to most working mathematicians, but it's an amazingly popular belief among technocrats. Math, like any other model built in the human mind, is a sort of reflection of the world. A very powerful one, yes, but still just a part of our minds, and like any other model, there are choices we made to get where we are with math which could have been made differently.

The example I'll give here is a paradox that I find particularly interesting in terms of what it tells us about hidden ideologies. Mathematicians call it the Banach Tarski paradox, and it generally arises in parts of the math curriculum concerned with point set theory. Never mind exactly what that is, it's something usually taught in the late undergrad or early grad level in pure math(as opposed to applied math which is not concerned with these issues).

What this so-called paradox does is create a way to construct two spheres of points from the points in one.

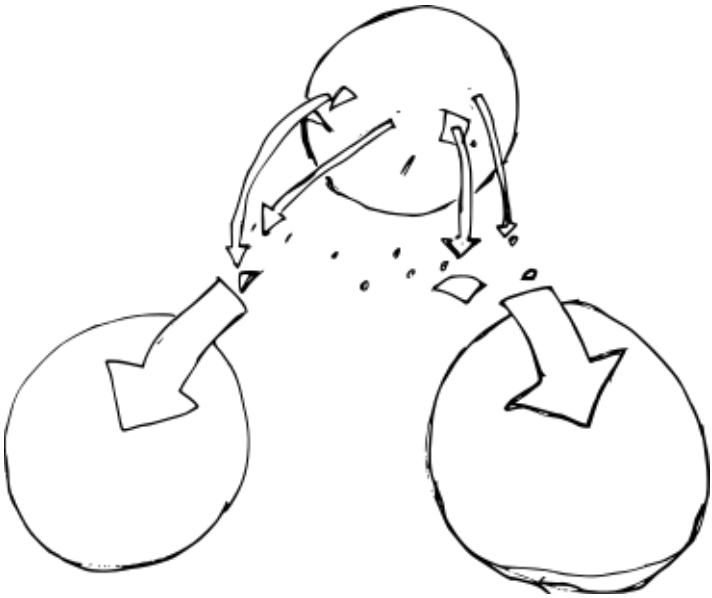

Figure 1.4: Construction of the Banach Tarski paradox

That is, all the points in the first sphere are re-arranged in such a way that those same points make two spheres of the same volume as the first.

But how is that a paradox? When dealing with an infinite number of points, is it really surprising that volume is not preserved? How surprised should we really be about anything dealing with a truly infinite quantity? I would say that this is a "paradox" because it contradicts the world view of the religion of property and money and

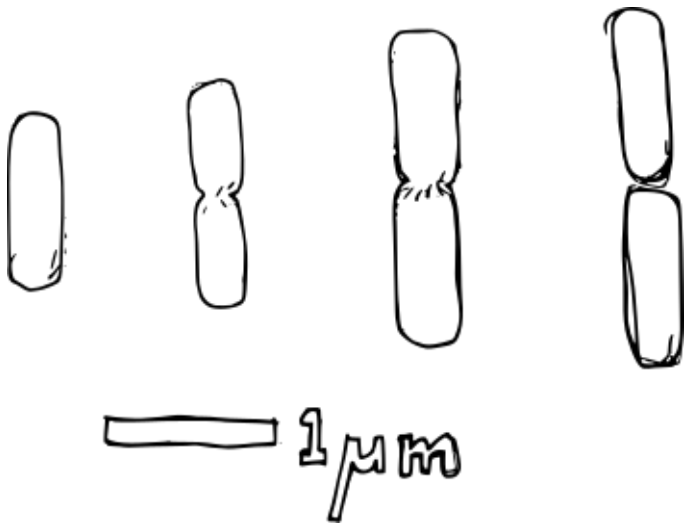

Figure 1.5: Biological Cells Ignoring Math and Capitalism

worship of integer numbers.

Those least surprised by this are people familiar with how life works. One of the most important and common life processes is cell division, in which a cell simply divides into two cells, which end up each being identical to the first cell. This is life! This is how the world around us really works: things can simply turn into a pair of things on their own. Now, the number worshiper will argue that the cell example is different, that there is a bunch of energy and atoms that have to be absorbed from the

environment for cell division to happen so you are not really getting something from nothing. But this is again showing how oblivious number worshippers are to their own belief systems, because this all depends on how you define things: what is a thing and what is not a thing? It degenerates into nonsense philosophy but suffice it to say there are many places you can choose to draw the lines, and the worst part of the number worshippers lines is that they don't even admit they exist.

Why Now?

Now is the time for *drastic* change unique in our history.

Why now in particular?

Both the positive and negative sides: danger to humanity is imminent, but also opportunity is greater than ever before because of the vast mineral wealth that is everywhere and a critical mass of processing and communication technology. Marx was about 100 years early, and didn't have access to the information or materials we do today. Globalization and Capitalism really have literally sewn the seeds of their own destruction, by creating seeds for millions of new societies by spreading mineral wealth everywhere around the globe.

The very destruction of capitalism focuses us on the better future in several ways. For one thing, the sections of society most exploited or crushed by capitalism are often also those closest to the massive waste and de-

struction streams of the present system. Often the poor and dispossessed live near dangerous waste which also contains what could be priceless mineral wealth if we had the technology to bring it back. Wherever you find the most oppressed people you will also usually find the most ruined land with the most material waste. Just like the people our economy casts aside, these materials often exist outside the ownership system, they are claimed by no one and valued negative or not at all by our economic system. But this creates a potential opportunity to build very rich new forms of industry that exist without ownership or money: built by people who no one pays, made from materials considered "toxic waste" by the ownership society, and given freely to a community who also owns nothing undermines the entire structure of the existing system.

This connection between the people and the materials cast aside is what Trash Magic is really about. People who's time capitalism does not value can use the materials it does not value to truly work magic: to build great works of art that we can live off of using the powers of our minds.

Purpose of this Book

This book is a manifesto. That is, "...a public declaration of the purpose, principles, or plan of action of a group or individual.", as it's described on manifestos.net.

The primary audience for the first draft is me. I'm writing this to be my own guide as I build this technology out in the physical world and deploy it by gifting it to as many people as possible. As that process starts to work, I will go back and make future editions that are geared toward a larger number of people. But for now these are notes from me to me and those who for some reason see things as I do.

Note that novelty is not my goal. I believe that the obsession with novelty in applied science is a toxin of capitalism and that by ignoring where ideas come from and using them as needed, with no expectation of novelty that much faster and better progress can be made. This work comes from the heart and mind of one person but none of that comes from just me: I assume everything I say here has been said elsewhere and that I've been exposed already to most of what I present here, in various forms, in books I've read or from people I've talked to. I am avoiding a real bibliography very deliberately here for this very reason. If it looks like an idea came from some source, assume it did. Even if I didn't read that source, I'm sure I read a book written by someone who did. Let's stop getting worked up about ownership of ideas and worry more about deciding which ideas are really good enough to keep in the commons.

Also, as stated in the title, this is an activity and coloring book as well as a manifesto. That means all illustrations are intended as coloring book pages, to be

colored in by the reader or their co-conspirators. The activities are of several kinds. One is the "14 contemplations" which are a sort of meditative practice in which you both color in a page with a 3d file and stare at certain things in the physical world while contemplating a topic deeply. They correspond to the 14 chapters of this book. Also, there are some skills in the chapter that tabulates those which may have varying levels of detail in this book but which the reader is encouraged to try out. Also, some basic geometry art projects will be part of the skill set and technical construction, which is the final of the activities. Since this is meant to be a book that germinates many living technologies, it makes sense that there should be specific instructions to build certain artifacts. Since those artifacts remain a work in progress some of them will be sparsely documented here and will have more information in future versions, online and in hard copies distributed with the actual artifacts(to be given away for free in large numbers).

I'm against the machine. That's what this is all about. I hate industrialized society, and I resent that the good products of it are used to hold us all hostage to the totality of The Machine. The military machine, the capitalist machine, the consumerist machine, the extraction of raw materials machine, the political machine, all of it. We're told that if we it's all or nothing. Don't like nuclear bombs? No vaccines for you. Sick of the Internet giants controlling your life? Well, that must mean you like writ-

ing letters by hand, you must be a Luddite. That's the message over and over from the mainstream of society.

I challenge all that. I say that the course of the last 300 years of industrial development has not been just fixed by some immutable laws of nature but has in fact been the product of decisions made which could very well have been made differently while still learning how the world works and how to make useful technology to better navigate that world.

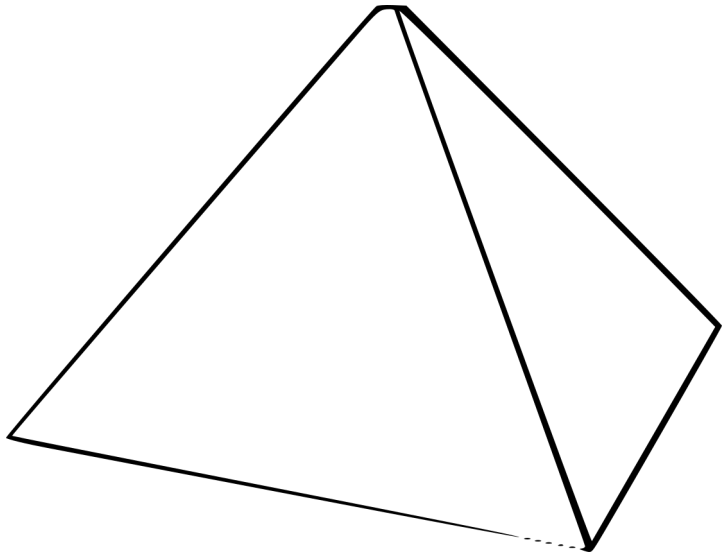

Figure 1.6: First Contemplation

First Contemplation: Pyramid of Capitalism

In the first contemplation we contemplate the evils of capitalism through the lens of the pyramid, a universal symbol of that ideology.

Go out in your city and look at the ways capitalism worships itself. Banks, giant office buildings of corporations, luxury hotels, old parks, and court houses all show

huge mounds of very precisely cut stone as part of the system of worship of stone and order that we see in the capitalist world. Go stare at them! Marvel at both how beautiful and majestic they can be and how much evil the also symbolize with their cold, impersonal stone. Note that these stone monuments are almost always accompanied by surveillance cameras, a jarring reminder of what they mean in our modern world.

The Contemplation can also be carried out at home by placing the pyramid in front of a small capitalist artifact, playing the proper music, and vigorously flopping around on the floor in ALL DIRECTIONS while maintaining eye contact with the pyramid and evil artifact of capital.

Chapter 2

Free Technology

What Does it Mean for Technology to be Free?

Free means that a thing can be created with only labor and the waste products of the old world or renewable products of the natural world, using information that is available to the public both physically and logistically.

I will start with a list of what makes technology non-free. Since this is a manifesto, it makes sense to call out what the problems are that I aim to work on with this project.

What does it mean for hardware to be non-free?

- If someone claims the legal right to control who can make a thing it is not free.

- If materials mined or otherwise extracted from the Earth are needed to make a thing it is not free
- If professional expertise that cannot be learned in a short time from clear online instructions are required to make a thing it is not free
- If a tool from the consumer capitalist economy is required to make a thing(e.g. a 3d printer from a factory) it is not free
- If the fabrication of a thing requires the use of energy from the Grid or non renewable sources, it is not free
- If a thing cannot be re integrated into the industrial ecosystem in a modular way after its lifetime it is not free

What about free technology, what is that?

- A free thing can be made from readily available waste *streams* of the existing industrial capitalist system
- A free thing is not patented and is disclosed publicly in sufficient detail to make patenting it illegal
- A free thing has publicly shared non copyrighted instructions which enable a non expert to learn what

they need to learn to complete the construction of the thing

- A free thing can be fabricated in a scalable way, from single units up through millions of units, with automation at large volume using robots built from same technology
- A free thing uses only ambient energy to function and to be produced
- A free thing has a post life trajectory built into the design, where all components are easily salvaged into other Free Things
- The construction of a free thing must create value from "nothing", which can then create value outside the world of numerical currency
- An individual thing by itself is free if it is also part of a larger group of technologies, which I call a "complete technological set", which can be used to reproduce themselves and to provide all basic human needs
- Free technology does not distinguish between technology and art: it is always both.
- Free technology naturally reproduces with the help of people and/or other animals. If left out somewhere, people will naturally choose to use the thing

and information contained in it to make more and to continue the development of that technological path.

What about Open Source?

What is the connection between free technology and "open source hardware"? Open source hardware does not at all have to be free: it can require a vastly expensive factory to actually produce, as long as the design is publicly available. This maintains the power relationships of industrial capitalism: the means of production remain safely in the hands of the capitalists, we are just re-arranging how we share amongst ourselves. The difference between free and open can be more subtle for software where it's always free in the sense that it can be copied an infinite number of times for no cost in principle. Hardware on the other hand is not just information. Without supply chains that are wrested from the control of the masters of the system, what is or is not free is affected very little by "open source" hardware.

Another important shortcoming in the open source model is the lack of demand for the project to be accessible to those outside the technical guild that built it. This is not as bad as it used to be, but it's still common practice for "open" to mean a thing has horrible documentation and usability as contrasted to "closed" commercial software. What this really does is *further*

enforce the class divisions in capitalist society by making a hierarchy of who gets free stuff and who doesn't. Those who are in the software tech guild can get free things that are unusable to a normal person, and which have such opaque help that no one outside the guild can be reasonably expected to figure it out.

Avoiding this shortcoming of open source software in the free hardware project will be a challenge in some cases. This means that if you want to use something involving the physics of magnets to build a thing, the quality of applied physics education you make available to your user determines the freeness or non freeness of your technology. That means that any free electromechanical technology is not really deployed until a whole curriculum is made freely available on classical mechanics and electrodynamics. That curriculum must be held to much higher standards than are presently applied for college or high school physics education. It must be very applied, with direct numerical examples throughout which can be easily run by a novice on any computer or phone. Also it must be able to cater to a very diverse range of learning styles: hands on, mathematical, theoretical, visual, etc etc. *All* of these must be made freely available in multiple open free formats. It must be possible to do this with printed pages and no computer or with any type of computer or personal device and no printer(either). When the thing is built, it must have information printed on it or embedded in some obvious way, which links back to

the main free storehouse of documentation. That documentation must also be decentralized to prevent any authority from destroying the information.

This imperative really affects the way that progress moves along. A working wire coil is not enough. It must be well characterized and documented with a series of easily accessible physics experiments. There must be both video and written content showing how to put it together. These experiments lead to a very fractal level of digression, but in the end they lead to absurdly robust technology which can be recreated from scratch by anyone anywhere quickly.

Free Everything!

What is free energy? Usually this term is used by various conspiracy nuts to describe ways of "getting energy for free" from something like the zero point quantum energy or the Earth's magnetic field. Both of these are nonsense, as are all the free energy schemes presented throughout youtube and the rest of the Internet.

No, we are told, energy is not "free". It has to COME from somewhere. But this notion is based on a capitalist world view. Energy is deemed "free" if you don't have to get it from a mine and labor. Most modern renewable energy is not free: much labor is expended to build the infrastructure out of mined minerals which have a finite

lifetime and eventually go to landfill to be replaced by more mining and labor.

But if free energy is energy that can be useful but is not derived from mining and labor, then free energy can and does exist. Energy not spent on air conditioning when you build under a shade tree is free energy. Energy from the sun that warms through your front window is free energy. And the electrical energy stored in salvaged rebuildable capacitors from salvaged rebuildable robots storing ambient energy is free.

Capitalist logic always looks for ways to show that things are not really free, because capitalism is based on the ideas that value comes from labor and mined minerals. If we approach industrial development from an anarchist perspective, however, we seek to build technology which is truly free, where no mineral extraction is implied in its construction.

A technology is free when it gives more than it takes. For instance a robot might require a few hours of service from human labor once a year. But if it does the equivalent of even just a few hundred hours of human labor it has a net negative cost in labor-value. In terms of minerals if it is built from minerals that were polluting the world around us, the mineral cost is negative: as opposed to subtracting value from the land as mining does it adds value to the land. And finally the energy of the technology must be free in the sense that it absorbs from something unwanted elsewhere.

Ultimately what is being built here is a form of artificial life. Life takes only what can be given from somewhere else. Our technology exists in a world where humanity is God. This all goes back to the notion that the structure of our technology is based on the monotheism of its initial architects. We have built a technological world where Man is God and only God is above Man(to use biblical sounding gibberish).

But this technology will be alive, will exist as animals and plants do, without a singular separate God. This means that while it needs humanity to help it survive at all stages and can easily be controlled by humanity it will exist on its own and can function to a large extent on its own, following it's hardware-progammed logic to find what it needs in the environment to keep living and carrying out its mission.

Free technology is owned by no one. Not only is there no intellectual property, there is no physical property, except for the Trash Wizard stick, which might effectively be a part of a Trash Wizards person. The act of creation of an anarchist artifact is a gift to society of that artifact. A trash wizard might grab any technology lying around and re purpose it at any time. Anarchist technology does not recognize the concept of assigning value to things numerically in any way. Anarchist technology may get involved in various value circles, having various types of abstract relationships with various value circles, as codified in the Data Feed. Anarchist technology is also

energy free in the sense that it always uses ambient energy, be it a set of pedals, a hand crank, a wind turbine, a steam turbine, a tidal generator, a lightning accumulator, or a solar concentrator. Anarchist technology is designed to be as modular as possible, being as friendly with other unrelated technology as possible. Anarchist technology does not distinguish between information, energy, and materials–all three are processed as equal participants in the various flow through the system. Technology is not to be considered free unless it can be constructed by a small band of trash wizards using their trash wizard sticks using common source materials from the waste stream of the old extractionist economy. The ideology of trash wizardry is that capitalist industry sacrificed itself for the bounty of our new free world. Mining is dangerous and destructive and suicidal, but it's done, and we thank our ancestors, thank their sacrifice and their hard work and the creation of so much material wealth so evenly distributed(you can find a mineral from anywhere pretty much everywhere thanks to the spread of capitalist industrial technology). We give thanks for this great gift from our ancestors and build a society based on free living on the bones of the old world. We accept that things will never go back to how they were before industrial capitalism but that we can live better because of our mineral inheritance. We accept that the ways of the old world were a suicide pact, but also that even in a more free world, we can never be free from change and un-

certainty. Ways of life, empires, whole worlds, climates, continents, will rise and fall, and we cannot stop that level of cataclysmic change from happening. But we can build an adaptable and sustainable future based on free values that moves forward into a future actually worth seeing. We can bring adventure back into the human condition, as well as acceptance of a huge and uncertain world, and our role as passengers on it.

Anarchist technology also breaks barriers between customer, worker, engineer. We eliminate these hierarchical notions. We are people. We build things as needed and help each other as needed. We tell stories to express our values with the help of our Data Feed. We break the very idea of an economy open and build a new way of relating to each other and existing.

A Technological Complete Set

following blog post needs to be cut up and turned into the complete technical set, with another list and maybe a cartoon

Fundamentally, as every capitalist will explain, the economy is about making it easier for people to trade different kinds of things. And it is of course assumed that you need things from someone you don't know who wants to trade money for stuff you "need"(even if that need is artificial, based on those people controlling all the communications technology on the planet).

So the way to destroy that is with technological Complete Sets. A technological Complete Set is a set of technological methods and tools which allows the users to live without an economy. That means they already have everything they need with that core technology plus some work that is not too arduous for them to do(less arduous than engaging in the outside economy).

A complete technological set has the following needs met:

- food
- clean water
- disposal of human waste
- temperature control inside sheltered areas: heat and cooling of air in indoor environment of some kind, construction of those shelters such that this needs minimal

- energy(use natural heat and coolness from the environment)
- communication/networking/controls/ automation/audio/ video/VR/AR these are the real reasons we need "computers"
- medicine and drugs
- make any of the tools needed for the rest of this, and do what industry might be needed to adapt to changing conditions: more people, fewer people, new

That's enough. The rest comes from that. And this is very hard and encompasses a lot of things.

Food is the one people always gravitate towards first, but I think that's a mistake. Growing your own food does not give independence, especially if that food is tied to land that is part of the ownership system. To be truly free you have to be able to get food fast anywhere with gathering, hunting, and *rapid* and *dense* agriculture. My guess is that a new agricultural technology will be needed that integrates the rest of the complete set with food *and* drug production, since it will all be part of the fractal reactor system, moving nutrients around as needed to grow both food and also other things that can be grown like drugs and even carbon nano structures. So when I put food on here, I'm not thinking of farms I'm thinking of a huge range of options. For societies that have chosen to live in water, I'm imagining 24/7 aquaculture driven by high intensity grow lights made from organic LEDs which are driven by tidal energy, combined with reactors that get needed nutrients from the sea while removing undated salt. For deep sea dwellers, the main energy source will be violent wave action and wind, which can power floating worlds of aquaculture in the same way.

I propose that the problems that need to be solved for food independence will be solved as a side effect if we focus on medicine first. This is one of the ways the capitalists use of controlling us. And they know it. "Sure", the capitalists say, "go live in your hippie tree commune.

But when you need an MRI and some antibiotics or AIDS drugs, you'll have to come to us and if you don't have federal reserve debt currency to pay for it we'll let you die."

As applied physicists it is our job to build the tools that let people practice medicine. That means chemical testing and processing, growing of all types of microbe and plant needed for medicine in house with short lead times, non-invasive imaging, surgery, prosthetics, and a lot of other measurement tools, as well as the ability to quickly and accurately access the sum total of human medical knowledge. The last part will require a complete reorganization of how medical knowledge works, and elimination of the arbitrary lines between doctor, nurse, pharmacist, patient, technician, and all the rest. That is a hard problem, but it has to be solved to destroy capitalism, because we need medicine to live good lives and the capitalists have one of the most vile monopolies on that.

So we need a chemical reactor that can work with microbes as well as chemicals, but this also covers a lot of other useful things! It's how we get clean water and turn human waste into useful products, including food, covering several of the points above. It's also how a lot of manufacturing will happen, because a closed environment of tubes and chambers and pumps is such a good place for assembler robots to function.

And what about cooling? We need refrigeration for a

lot of things, including food and medical storage, as well as cooling to make spaces not too hot to live in. That means pumps, and fluids. If you can pump and move fluids around you can cool, with any of various working fluids, including water and some readily available other chemicals like ammonia. Making ammonia from urine and then using compressors to make coolers out of that seems like a good choice for a universal basic cooling unit.

Heat should really be the clever use of solar(as in heat, not some photo voltaics, which I oppose in their current form) as much as possible. And cooling of human habitat should be the clever use of cool deep water and cool deep earth as much as possible. The heat is there and the coolness is there, we just need to think the heat flows through a bit more. And with private property fetishism eliminated, and the States finally smashed, migration can be a huge part of this. It is a simple fact of life that some places are much nicer one time of year than another. One of the great crimes of the nation-state is forcing humanity to pretend this isn't true. Migration to a different climate on the time scale of a season is not hard technologically, it's all politics that stops it. No borders! No nations! No property!

So now the list above needs to get re-arranged into a list of things to actually build. Pumps, motors, generators, energy storage electrolytic cells, energy storage in pumped water, construction of all sizes of tubes, all this forms the matrix the rest is built in. And I need the

generic assembler/editor technology mentioned before, where manipulators can cut and weld from the nanoscale up through the meter scale the found objects thrown away by capitalist society.

That should form the seed. If it's easy to do a chemistry process, build a good environment for a biological process, and reverse engineer and edit arbitrary semiconductor circuits, people with expertise on these things will be able to quickly replicate the capitalist technology they use now. Most "professionals" are being hurt by capitalism now, and using bad tools that make it hard to do their jobs. Given the alternative of free and also better technology they'll move over in droves and drive this thing really fast, we just need to light the spark, make that first set of tools, and lay down the design rules that make this progress work well while continuing to avoid capitalism. Part of how this needs to work is we need tools that people can adopt *quickly*. A trained doctor should be able to use our medical tools immediately because their function is obvious, simple, and easy to modify as needed by a person competent in their trade but with zero background in our specific technology. We seek to remove the technician and engineer completely from the process of technology usage.

Destroy the Economy

Ultimately this is a path to destroying the economy as it stands today. The best people will jump ship the instant they see that we have a better offer than the capitalists. The capitalists rely on the exploitation of the professional class(with lots of perks thrown in to differentiate them from the working poor) for their system to work. Given a choice, if people switch instantly to our methods, their system of fear will crumble. They will keep paying people to do work, but the wages will have to spiral upwards as the best people refuse to work for money. Eventually the working class can actually bankrupt the capitalists by removing their labor from the money system. If the last capitalist wants to pay the last professional a trillion dollars a year to sell themselves stuff, so be it. Without the labor of the masses, they're just another LARP club, and harmless.

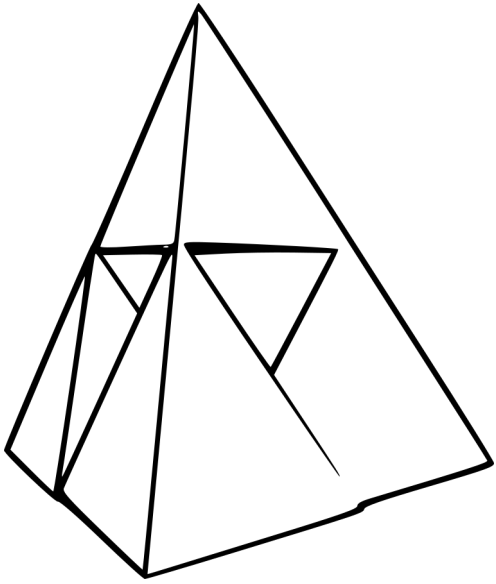

Figure 2.1: second Contemplation

Second Contemplation: Tetrahedral Fractal

Here fabrication is part of the practice, we carve out a very simple tetrahedral depression in a stick, chop up bottle caps and apply heat to them to smash them into the mold, making a plastic tetrahedron. This process is repeated several times, and then the individual units are

built up into a larger structure by welding the corners. This contemplation involves staring at the very limited porto-fractal shape and contemplating how it would scale up and down, and the limits of that process. How big could you make this? Or how small? What is easy or hard? Try it.

This is a very inward-looking contemplation, and it should involve some fairly meditative(more than the previous one) floor flopping movements.

This is about anarchy-freedom. So anarchist songs are what this Contemplation is themed to. I will start with the Yiddish song Down with The Police.

Chapter 3

Principles

Statement of Principles

- All technology should be free
- All people should be free to leave a technical sphere and enter or build another one
- All national borders are not legitimate and must be abolished
- The world is magical. The properties we have always called "magic" can be ascribed to all things in the physical world, and these powers can be harnessed by the techniques of Trash Magic
- Capitalism cannot and should not be reformed, it should be opposed in all places and times until it dies
- The concept of professionalism is harmful to the

human condition, it poisons the soul, and is evil

- The concept of finite number to represent human values is a mind virus that must be purged. The infinite exposes deeper truths than the finite. These problems go to the deepest level of our mathematical thought from arithmetic to the underlying axioms of mathematics
- Morality consists of a set of axioms. An axiom is a unproven statement which we take to be true in order to build up a system of thought which can guide action. The principles in this list are put forth as axioms.
- It is not our role to debate capitalism with its defenders. Every possible basic argument for or against capitalism already exists on the Internet. Our job is to build a set of moral axioms, a set of technical skills and knowledge and build up a practical society from that. It is not our job to waste time repeating the same arguments with capitalist apologists and time wasters.
- No technology should be made from mass-mined materials
- The sum total of all money that exists in the world is a small fraction of what would be needed to compensate the victims of capitalism from its crimes(e.g. slavery and imperialism), thus there can be no justice within that system

- Every single word said every single idea ever put forth by an economist is a vicious lie. Economics is not a science, and this work is rejecting traditional science anyway. It is not our job to argue with the economist it is our job to build a better world in which they are not welcome.
- The wage system must be abolished
- End work. I am against work in all forms. We must attack the concept of work at all levels.
- Technology is personal, as it should be. Relationships between technology and the human body are always in mind.

Design Rules

Engineers who build technology usually use something called "design rules" and "figures of merit" as guides for how to build a thing. The following are the different design rules in which we may deviate from capitalism to end up with technically different results:

1. The more general solution is always better
2. The Most readily available materials are always the first choice to use as well as to study
3. The most obvious solution is the best, although what is obvious may not be obvious
4. Self similarity is a desirable property, and by default it will be built in for several(but not infinite!)

zoom factors to all technical systems

5. All technology is art, all art is technology
6. All technology contains its own data, is linked to itself on the web, self documents how to make more, where it came from, where it is going
7. Technology is not really deployed until you can create it with zero federal reserve debt or consumption of mined or extracted material. To deploy a technology is simply to make it and have it get used, and you must spend zero money to make that happen. Selling it after that is optional, and can be done for workers to get central bank debt currency but can also not be, and all parts can float in and out of different value circles(more on this later in this work)
8. Absolute precision will scale linearly with scale, meaning that we might keep just 10% relative precision at different scales, with gross motion at 1 meter with a few cm uncertainty, then a few cm motion with a few mm precision, on down to 1 nm motion with 1 angstrom precision.

9. Every piece of technology should be as versatile as possible, with clear and easy instructions encoded in it for many uses
10. We will not build or work with those who build antipersonnel weapons. Drones and other machines are fair game as targets, however

11. Every technological component should have the maximum possible number of uses, and should be cross referenced with other instances of itself so that the user can find out those other uses instantly, and this should be true of all the sub-components of a technical artifact
12. Every technological artifact and component should tell a personal story, connected to users, builders, and artists.

Chapter 4

What is Trash Magic?

Why Trash?

Who owns a dog turd left on the street? Who owns the piles of plastic bottles that collect in an eddy of an urban stream? Who owns the soot that collects on the walls of a bus stop? No one. The concept of private property, which I regard as evil, does not incorporate all things. For capitalism to function it has to have both "assets" and "liabilities", which the capitalists associate with opposite signs of numbers. What if a turd is not a liability or an asset? It does not exist in the capitalist universe, it is their ultimate trash, of value to no one, and it is the seed that we must use to create a better world.

Why Magic?

Many reasons. First of all, what exactly is magic? It's subjective. Magic is what, subjectively, gives us a certain feeling of wonder about the world. I believe that that wonder should be intrinsic to our technology always, just as we expect it to be with art. Hence the removal of the artificial separation between art and technology is a path to what is essentially a form of magic.

Also, the use of this word is very annoying to members of the technocratic priesthood which this work seeks to undermine. The very possibility that someone might do something useful and interesting in a sphere called magical is upsetting to them, because it is clearly not part of their "pure", "rational" world. This thus draws a line in the sand of sorts: on one side is engineering and business and the rest of the "rational world", and our work stands very much on the other side, where things are a little less sharp and clear and countable. Hence my statements in the first chapter about Trash Magic being an artistic movement in this first stage.

What is a Trash Witch? What is a Trash Wizard?

Witches and Wizards have for centuries been symbols of humans' ability to wield various magic powers. I draw on many traditions for this concept, from pagan lore through

Tolkien and Harry Potter. The traditions built up from fiction, culture, and religions of various kinds give us a picture to draw on for the archetype of the Trash Magician. I don't want to use the term "magician" too much though because it can be mistaken for the person who puts on a magic show. Perhaps that is not all bad, though! The magic show can both teach and inspire wonder and that is certainly one goal of Trash Magic.

A potential downside of calling us all witches and wizards is that those can be gendered terms, and that's not what I'm looking for with this new society. But I will propose for the sake of this work a non gendered definition of witch and wizard. The person wielding trash magic at any time is practicing witchery or wizardry if they are doing witch like magic or wizard like magic.

What?

Well, for example, let's say you're in the woods at night, doing some hard core potion making and saying something like "fair is foul and foul is fair", and there's a lot of cackling. That's witchery. If you're in a huge field of rocks swinging your Trash Staff around and launching lighting bolts at the other rocks, that's wizardry. It doesn't matter what gender the practitioner may or may not have–if you are wizarding you're a wizard, if you're witching you're a witch. At least for the moment. Mostly trash magicians have both Trash Wizard and Trash Witch natures, and most magics we practice will use both as well.

But I have still only loosely defined this way of being. The Trash Witch is someone who believes in a world where we both have a element of adventure and mystery in our lives and where we have the advantages of what we now call "modern technology". We believe that this magic should be available freely to everyone in the world, and that everyone in the world should have the freedom to wield this and modify it as they see fit, and use or not use whatever magic they need or don't need.

Trash Wizards and Trash Witches use the laws of physics and the methods of applied physics as a form of magic. We teach that magic to others, and spread both the serious scholarship of Trash Magic and the basic practical skills needed to give the magic to all.

All our teaching and building is free. Free, meaning outside the money system and capitalist economy. But also free meaning people have total freedom to take this and duplicate it and modify it and make it truly their own. A love of pure science demos is a core value of the Trash Wizard or Witch.

Another goal is independence. A group of just Trash Witches should for example be able to live on their own, with a good quality of life. Maybe dozens of Wizards or dozens of Witches can easily form tribes to build and scavenge and do adventures and art. But also tribes can form super-tribes which merge to build truly large works. The only way giant social structures can be optional and not control us all is for us to be able to live freely with

just a few people. The magic we plan to wield here is designed to give people that power.

Figure 4.1: Wizard by the creek

We also strive to amuse. You don't want to learn

about magnetic fields just because they're useful. You can see from us that they're actually magical! Magical enough that a show put on with magnetic fields or electric fields is very much worth watching. In fact, one of the most popular shows in most science museums is the electric field demonstrations with giant lighting machines.

So a Trash Magician uses a combination of Wizardry and Witchery to amuse and provide for people with Trash of the world. Trash is generally stuff that is not only free but infinitely free. Not only can you go find one or two or 10,000 of a thing, you know that later you can go back and do that again as many times as you want. This is true with flowing water from spring snow runoff or from tides or drainage of some large rainy area. It's true of winds that always blow, of the sun, of sand and dirt and rocks. It's true of sticks shed by the lower sections of pine trees. And it's true of the plastic bottles thrown away by capitalist society.

A society of free stuff is not one with "zero cost". It's one where cost is infinite but value is also infinite. We are moving to a value system that works mostly with infinities. That is part of what makes Trash Magic actually magical. And if you're a Trash Witch or Wizard, that's your stuff! You wield the magic that moves the trash around!

In addition to Trash Wizardry and Witchery one might be a Trash Daemon or Trash Imp. Trash Goblins can have a place in our community but not Trolls.

Trash Wizards are always there for everyone. We welcome the refugees of capitalism and it's evil twin, war. We do not recognize the validity of borders and are here to help subvert them as needed to help the down trodden.

Alchemy, Chemistry and Art

Part of the narrative we learn when we study chemistry in school is that of the failure of alchemy to accurately describe the elements. We learn that these primitive prechemists thought of the elements as being earth, air, fire and water, rather than the array of chemical elements we know in today's periodic table. The *real* elements are divided up based on our supposedly superior modern understanding that atoms are the basis of all matter.

I dispute none of basic science we all learned in school in terms of atomic structure, this manifesto is not quite that kooky. What I do dispute is how information is organized in our minds and in our education system. Consider an element like oxygen. We know that a lot of oxygen in the world around us is in the form of two atoms together, as a gas which makes up about one fifth of the air around us. We also know that all water has one oxygen atom(along with two hydrogens), and so all the water in our world has oxygen. Fire is pretty much always a rapid chemical reaction involving oxygen, so we also know that all the flames we see in our world on Earth are partly made from a form of oxygen. Finally, the one of the

most common minerals on our planet is the relatively inert silicon dioxide that makes up most sand as well as many other minerals. The melting point of this solid is well over one thousand degrees.

Now, while I would never deny that it's useful to say all these things have oxygen, or to understand what that means, is that really the most pertinent quality they all have? To the alchemist sand is "earth", fire is fire, water is water, and air is air. Four elements, which we deal with very differently in all possible ways. We look at that and say it's "wrong" because the knowledge of what atoms make up these things is somehow more "fundamental" supposedly. But what if we didn't organize things that way, even though we understand how atoms work? What if we still recognized that earth, air, water, and fire as elements, which just happen to be also made up of atoms? This world view would have the same facts as the one we hold today, just with their order re-arranged.

Ideally what I seek from this project is to remove these kinds of hierarchies altogether. I don't want to say that alchemy is "right" and chemistry is "wrong", what I object to is the basic notion of right and wrong here. It's based on the notion of our ideas having some kind of objective other reality beyond that of the world we live in. I think this kind of ordering of ideas is one of the ways we've held ourselves back in science due to ideology.

We need to stop banishing things like spells and elementals and potions from "real" science just because

of cultural values. A drug is a magic potion, what else would it be? Prove it isn't! A program on the firmware of a robot is a magic spell. Prove it isn't! And every artist knows art is magic. The only way we have denied that in science is by simply saying we're better than art on the ladder of "reality". This has, again, held us all back. It's led to a century of inaccessible art and incomprehensible science. We need to reunite the strands of alchemy, magic, art, and science.

Symbology

Where to trash magic artists get our symbols? From the natural world, from geometry, from anarchist iconography, and from religious art. We also seek to replicate, but softened by the influence of the natural world, the design aesthetics of 20th century industry. This will be almost a parody or a three dimensional rhyme of sorts, not so much to bring out the function of the industrial thing but to remind us of its form to make us think of where our trash comes from and what we are replacing.

Note that when I say religious art, this is very broad, since much of art through the ages has always been inspired by whatever the artist viewed religion to mean. Religion is our deepest held beliefs which form our world view outside of that which can be proven. Art at its best tries to express what that means, and is often deeply religious, but takes very different forms due to the di-

versity of religious beliefs. In particular, however, trash magic will lean toward the "occult" from various Western traditions. Due to the author's non-indigenous Western background, I want to avoid appropriating cultural traditions of which I'm not a part. And I feel like one way to do this is to focus on "pagan" traditions of various kinds, as well as occult Jewish and Christian art.

The anarchist symbology will include the black wild cat used by the IWW and other anarchists, as well as various permutations of the circle A. The following image combines the black cat with the form of the magnetic field from a tiny magnet, symbolizing one of the forces which we will harness in Trash Magic.

Some electrical symbols will also be incorporated, partly since many things we will make involve building electrical circuits, and building those symbols into the art makes things self-documenting. While these form a useful function in helping to make a thing free by documenting how it's put together, they should never abandon form for function: circuit documentation should be a work of art as much as a document.

Capitalisms Unwanted: a Human Treasure

One of the sources of constant pain for most people subject to global capitalism is the phenomenon of some hu-

Figure 4.2: Wildcat in the field

mans being simply unwanted by capitalism. The people who live in the big cities and write computer code for a living and control the nodes of power in our society no longer have use for most of humanity. This is true even in a supposedly "rich" country like the United States or France. Looked at globally, whole nations are written off by the global elite as disposable, a mere nuisance. Meanwhile, war, an inevitable aspect of capitalism, creates an endless stream of people who have had even what little shreds of social wealth they might have had smashed by

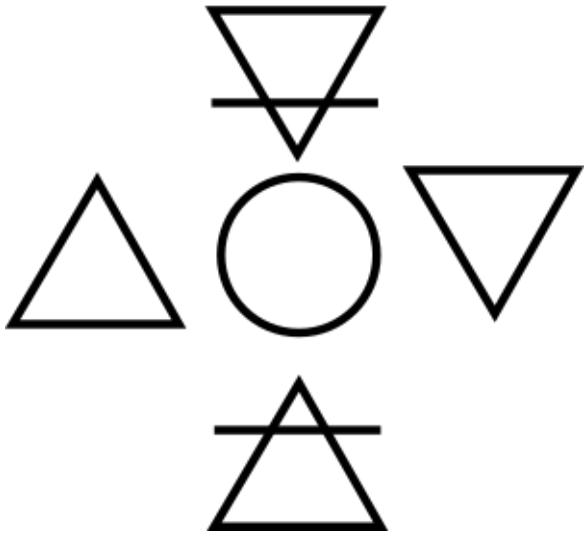

Figure 4.3: Elements

the war machines of Capital. Environmental destruction will also create increasing numbers of refugees as population grows and our living world continues to be murdered by Capitalists.

The people in this "unwanted" demographic have nothing to gain from the current system. Most of the laws in our system exist to protect property owners from those who do not have property. As long as someone owns property, the capitalists care at least enough about them to tax them. Once someone has no property *and* no

Figure 4.4: Squat Sign

special technical skills to put them in the priesthood of "tech" the capitalist system has zero use for them and thus doesn't bother to help them even survive any more than they have to as vestiges of the society the Reaganists have destroyed in the last 40 years.

But from our standpoint the concept of a "lower class" simply makes no sense. Each human mind has infinite power to create art and science and culture. The fact that capitalism has created an infinite stream of unwanted

humanity outside their system, who have zero vested interest in that system simply means there is an unlimited supply of human genius to deploy on post capitalist projects. The future belongs to those who are able to welcome capitalisms unwanted with open arms as the infinite treasure they are rather than constantly attempting to cull out the "unwanted" from their own ranks, driving the working poor out of their cities or off their land.

We must develop technology/art/culture which naturally appeals to and is instantly useful to those abandoned by capitalism. It's the right thing to do, since they are the most underserved in the current system. But it's also the long term strategic thing to do, since it means we will naturally out grow and overtake the capitalist system as we build something that is better enough that more and more strata of the existing society jump across to the free world and join us.

Skeletron: The Wooden Bones of Art

Skeletron is the system that makes the bones of Trash Magic artifacts. Skeletron is simply a way to modify things found in your environment to make them play together well with Trash Magic. Primarily this means gathering sticks, shaving them to be flat on one or more sides and removing the bark, and drilling holes in them. Quarter inch holes spaced about one inch along the line of the sticks is the most basic component of Skeletron. This

can be used to do many things, and as more people build it and use it and modify it, it will become increasingly versatile and free.

With a universal wood framing system we can build up many different human sized structures. This can be used to make various shelters, although to do this we will add plastics to the system, using methods of hand plastic welding detailed in the last chapter of this volume. With the ability to make wood skeletons with plastic skins we can make waterproof structures on land as well as waterproof boat structures and amphibious artifacts of various kinds. The combination of wood and plastic in a modular and modifiable way also can be the basis of all the other industrial constructions to be described in this work.

Trash Magic Kit: The Stickening

Part of practicing Trash Magic is having constant access to some basic technology kit, generally based on various sticks from the above system, which can be used to build up everything else.

What are some capabilities of Trash Magic kit?

1. Measuring tools: distance, position, mass, volume, temperature, pressure, etc.
2. Electrical to acoustic probes to measure the electrical properties of our environment in real time
3. Optical microscopy

4. Conversion to robot mode where it drives itself around
5. Convenient single shoulder strap for comfortable wear like a bike messenger pack
6. Music player
7. High voltage storage capacitors
8. Batteries for low voltage storage
9. free space optical audio communication(analog)
10. fractal fluid control
11. can harvest energy using a built in magnet and coil setup
12. water pump always available
13. goggles that can interface with various imaging technology using analog displays with vibrating fluids
14. 3d imaging at all scales with vibration of fluids and ion transport

Free Phones in Trash Magic

One of the many idiotic things capitalists say to shut up their critics is to point out that capitalism is the source of the smart phones that anti-capitalists inevitably use. These devices are indeed amazing, and are no longer luxury items by any means. On the contrary, they are very much a survival tool used by the oppressed classes now, and it's very dangerous to ignore that role this technology plays. But what aspect of them is so great? The social networking. That's always what you need: access to the

web, various messaging systems, and various commercial things like Uber and Lyft.

Does that really need to be a computer? A truly free phone would be a pure communication tool that communicates in a distributed way like fido net of old. the sole purpose of the hardware would be to communicate images, sounds, text, and to decide where those should go. That's it. What the hell do you need a computer for? Mostly so that The Man can spy on you and figure out how to sell you things you don't need, and force you to constantly throw more federal reserve debt back into the machine for more advanced machines to get more indoctrination to continue the cycle.

Don't be fooled by the dominance of the computer technology into believing that's inevitable. It's not. We can get orders of magnitude more benefit from peer to peer networks than we do today as slaves to the military industrial machine if these phones were all free like freedom, linked up on free hardware all the way. This can actually be the basic informational skeleton of the value circles.

I believe that the hardware can be re worked from the ground up based on our approach to applied electromagnetism to get something with totally new fab. But in the mean time, given that that is a lengthy applied physics research project, what can we do? My answer is to watch closely everything that has anything to do with Raspberry Pi and other "internet of things" projects in

the open hardware domain. I say "open hardware" here and not free hardware, because it's not free according to my strict definition: it relies on mine- driven fab and capitalism, and there is IP in the supply chain(and some other problems). But it's way better in terms of open and free than the whole android/apple ecosystem.

The Tripod and Multitool

The basis for all Trash Magic fabrication will be the tripod. a tripod is exactly what it sounds like: three sticks, joined at the top with wire or tape or rope, as well as with guy wires at the bottom if needed, with the bases of the three sticks planted in the ground for stability. A rock hangs from the center to keep it steady.

Each of the three sticks shall be of Skeletron. Each shall be the size of the Standard Trash Magic Staff. A practitioner of Trash Magic shall have the power to deploy this at any time, at any scale and with any tool. Full xyz motion is possible with wires that are fed through holes or wheels on the sticks, and can go to stepper motors for drive and/or wheels on potentiometers. Each wire connects to an arduino that runs a three terminal pulsed transport measuring protocol. The ADC signals are amplified and converted with some math to an audio signal, visual display, and or vibrotactile interface.

This probe can be heated with the wires, can do local electrochemical work and measurement, measure nonlin-

earities of all kinds, and can thus weld, plate, edit, implant ions, plastic weld and plastic re-shape, signals also displayed in a GUI in a smart phone if needed but can also not be, can have no "smart" computer at all, just dumb computers. Sensing can be capacitive, inductive, resistive, frequency dependent or not, nonlinear or not, gated or not. Many different sizes and weights can be used, gear ratios can be changed on the fly with various interchangeable wheels. Everything is modular.

Thermal regulation of processes can be carried out by moving the position of a suspended cauldron in 3 dimensions relative to a fire at the bottom of the tripod, using a microprocessor and feedback on a thermometer to regulate the temperature to a fixed point.

In a cluster of Trash Magic industrial production there can be many tripods, all in a network, connected by plastic plumbing, electrical and data connections, and zip lines that move materials from one to another, setting up ad hoc nodes in an assembly line that can be grown and shrunk on the fly.

Tripods can also support roof and wall materials, making shelters that people can sleep and work in. Tripods can be trees that already exist. Tripods can also be completely submerged for doing intricate work on the bottom of a body of water. In zero gravity another set of sticks are needed, and another cable and springs. The materials for a pair of tripods should also be able to become the skeleton of a simple boat, which can then deploy mini

tripods to the water below it.

Tripods can be fractal, with a small tripod lowered from the tool head of a large tripod. Smallest tripods should have Angstrom resolution and atomically sharp tips, biggest ones are hundreds of meters tall.

. . . And More

This chapter is one that must be sparse in the first edition but which will expand in the future. That is because I have a bit of a chicken and egg problem: I need a finished manifesto to inspire me into total commitment to the applied physics research, but need the fruits of that research to properly deploy this first edition manifesto. So I'll attempt to split the difference here, just sketching out a crude shadow of the things I plan to build, with the understanding that it's probably wildly inaccurate based on how the research will create surprises.

Chapter 5

Universities

The university system is a disaster in just about every way possible. However the *potential* of this system is too great to ignore. The potential of all those excited young people ready to change the world who also happen to be on some of the nicest land in the world, in institutions which have a fair amount of independence can truly change the world if they change how they are run.

Much of this chapter should not be written by me but by the people who are scholars of the history of student insurrections. Student insurrection has been a critical component of both university life and revolutionary practice for many centuries. There are whole movements dedicated to this kind of work, some of which are documented in the Undercommons Project at `http:`

//undercommoning.org. If you are on a university campus, study the links contained there and study university history and the history of student revolt globally. Study this history and learn how to apply it to your own story and your own campus.

Universities: Visions of Utopia

If the university campus lived up to its potential it could be a true paradise: essentially a giant garden filled with buildings for studying and creating knowledge. Amazing! They are usually situated on some of the best land to be found anywhere, have great access to everything needed in life, and have dense urban style housing in a pastoral environment which allows for a simple, car free life.

University campuses are often physically spectacular. They often have some of the greatest examples of art and architecture of available both used in their construction and lovingly maintained for in some cases hundreds of years. It is typical for them to have wooded areas owned by the university, as well as often running water and in many cases access to very large bodies of water. University campuses are often more self contained than most institutions, creating their own power and managing their own utilities, and having a fair amount of autonomy from local government.

Undergraduate Education: Broken Promises

The college education has become a key element in the great lie of the American middle class dream. It is also a major factor in the older generation destroying the opportunities they had for the younger generation.

College has become just another capitalist cartel, exploiting the hopes of young people in exchange for a life of debt servitude. Young people are still told by their elders that a college education is needed to enter the middle class, which is supposed to be a good thing. They're told that the price is justified by long term earnings. Then they're sent off to live in a party resort for 5 years where they shuffle through a series of pointless and irrelevant classes, and wind up with a bill of many tens of thousands of dollars(this is primarily an American problem, but the neoliberals will bring it to your country soon enough if they're not crushed at the global level).

And what do we learn there? Theory! Propaganda! How to write papers no one will read about stuff no one cares about. 100 year old science. At this point defenders of the System start howling about "pure knowledge", by which they mean theory over "applied knowledge", by which they mean actual knowledge about how the world works. Theory is a virus, a disease, and a religion, and it has no place here.

What should we learn? Same subjects, but useful.

Why can't biology majors make drugs? Why can't physics majors build a flying drone? Why can't chemistry majors build a water desalination plant? Many subjects should, I think, be totally eliminated, as they have no real value, such as economics and computer "science".

Science Grad School: The Ponzi Scheme

You don't have to go to graduate school to see how much it resembles a pyramid scam. Suppose any one professor has about five graduate students at a time, each of whom takes about five years to graduate with a PhD. If a professor does this for 30 years, they will create on average one PhD per year or 30 PhD's total. Now suppose all those PhD's find jobs similar to what their advisor has. This is possible only if the size of the field increases by 30 times in 30 years. Very crudely this corresponds to about 12% per year. Given the expansion of the physical sciences and their satellites in the years during and directly after World War II, building a scheme like this in those years actually made some sense. However, those days are decades behind us, and now as research budgets shrink and schools, companies, and government agencies are systematically destroyed by politics, this math looks much more like a pyramid scam than a response to society's needs.

As a grad student you will *probably* never get the job you're supposedly being trained for. But you will

dedicate 5-7 years of your life to helping someone who *did* get that job to continue to climb the academic ladder. The people at the bottom of the academic pyramid spend their lives working to help the people at the top, and then are mostly cast aside.

The tenure clock then puts yet another opportunity for exploitation in the career path, making yet another way for people now well into middle age to work long hours for more years to build up an academy that they might then be cast out of.

Hollowing Out of the Academy

There are many factors that have contributed to the downfall of the university system over the last few years. I would argue that since Ronald Reagan was elected president of the United States in 1980 there has been a coordinated ideological war against all culture that might exist outside of the profit system, and that universities have felt the brunt of this particularly hard.

A robust, healthy, independent, and publicly supported university system could provide a real balance against mainstream corporate power if it existed. It is therefore strategically important for the lords of global corporate rule that they be as controlled as possible by corporations and the central government so that they cannot exercise a check on those forms of power.

Intellectual Property

Intellectual property deserves its own section here because it has been so corrosive to the culture of the academy in so many ways. This manifesto is opposed to all forms of private property, and particularly intellectual property, but the patenting and copyrighting of work done in universities is particularly evil.

It is now standard practice for public tax money to be spent to create knowledge which then goes into papers behind a paywall protected by brutal copyright enforcement and into patented or even trade secret knowledge. If the rule of law actually meant anything this would clearly constitute a criminal theft from the public. The fact that this is *not* considered a criminal act is in fact a major indication of the evil nature of the capitalists' so-called "rule of law".

Potential Paradises

How should a university work, after the fall of capitalism and the takeover of their administration? They must be self-sufficient. They must grow all their own food and produce all their own energy and industrial goods. They must be able to maintain the core knowledge contained in the libraries with equal or superior care to the existing capitalist system, as that is the heart of the university.

The education of the incoming young people who are

now called "undergraduates" must be joined with the construction of this new world. That is, undergraduates will combine learning with labor to actually physically grow the food, build the robots, build the industrial production, build the energy infrastructure etc. The graduate education will combine more advanced and specialized practical work with more scholarship: writing and reading as it has been done by scholars for thousands of years. What are now called "staff" must be integrated into this as well, both on the scholarship and on the work and the development of new methods of work. Bringing the staff into your insurrection early also creates powerful allies for later on as you fully take over the school.

University Occupations, Phase 2

Any history of any radical movement will inevitably involve student occupations. Students typically take over some space on campus, keep the land from the cops, and carry out various protest actions or teach ins over some number of days or maybe weeks. In some cases they stand down after actually getting some demands met by the administration. And then they end, and everyone moves on.

I suggest that as with all occupations one way they can continue is to create art that can be moved and lasts and is taken from one action to another, creating a whole narrative that passes along both the ideas and products

of each action to the next, creating a snowball effect. The purpose of this chapter is to gently nudge people in the direction of building this kind of infrastructure instead of just running a protest as long as possible until the inevitable crackdown.

Case Study: Your School

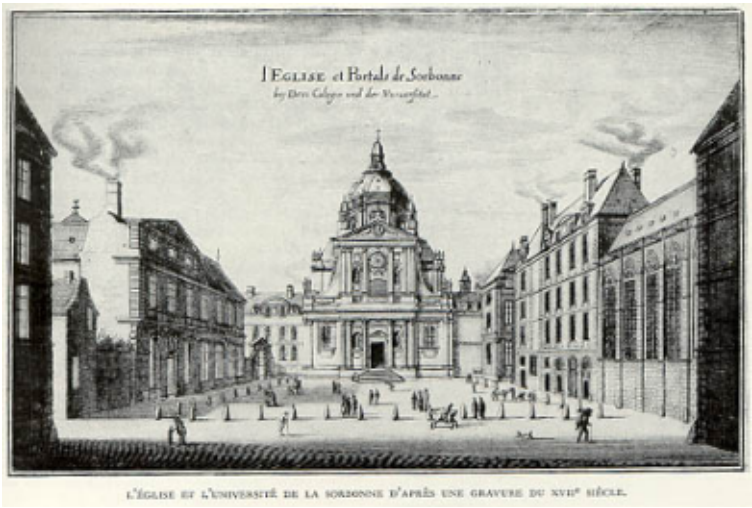

Figure 5.1: The Sorbonne

You have to write this section and integrate it into your version of the text, if you are connected with a university.

Figure 5.2: Map showing location of Roosevelt Island in the East River, between Manhattan island and the Eastern boroughs of New York City.

How much land does the school own? Map that, and go walk the land and figure out what is on it and how it flows. What energy resources are connected to that land? A creek or river or ocean is your first choice. In many cases the local river is near but not directly adjoining the campus. Figure out what a supply chain would look like that would connect infrastructure you build between the cracks of the property society on that river with the campus. Can you charge batteries in large numbers and bring them to campus using couriers? Can you build hidden power lines to bring power in? What about water, can you purify that, bottle it, and bring it in by courier? Study the map you make of your campus and environs, and figure out what it would look like to get supply chains built up that will function under martial law, in all out war with the campus police.

Do not just plan for the short term! If you play chess with the campus police you will lose; you want to play go. In go, territory is captured and lost in a dynamic way, and those gains and losses can oscillate forever in theory. You want to build long term strategy that involves not just holding an administration building for as long as possible, but to become a force that flows around campus, rising and falling as you see opportunities, and fading away. University insurrections have always suffered from a lack of strategic thought in terms of how land is taken and held. Realize that as soon as you create any sort of resistance fixed in geography you are handing advantage

to the campus authorities. You are fighting a guerrilla war, act accordingly.

Also, the long term plan must be partly legal in nature, to exist within the capitalist state without further military escalation by authorities. This means you need to recruit from the law school, and have people studying the corporate governance of your school specifically to figure out how to carry out a legal coup d'etat in which full legal control of the university corporation is won by the insurrectionists. University corporate charters can be very complex and strange and old. Legal documents like this often have strange legal loopholes which are hard to find but which can be exploited at the right moment in such a way that those who believe in the so-called "rule of law" can be convinced to side with the insurrection.

Note that this "war" should never be about violence. While the goals are similar to violent insurrections for a more democratic and free campus, the methods should never involve competing in violence with those who have made it their life's work(the campus police and their backers). Rather, we must win on superior infrastructure. Build better things: better technology, better classes, better scholarship, better classrooms, better food, better housing, better libraries. Do that and you can really win the academy back for the scholars away from the business scam artists who now run all universities.

Universities: a Global Beachhead

Taking universities over can be a huge international beach head that goes around all national borders. Every country has them. And they all have very energetic young people who want to change the world and try new things. They can be of huge global importance in the years to come as the current system falls apart. Capitalism is killing the universities, and the faculty who love the schools will see eventually that they have to abandon capitalism if they are to see what is good in the system continue past this century.

Chapter 6

Rumbles of Robots

Robots!

Robots! The word is loaded with both promise and peril. We dream of robots that do all tedious labor, freeing humanity from it, as well as of robots that might take over and kill us all(fiction seems to favor the latter).

I also believe robots can be transformative, although I think we should look at much of the hype from today's "tech" companies with many grains of salt. Self driving cars and autonomous battle robots have mostly turned out to be worthless hype machines useful for making Silicon Valley hucksters rich and not for much else.

Here I will look at some of the robots I think we should build with Trash Magic which can make a better world for caring for one another and having adventures,

which is what this book is all about.

A Rumble of Robots

The collective noun for robots is "a rumble of robots." I'm not sure where I heard this, I think one of my friends may have made it up, but it's so perfect it's too good not to use. So I want to talk about rumbles of robots. In particular the difference between robots used for consumption and for production.

Amazon is in the process of building robot based infrastructure for delivery. This is fundamentally a consumption driven project. The main initial figure of merit in the growth of their network will be coverage: the more potential consumers are covered, the better. This will mean that it is optimal for robots to be as far as possible from other robots. But how does this picture change for production?

Rumbles of robots are very common on the production side of things. Those who produce cars and computers and the like often have rumbles of robots, with humans just as technicians who run the machines. Much like a cow hand or shepherd, I think there should be a name for those who herd rumbles of robots: rumbler. So the trash wizard is also a rumbler. And the trash wizard stick is like the shepherd's crook: a device that controls a network that consists of your rumble of robots.

That is what seizing the means of production is really all about. It's not about seizing an existing factory, which will be based on existing methods, or about building a primitive system that can't compete. It's about building rumbles of robots which can reproduce themselves by harvesting free materials to make more, and then rumbling them around to build what else you need.

Key elements of the trash wizards robot rumble are mobility and versatility. They will run off of locally harvested energy, and be programmed to gather energy as needed as well as materials. They should scale in that the robots you need for a 10 bot rumble are not so different from a single roninbot or a 1000 bot rumble. They should be able to reproduce from found materials and forage for those materials with some simple guidance from the rumbler. That is the plan.

Robots with different times scales, centuries of work, or hours of lifetime

Something that I think needs to be investigated in robot design is time scale. Capitalists like a certain time scale– the shorter the better. But without capitalism and its obsession with short term growth and profits we can set times scales on hundreds of years or even longer in some cases. Suppose an area of land is contaminated with plutonium or some other radioactive heavy metal. It might

be there for many thousands of years, making the land uninhabitable. Thousands of years, but not forever, and plutonium has uses even in a peaceful society without rules. Why not clean it up?

Perhaps the robots that clean plutonium will grow their own biofuel to get energy from the sun and slowly pick their way across the land, working with cyborg worms and fungi to dig up the atoms and move them together and out of the water table. How many processes of atomic or molecular transport open up when we allow a process to take thousands of years? Many. I'm sure capitalists already use the term "geological engineering" but I would say that to truly apply that term, you should be carrying out a technical/artistic endeavor which takes place on a geological time scale. That means it has to be *very* easy for future people to understand, maintain and repair. It also has to anticipate future geological changes, including catastrophic ones like a volcano that destroyed all life on earth for a billion years. And it should have time horizons that stretch well into the 10's of millions of years. What's your hurry! If we were not all hounded by debt to capitalists we could take time to really work on hard things like plutonium cleanup one atom at a time.

Earth Robots

The octahedral ball drone is a octahedron made of three intersecting sticks, with a flexible joint. Simple mechan-

ical motions of the tips of the ball-like shape cause it to roll across the landscape with a slight hopping or walking aspect that makes it able to deal with very rough terrain.

Rolling ball robots can be used for all sorts of long slow land cleaning processes. Rather than try to maximize battery life, they will use capacitors to store energy, and recharge the capacitors from ambient energy. For a rumble of jacks in the prairie, the obvious source of power is the wind. Ideally, the wind will be used to create energy which will immediately go into directed propulsion. This might be slow since it depends on gusts, but it can go on forever, so slowness becomes ok. This is technology that you would deploy to spend 1000 years cleaning up a sacrifice zone, where you want no outside energy or materials to be needed at all and for the rumble to keep doing its work for hundreds of years. Also, obviously, clearing of mine fields is a immediate application. A rumble of tire-sized octahedra could potentially roll themselves at 10's of miles per hour, keeping up with a car or truck and making it possible for the rumble to proceed in a mob ahead of a motor vehicle, taking out IED's in real time. The rumble could end up in a convoy geometry, stretched out over the length of the road, doing recon ahead and tracking behind to see what's happening after a convoy passes. In these applications it probably makes sense for the source of power to be the trucks or cars in the human/freight convoy, with individuals in the rumble cycling through the charging station and back out into

the rumble.

These are a great tool for agriculture, or even just gathering. A gathering rumble could go out and gather roots and berries from the countryside in a quasi-cultivated area. These roving balls could be picking up and dropping seeds as they go, mapping where all the useful plants are, and also harvesting as they go, taking wind sun and water as energy sources as needed, then spending energy when it's available to do the work.

Rolling robots with windmills: they roll, then gather wind electricity into a capacitor, roll again, and repeat. They can go for hundreds of miles with no intervention. The instinct to go a certain direction based on navigating off of the sun is programmed into the physical hardware. After some long time, maybe many years, the machine calls for help, eventually someone finds it and follows the instructions for repair and improvement. With generation after generation editing and helping the thing exist, it can exist for hundreds of years, slowly cleaning up wasted sacrifice zones of the old capitalist world.

Free robots like this are a rational response to the fact that the existing system has created sacrifice zones. These sacrifice zones have negative economic value in the old system, making them freely available to be absorbed into the anarchist industrial infrastructure. This is key: in order to avoid getting crushed by the forces of the old system too early our movement must exist in the fringes of the current system, where the old ways have

created land of negative value. The very fact that land can have negative value, that this is a concept that people accept, should be yet another red flag that assignment of numerical values to real human values is a morally bankrupt act.

This should always be the goal of free technology if it wants to grow exponentially without a lot of resistance: the input must be things deemed of "negative value" by the old system. Unlike most projects in capitalism which constantly drain everyone involved more and more over time, creating generation after generation of institutional burnout.

Air Robots

Everyone is in such a hurry! Most aerial drones for personal use today(2016) are designed to move very fast for very short periods of time. Generally with four propellors pointed straight up, they can take off fast anywhere, go in all directions fast, dodge fast moving obstacles, and often only last a few minutes. If broken, they have numerous small parts which can be very hard to fix.

Quad copter personal drones are great capitalist technology: they break easily, cost a lot, do very little, need constant upgrades, and are mostly "useful" for entertaining the techno-priesthood and annoying everyone else. Not surprisingly I see much that can be improved here.

The first way I would set about making drones less useless is by making them float instead of fly with propellors. Given that they're both small and don't have living cargo, I would say the arguments against hydrogen for lift are mostly obsolete.

How should motors work for soaring drones? First of all, if the thing is large enough it can float on the circular current patterns in the upper atmosphere, holding position with no mechanical work done. But what about motors for guidance? These motors should be electrostatic, powered by extremely high voltage giant balloon capacitors which are the main body of the soaring drone. Using two very light polymers in very thin sheets with opposite positions on the turboelectric series, it should be possible when far from the ground to generate *extremely* high voltages very easily using the mechanical energy source of the rotating air currents. Electrostatic motors can then run off these, also built from thin polymer sheets with thin metallization. No magnets and no copper coils! It's nutty to use the magnetic field for high altitude low power low speed motors, they should all be based on electric fields, because it's easy to get megavolts up there.

What about scaling these robots way up in size and weight for use inside storms? One could imagine giant metal gliders in massive rumbles of 10's of thousands or maybe even millions of units, all ripping around in a storm could over the ocean. These generate giant

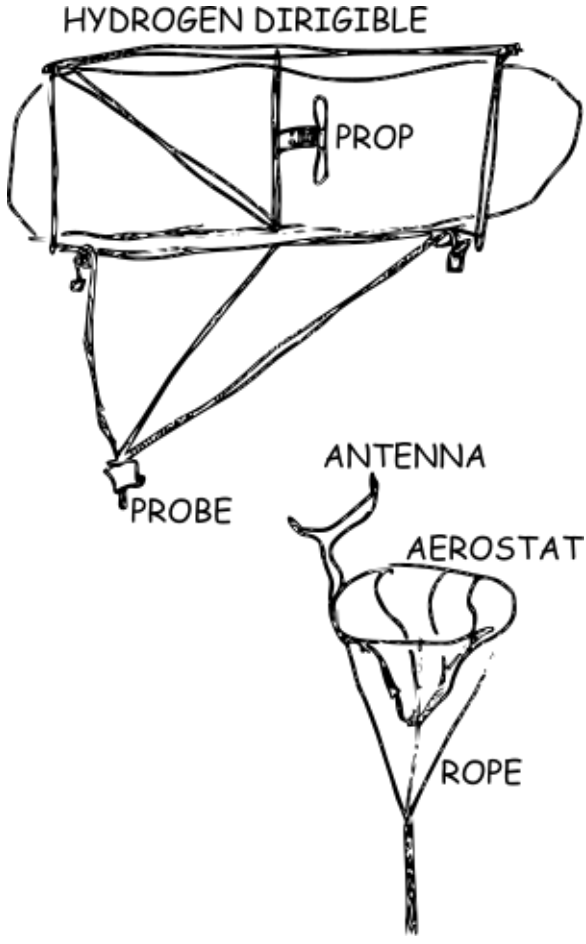

Figure 6.1: Hydrogen Drone

hydrogen-filled blimps which then gather in a huge rumble to go turn back into useful work near a settlement or floating factory.

Water Robots

Littoral robot rumbles which can use tides and river currents to generate electricity to propel themselves upstream. They can be amphibious, use water to charge and land to move, can move with hopping, jumping, walking, rolling, and slithering. Littoral trash cleanup robots are fundable, can make a huge difference in cleanup of a waterway, and also give us free source material for more building.

Another robot rumble I want to build is the slithering water robots. These use the usual magnet and coil arrangement to create a slithering motion in buoyant objects, which can then smoothly cut through the water. The fact that this has not been widely deployed is totally insane: the same drive can be used in reverse to get electrical power out of wave action. If the length of each robot is a few wavelengths, the whole thing will be forced into a wave which can create EMF as the magnets move, which can go into the storage capacitors, then released to change slightly the nature of the serpentine motion to direct the drone in a specific direction.

These can be incredibly powerful technology! The ocean can be a fantastic source of raw materials for the trash wizards. Note that for neutrally buoyant drones,

this can serve to move them through the water below the surface. One mode of operation might be to cruise a few meters above the bottom of the ocean, scanning for stuff to salvage, then dive and grab rocks to be negatively buoyant once a target is found. With just barely negative buoyancy, the rumble can float just above the target as they pick it apart. They then drop the weights, rise up, inflate bags to float(everything is made from rubber, and reversible air/vacuum/water pumps are in all things), and pull up and bring material back to assembly centers, which can also be floating robot rumble factories. With ocean currents and waves as an energy source, and no hurry, these robots can work as slow as they have to, slowly making more and more of themselves until they can have a global impact on ocean cleanup.

The water based propulsion system also is very appealing for boats. I want a boat that runs on wave action, wind, and tides, to grab energy as it finds it, and then use it as needed to move toward a destination. I can imagine this being just about kayak or canoe sized. I could also imagine a freighter that is meters or even 10's of meters long. That sounds small for a freighter, but imagine, again, that they're a huge rumble that can be easily scaled up. This can be a freight swarm to move materials across water.

How Robots Reproduce

Not on their own! With help. Robots can always ask for help, and it is our task as their designers and creators to build the information into them in the form of works of art that makes it obvious how to repair and extend the robot. A robot should also be constructed in such a way that it is its own means of production: the components of the robot can be used as a machine to build more robots like it. This will require human effort, but both the physical tools and the information required to learn the skills to duplicate the machine are built into the machine and obvious to find and use. Modern technology is designed to scare you away from modifying it or interacting with it in any deep way. We seek to build machines that do the opposite: invite the user to get more deeply involved, building more, documenting that process, and extending the technology themselves for others to use.

I will illustrate this with an example. One of the simplest robots will move itself around looking for energy, then when it finds some(generally a fast moving water body like a creek) it will turn itself into both a power plant and a chemical plant, storing energy and chemicals extracted from the water(targeting human industrial waste of various kinds). This will involve a computer, some motors and some sensors. Other machines will be involved in large scale computer fabrication as outlined in other sections of this work.

Cyborgs

A cyborg, or cybernetic organism, is a combination of artificial devices and living things. I believe that we should blur these lines both in ourselves(we have already done that) and in our fellow living things with whom we should be able to more harmoniously co exist.

One other thing to observe about both ourselves and our fellow living things is that when examined closely we are almost all in a symbiotic relationship with other living things. We need our gut bacteria to live, cows need fungi and bacteria both, trees rely on fungi for their roots to be robust, which ensures the survival of the whole forrest, etc. The responsible development of cyborgs should combine living things with non living things in a thoughtful and artistic and compassionate way.

I propose that the more communication oriented of our fellow living things should be given access to our communication networks. I have no idea what happens if you build a virtual reality headset for a octopus or squid and allow them to communicate with other squids thousands of miles away. But if they can put their heads in or not on their own, surely it's worth trying? Perhaps we could allow them to smoothly join our society, and co exist with us if we allowed them to communicate with each other using our tools first. A truly symbiotic relationship with cephalopods might end up with an arrangement where we help them live good lives using our

control of the oceans and our sensor systems for weather and they use their bioluminescent skin as display technology for some networked communication devices.

I would note that both for these water based creatures and for the various flying creatures including insects, birds, and bats, their brains may allow them to control flying drones with much better skill than we can, and in large rumbles with much better flocking ability. Perhaps another virtual reality rig is called for, allowing birds and bats to connect with huge soaring drones so that they can expand their minds the way we do with our machines.

We should not limit cyborg development to the obvious animals! Plants and fungi and various strange micro life should be also investigated at all levels. What would a slime mold cyborg look like? Something awesome, one might hope. And finally plants, when integrated with technology, can suddenly move! This leads us to the super ent, which is the next section.

Super Ents

The fractal mater reactor should be alive. Trees, bushes, grass, etc. can grow all around it, with roots going into various fractal channels which provide nutrients. These liquid spaces can have various animals and fungi and microorganisms, creating a whole ecosystem. Imagine an island built up of such mater, the size of a small build-

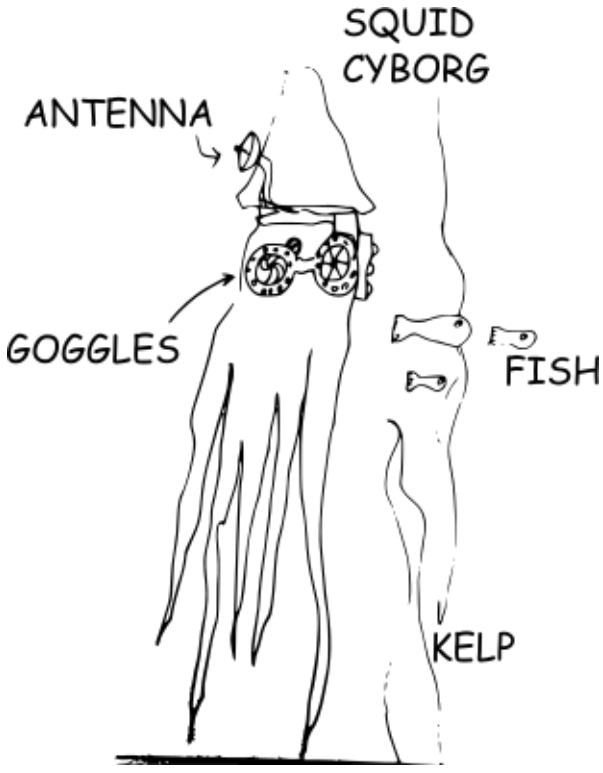

Figure 6.2: Squid Cyborg

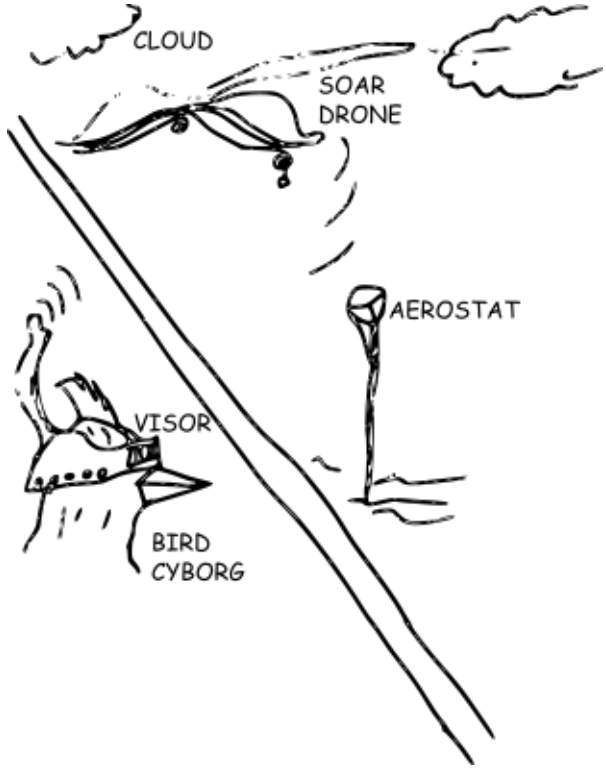

Figure 6.3: Bird Cyborg

ing, covered with trees. Ambient energy is used to slowly build up and discharge electrical energy to operate philosophy engines which slowly walk the whole thing across the landscape. With little or even no human intervention, this lumbering living giant might spend decades crawling up and down hills scouring for junk cars, which it turns into a ever-growing robot rumble that it can give away to any passing humans for free at any time.

Building this kind of thing in the ocean can be incredibly powerful. Whole floating islands filled with fractal reactor technology can wander the high seas, with the humans all underwater in bubbles to ride out storms, picking up storm energy and sea junk, and building a every larger floating city deep out in the ocean. This aquatic fractal techno city could exist even in a dead world of violent storms and acid oceans and extreme heat.

Machines that comb the ocean for contaminants, using waves go get energy to move around and sort and grab stuff, potentially floating around for years before being found based on a data stream that pulses out periodically, and eventually another type of robot tending robot can grab it, extract the materials it's gathered, and bring it to a floating factory robot rumble. This kind of robot is important for the ecosystem of the jungle city in the ocean-inundated coastal post apocalypse.

. . . And a World To Win!

The Anthropocene is here. Like it or not, it's here. For the next 1000 years our planet is going to be dominated by the actions we choose to take as a civilization. If we stay on the track we're on, the atmosphere and oceans heat up, massive desertification destroys wet ecosystems while rising oceans eat most of our cities, and the oceans become a toxic waste dump that cannot sustain life. If we do nothing that is clearly what will happen. Or something worse involving nuclear holocaust. Given these alternatives, what difference does it make how drastically we change things in the sea, air, and land? The opportunity to simply not let civilization get big enough to destroy the world has long passed us by now.

So is it so wrong to imagine the whole landscape filled with these lumbering rumbles of rolling, slithering, hopping, and gliding robots? Is it wrong to let them reproduce with human help, but with very little labor-time, allowing groups of people to build endlessly expanding rumble spheres around the world to create a world of total abundance? I say that it is not wrong. Maybe if there were a way to go back it would be a hard choice to do something that disturbs the balance of nature like this, but there isn't.

This is what the trash wizard wants to make possible in the world: endless streams of material and data moving through the physical world with robots made from

trash, which encompass our whole human environment. Maybe not the whole world, but enough of it. A world of abundance using the rumble sphere and value circles could exist outside of the states and corporations. It does not need land, just someplace to move to–it is all mobile by default. The trash wizards build the needed expertise up and document it and teach it so that any group of people can create this kind of culture anywhere, specific to their individual cultural needs and the available resources in whatever geographical area they're in.

Chapter 7

Free Drugs, SlimeZistors, and Ion Magic

Technology Should be Slimy and Dirty

Look around you. We are leaky bags of salty dirty water, and we are surrounded by mud and dirty rocks on all sides. This is the world we live and grow and thrive in. It's how our food grows, it's how our waste is disposed of, it's how we get our raw materials and how we dispose of our "trash".

And yet this is not how our technology is.

Our technology is, instead, obsessed with the clean and "pure". It is obsessed with order, with perfect rows of

things, with straight lines and perfectly geometric circles. The very structure of all our technology represents our worship of numbers and math and military order, as well as of mining and minerals.

I will go into more detail on this later, but I believe the structure of the modern micofabricated circuit is a product of the white supremacist ideology of the far right lunatics who started Silicon Valley. They were, like all of their kind, obsessed with "purity", order, and forcing everyone to march to a perfectly timed clock. This is borne out in a machine architecture which they pretend is a product of some kind of technical evolution but which is just as much a function of their capitalist religion as the rows of decorative stone columns they place outside their buildings of power.

If, rather than Evil Machines, we want our technology to be more human and more life like, it should resemble what we see around us in the living world. This means it should be largely filled with and immersed in dirty water. And it should be capable of moving fluids and gasses around at around with simple circulation systems.

Another key distinction of living systems is that they do not distinguish between material transport, data transport, energy and electrical transport. All of these involve the flow of ions and various big molecules through fluids.

Our non-living technical systems crudely split these functions off from one another. We have banished pure information to the domain of "computers", all controlled

by the all powerful Master Control Program of the Central Processing Unit. Fluids flow as needed for cooling for chemicals, but are clearly lower in the hierarchy than information which rules all in today's "tech" world. Ions in fluid rarely take a deliberate role unless it's in a living system and cannot be avoided(people drinking sport drinks with electrolytes, or use of acid in car batteries).

Moving Fluids Around

One type of magic that must be wielded if we expect to have a decent life is potion making. This means mixing fluids, moving them around with pumps, compressing them, running electricity through them, and also doing things with gasses of various kinds. This is needed to efficiently compost waste at a high speed safely and to build up plant growth infrastructure fast for food production. It is also where novel chemicals and various life saving drugs come from.

Fluidics is generally a term used to refer to the use of fluids in ways that are analogous to electronic circuits. Since Trash Magic seeks to eliminate the boundaries between fluid flow and electronics, I want to integrate this word into our vocabulary to help blur that line. Here I will briefly describe how the fluidic systems will initially work in Trash Magic. The full technical description of this system will take up much of the future volumes which will come after the Manifesto.

We need to do all the things with fluids that living systems do, as well as some things they do not. Everything we use to build with should also be used for fluidics. This means we need fluid channels to be cut into stone, wood, plastic, and metal. Part of the initial Trash Magic set of skills and tools will be to enable this. Probably the easiest to do are the two I've done already: wood and plastic.

The use of salvaged plastic for fluidics is worth focusing on here because it's such a hallmark of our way of doing things. The thing that makes plastic special for our purposes is how easily it can be edited after being formed. No plastic structure in our system is permanent. Any joint, valve, pump, chamber, or tube can at some future time be reshaped into other components as needed.

How do we do build a fluidic system that easily self-edits? Look at blood. Blood is not just a fluid, it's a rich medium of machines and information of all kinds which can do a huge array of tasks in the living body. So should it be with our constructions. If the channels are all filled with fluid, solid objects can be moved through the system using fluid flow, rather than a propulsion system or external control tool of some kind. All that is needed to edit the plastic walls of the tubes are simple tools that combine heat and force to shape and weld. Thus one of the elements of this has to be many sizes of simple robot that do this work by remote control at various scales.

The issue of scale brings me to the next topic: the fractal nature of our systems. A fractal has self-similarity over different size scales. Mathematical fractals can have infinite numbers of scales of self-similarity, but as I've repeatedly pointed out, this type of pure math has no physical reality and we should look to things that actually exist in nature as a guide for what is or is not useful from math. Look at a fern. It is usually pointed to as an example of self-similarity to show how relevant fractals are to the world around us. But notice a fern is only self similar up to a point in both directions. As you go up to the scale of a whole forrest, a fern is just a spec, with no fern-like nature, and as you go down to the scale of atoms, that fern-like nature is also lost. Thus we seek to build things which are fractal, but not infinitely fractal.

Channels through the plastic, wood and stone should be filled with fluid much of the time, but can also be used for various gasses including air, as well as possibly vacuum in some cases.

For pumps, the simplest solution is the first choice. This means hydrostatic pressure from existing bodies of water are a first choice for an overall pressure bias, and for user control the first choice is direct manual manipulation of flexible membranes. Rather than a user controlling a button that controls an electrical signal which controls a machine that controls the fluid, I think it's always better to have direct connection between your body and the solid that controls the fluid. This means flexible

membranes and various tubes to transform up or down in pressure or volume.

Something that we can try to do with Magic that the capitalists avoid is work with chaos and complexity by using our skill as living minds to learn how to do that. For fluids, this means that I would argue vortices should play a larger role, We can learn to generate them and manipulate them, and that can be used to do chemistry at a very physically specific region of a fluid. It might take skill to control a fluid probe in the right way to make a vortex that can be used to carry out a useful chemical reaction, but in our world view that is ok. Human skills are better than fancy machines. The vortex ring(of which smoke rings are an example), in particular, is a really beautiful thing which is under used by the techno priests for obvious reasons.

I use the term "fractal reactor" to refer to the whole class of technology/art that will be built up in the way described here, since various reactions are a main goal of the systems.

Brew Everything

It has become clear from recent advances in mainstream biotechnology that almost anything can be brewed using what the capitalists call "industrial fermentation". This means that micro organisms are cultivated and environments are controlled so that those organisms can create

products that are useful to humans. This generally involves controlling temperature and pressure and flow and mixing accurately, as well as making sure vessels are not cross contaminated with the "wrong" organisms.

One of the most important things to make free from capitalist control are drugs. All drugs. Conventional western medicines to reduce swelling, AIDS drugs, pain killers, specialized treatments of all sorts of disease–all these must be made free. The capitalist system builds huge centralized factories to carry out "industrial fermentation" so that these things can be done for profit over a very large number of people. If we are to eliminate these centralized factories, we need to be able to make very small batches of safe, high quality medicine.

Making 10 doses of a drugs is never relevant to a capitalist, so we have no idea how hard or easy that is. Our task as we redirect basic science research away from profits is to change what questions we ask to better reflect our values. Building a fractal reactor that can make a 6 months supply of insulin, then can be reprogrammed easily to make 100 doses of ibuprofen is simply not something the capitalists will ever do. But we must do it.

We will need to be comfortable working with DNA quickly and efficiently to do this. I think this will involve moving away from the current system that uses a ton of statistics and computer work and fancy chemicals and figure out how to use living things and our electrical probes to physically manipulate DNA directly using elec-

trochemical devices that integrate with various nanometer scale ion channels. I essentially argue that as our technical systems look more like living systems in other ways that building this type of thing that comes closer to how real life works will be easier and easier as our science progresses.

I think it is impossible to overstate the potential value of really free medicine. This is one of the ways the capitalists fail the most painfully to care for the people in their society. If the choice is 500 dollars a month for a capitalist medicine or zero dollars for a free medicine that is also targeted specifically to your personal metabolism and genetic code, it will not be difficult to convince people of the inferiority of capitalism.

As with food, clean water is almost too obvious to belabor–everyone knows we need free water, and everyone who's not completely brain washed can see capitalist behavior in regard to clean water is pure evil. Free water: we need it. Capitalism is a failed system, time to move on.

Ion Magic

Life is electric. In life, when information flows in a nerve pulse or when we pump molecular fuel in and out of a cell, electrical charge flows from one place to another. When electricity flows in salty dirty water, it is generally in the form of ions, which are atoms that have either lost

or gained an electron, making them carry a nonzero total charge. Chemists use the "+" and "-" to indicate that an atom has either lost or gained charge, and how much. When salt is dissolved in water, the chlorine turns into Cl- ions and the sodium becomes Na+ ions.

Nerve impulses involve the flow of K+ ions, which are potassium with a missing electron. So when you eat food that has potassium as a nutrient it appears as a solid but when your nerves use it to operate it's an ion. Ions are central to what makes life life rather than just dead matter. Thus I identify the ion as another of the fundamental alchemy elements along with earth, air, water, and fire.

Most of what we call chemistry and biology are in fact electrical processes. If we want to integrate our art into those processes we need to be able to interact with flowing ions, both detecting and controlling them. An integral tool of the Trash Magician is thus a probe which allows us to do these things in a simple way.

How do we interact with ions? By batting them back and forth like a cat with a ball of yarn. A capacitor is a simple electrical device that stores charge. Pretty much everything in the universe is a capacitor at some level, but our industry has built them to specified values and they're very easy to control and salvage. The behavior of a charging capacitor is very much like that of a tank of water. How fast you can fill or empty a tank of water depends on both the capacity of the tank to hold water and the conductance of the pipe you drain it or fill it

through. If you can change the direction of flow quickly compared to how long it takes to fill or empty the tank, you can set any of various average water levels, and ramp the flow rate up or down as well. Going back to our electrical probe, the capacitor is the water tank and in our case the actual fluid we are connecting to is like the water pipe(but for electric charge). This is perhaps confusing because I'm making an analogy between two fairly similar systems, but it should become more clear after you actually get to see and use this machine.

This tool seems obscure but it is extremely useful. The first thing it does is measure the electrical conductance(how much current flows for a given voltage difference) in real time. It does this by choosing an average capacitor voltage, then alternating the flow of electrical current with just the right rate to keep that balance for a given oscillation level. This oscillation in current will create a signal the frequency of which is set by conductance. With amplifiers and speakers, this means conductance can be played out as a musical note! We have thus created a combination musical and scientific instrument, which allows you to both work on chemicals as pure art and to measure their physical and chemical properties.

A hand held or machine controlled(using the Tripod) probe like this with audio feedback can be used to image objects based on their electrical environment in a fluid. With many wheels and belts to take large motion down to small motion it should be possible to use this to image

objects far smaller than we can see with visible light, even with the most powerful microscopes. A truly free form of nano imaging like this should immediately have impact on what science we can do for free, since it will enable imaging much faster and in more places than the capitalist science establishment can access.

Another key element for imaging is vibrational drive of fluids. Part of the first phase of early Trash Magic technology will be a generic mechanical vibrational drive. By using various mechanical resonators it should be possible to drive water waves at many different frequencies. With a time delay made by a very simple circuit which the Trash Magician can control with a simple knob, it should be possible to time electrical imaging with the vibration of the water, allowing a scan to be quickly made in whatever axis the wave is on with potentially video rates.

This is how our technology integrates together! Sticks and rocks and plastic trash are used to make a fluid circuit with electrical connections, then another stick with an electrical probe is used to play the fluid as a musical instrument, and another stick is used to create a vibration, and a bunch more circuits made from trash are used to make a visual display from this.

The time delayed imaging can also be used with optical microscopy in combination with the electrical probe. A strobe light which is triggered by the mechanical oscillations can be tuned in its time delay to create amaz-

ing artistic effects with projected light from optical microcopy of fluid channels filled with living things! This will get much more attention in the next volume of this work, but suffice it to say here that some simple optics for both microscopy and projection must be integrated into Trash Magic sticks and rocks and trash for this to be ever present to connect us with the microscopic world in an artistic way. Part of this system should involve projection on a wall or screen, and part should involve integration into goggles for an immersive experience.

So far I've discussed this probe for imaging, but also made some vague claims that it can do more than that. Using vibration and probe motion and pumps to control fluid flow while also using the probe and various other wires in the fluid to control voltage allows us to control the local "electrochemical potential". This quantity is essentially what tells an ion a place is good to be or not. It is how you get ions to move, the essence of Ionic Trash Magic. Anywhere you have ions in your fluid(which is everywhere) there is some value of this electrochemical potential. There is thus always a preferred direction for ions to flow.

So this probe is nothing less than a magic wand that lets us control how ions flow in the whole world that we care about(dirty salty water)! What atom these ions come from can be controlled both by flowing chemicals around and by changing which metal our wires are made from. If we then combine that with the ability to move

living things through our plumbing(bacteria, tiny worms, aquatic fungi, etc.) which all also control ion flow, we have truly Magical powers over this world. Ion Magic.

What can we do with these powers? I don't really know yet. The fact that things will be easy and free to try will create a massive flow of amazing discoveries with this once it's deployed in a truly free way. I think that it will be possible, however, to very easily integrate biological systems with electrical systems, making things like DNA sequencing and also neural interfaces exponentially easier. I also think it will be possible to make potions that are right on the edge of some transition, such as from liquid to solid, and move the probe around to 3d print solids right in a liquid, then go back and edit that solid, adding and removing parts as needed later. This is far less fantastic than it sounds, collagen, the structural molecule found in blood is known to be fairly simple to control using electricity in much more crude apparatus than what I propose here. I'm fairly sure the only reason we are not 3d printing with collagen in a stone dish with some trash based magic stick is that no one has tried. So let's do that! And bury capitalist science in the landfill of history.

The SlimeZistor

I have coined the term SlimeZistor here to refer to the hybrid electrical and fluidic elements which will make up

our systems. The idea is that I'm not sure what the slime will be(swamp scum, tap water, blood plasma, orange juice, etc.) or even how the electrical leads will be connected, but I'm willing to draw a black box and say "in this box are both fluid channels and wires and they're a SlimeZistor".

I'm leaving it open! One of the things I find infuriating about capitalist device physics is the endless classification of tedious sub species of device. Who cares? Most of the time, I want a switch or some memory or some energy flow or something–and I never want to have to care what long acronym the specific device used to do that has. It's the virus of professionalism rearing it's ugly head! The more complex the system of classification of basic electronic devices is, the more highly paid member of the technocratic priesthood can be supported by it. Those devices are never transparent and thus never free: much tedious and otherwise useless data must be absorbed to use them, making them very non-free.

I will say the SlimeZistor will involve all the fractal reactor stuff described here as well as the electrochemical probe, vibrational motors, simple oscillators with capacitors, optical circuits and the like–the elements of the rest of Trash Magic. We are attacking the divisions made by the number worshippers here. Just as everything in the universe can store a little charge and is therefore a capacitor, everything in the universe can be operated as a switch and therefore is a transistor. If everything we care

about is made of some form of slime, it's all SlimeZistors!

Editing Capitalist Electronics

It is undeniable that the capitalists have built an impressive wealth of microchips! Just about everything they make now is crammed with absurdly complex micro electronic circuits, with millions or billions of transistors on them, running at absurdly fast speeds with clocks of millions or billions of beats per second. Let's use all that, but not buy into it.

To connect with the electronics we first rip it all out using destructor robots. These can be probes in tripods that rip apart the cases so that the raw circuits are in our fluid. We then use the probe mentioned above to grow metal wires right in the slime which connect the various pads of the circuit with our SlimeZistor based circuits. We need to build up a protocol for using chips this way without fully integrating our technology with the horrible software which pollutes the capitalist chips. This will be a trial and error process, and we must not be held back by theory–we must simply do it and then write down how we did it.

As I said above, I think you can see evil ideologies polluting every atom in the modern capitalist chip controlled by the Silicon Valley cartel. I think it is worth mentioning here that one of the founders of Silicon Valley was William Shockley, an infamous white supremacist with

many extreme views on race and racial purity. The engineering manifestation of white supremacy and worship of numbers and military force can be seen in the perfect rectangular arrays, rigid clock system and extremely pure semiconductors used in modern micro fabrication. No more fascist micro chips! We must smash them all, and absorb them into something better. This also gives us a more complete form of cyborg technology that the capitalists will ever have, since the SlimeZistor will bridge the gap between the salvaged capitalist chips and the living systems that are in the fractal reactor tubes.

Plasma and Plasma

Different scientists use the word "plasma" to describe two very different things. One, used by medical people and biologists, refers to the main fluid of blood, the medium in which blood cells drift around. The other refers to ionized gasses, and is most commonly seen in various gas light tubes and glowing lightning displays. Trash Magic seeks to unite the shattered pieces of science. To that end, we must bring the plasmas under one roof!

By this I mean that I want to be comfortable that any given art piece we build might have both blood plasma in it, which can be used to create a 3d object made of printed collagen for instance, and tubes carrying for instance oxygen plasma, which can be used to aggressively clean surfaces for various applications where that is use-

ful. Oxygen can be extracted from the water with electricity fairly easily, and waterweed-driven vacuum pumps can create low pressure oxygen tubes. Waterwheel driven high voltage generators can then be used to ionize the gas, making a nice glowing tool that cuts through all kinds of dirt molecules readily available anywhere we need it. Let's bring it all together!

Another plasma that should be readily available is methane. Methane should be used as a process gas for making carbon nano electronics(nanotubes, graphene, etc.). Since part of a complete technological set will always be disposal of biological waste including various types of feces, we will always have biological reactors making methane from that process. Rather than release that gas into the atmosphere it makes sense to always use it as a process gas to make practical things from carbon(also including diamond, which can be useful for many things). The human solid waste reactors will combine the biological reactors described earlier in this section with various fractal reactors that use the outputs of that initial conversion system. Robots specialized in picking through the mass of waste from the future toilets also need to be built, possibly as cyborgs with existing composting organisms like worms will also be built.

The Future: Free Nanotechnology

What all this is really heading towards is the realization of many of the dreams of what the capitalists have called "molecular nanotechnology". That is a hypothetical technology initially in which atomically precise control of matter is carried out. Much hype was built up in the 1990s by people inside the science establishment, which led to a lot of funding and very little real advancement. Like all capitalist technology, the sketches of the hypothetical future technology these people made involved extremely precise and accurate control of every atom over many size scales. We know from looking at living things that this is neither needed nor wanted, and I think that's why they failed. We need to build up a more artistic approach to moving and placing atoms, and one which is more integrated with different systems.

With electrical gas plasma reactors we can create carbon nanostructures with control over branching and shape, making carbon nano electronic circuits. With ion transport and mechanical probes interacting with living things, the ion magic of living things can be used by our system. With imaging of the environment for ions in solutions we can have a fast, simple and experimentally relevant nano imaging system deployed for free everywhere. Ultimately what this leads to is not just complete sets of technology which don't *need* capitalism, but sets of Magical components that vastly exceed in power what

the capitalists have ever built or will ever build.

Chapter 8

Magic Tales and Magic Lore

Moving Beyond Money

Money is a failure. I have gone into some detail about this in the earlier chapters and I will attempt to not belabor it here. How, exactly does it fail, though? I say it's wrong to add up human value using numbers, but what exactly is the mechanism by which this causes so much misery? There are many mechanisms, but one that I think is worth starting this chapter off with is its dissipative nature. As money flows through our society it dissipates. At each stage from the banks out through all the people working and selling things and paying each other to when it comes back to the bankers, money is

"lost" along the way, usually to various parasitic organisms like landlords and online payment gateways that add no value but simply take from the system.

So one feature I believe we need to look for in a value system beyond money is that it should be additive rather than dissipative: rather than transactions making value decrease, as they do for both money and the physical goods capitalist claim as "property", we want value to *increase* as transactions happen. This goes against everything capitalism stands for, as it doesn't work with currency based on integer numbers, mining or human misery, but that's the point. The fact that there is "not enough money" to do all the many things that need doing in our society is partly because most of us do not have the ability to make it. We can get it from someone else, but ultimately they had to get it from someone who got it from someone who got it from a banker and of course all those transactions paid the dissipations tax to the various parasitic rent collectors. We can't just sit down, think really hard, make a thing, talk to some people and *make* something of value. We can make a thing then sell it for money, but that is no longer a closed system. If there are just the two of us, alone in the woods we cannot create value in the money based system without also involving a banker. Any system of value that we use to replace money must have the ability to grow in value and scale in a closed system, without any need to communicate with bankers, governments or others of

their kind.

It is also worth at least mentioning the so-called "alternatives" to money in the form of electronic currency like Bit Coin and the "time dollar" or other currencies based on selling hours of your life away. These are all still money. They use numbers to represent value, and address almost none of the underlying problems with modern money.

In the special case of Bit Coin the creators have actually managed to build perhaps the only money system worse than central bank debt currency. They have replaced central bankers with members of the technocratic priesthood who answer to no one and are some of the most unpleasant and anti social people in our society. And they have replaced an inflationary system with a deflationary one, making currency ever more scarce as time goes on. I wish I were creative enough to have invented Bit Coin as a sort of counter example of technocratic capitalism gone mad, much like the Schroedinger's cat story used to show the absurdity of quantum superposition(which still appears to accurately describe the world). It would have been a great thought experiment to show in a series of amusing anecdotes just what a horrible idea this is, but alas, this is not fiction and we all have to deal with Bit Coin people for the foreseeable future.

Infinite and Infinitesimal Value

When you say you want to move beyond money for keeping track of value, the capitalist will typically turn purple and start spitting about how absurd the very idea is of doing anything like this. They have been trained to do this, and it's a part of the immune system the capitalist machine has built up over the centuries. However, they know perfectly well that values without any numerical equivalent are quite common in and essential for our society in even its current form. Our society and indeed all societies have concepts of value outside finite number. Both "priceless" and "worthless" items are quite common in any system.

That which is called "worthless" by capitalists are often the feeds we will use as "Trash" in Trash Magic, infinite supplies of things given zero numerical value by the capitalists. Returning to the example from a earlier chapter, the dog turd on the side of a street is an example of something viewed as "worthless" or "trash" by the capitalists. To take this example farther, what would it look like to attempt to apply capitalist "economics" to the dog turd? Over some days it will be digested by insects, bacteria and fungi. Once some atoms from the turd have been consumed by a fly, does the fly own them? Who owns the fly? Or perhaps the fly is a liability, whose is that? If the fly is eaten by a bat who then uses those calories to also eat the mosquito which was going to give

me malaria surely the fly is now an asset, but whose? Mine? Or the bat? But who owns the bat? And if I return to the turd a couple weeks later and it's gone, did it "depreciate" to use the jargon of accountants? Depreciating assets can generally be written off as a discount on your taxes in most countries. How would I do that for the dog turd? Perhaps if the turd was on land that I owned and I had a numerical tally of the molecular wealth in the turd I could then calculate how fast the flies are taking away this great wealth and somehow turn this into numbers and then a tax write-off. But surely the molecular wealth in the bellies of the well-fed flies are now an appreciating asset. Is that then to be taxed? Who owns the flies? It's all just nonsense! The vast universe around us of "worthless" things proves the extreme limitation of the capitalist worldview to even basically describe our environment.

But what about the "priceless"? This is also an extremely familiar concept in every capitalist society and is also one in which their methods of assessing value completely and catastrophically fail. When it applies to an individual this is usually called "sentimental value", and applies to well-loved personal things. This might be a t-shirt which was purchased for very little and is too worn to still wear but which was worn on some long journey. More often the most valuable personal treasures are those which were given to us by others. We also use the concept of priceless to refer to those things with shared cultural

value. Perhaps a capitalist can put a numerical price tag on things like the various stone temples of our different human societies from centuries past, but we all know that is not the real value. When a ancient temple valued by the local government at some arbitrary number of units of bank debt is destroyed no one in the world would dare say that this is really the same as that much bank debt being destroyed. It's not the same, because there are values in these cultural artifacts which cannot *ever* be added up using numbers.

An example of priceless value familiar to some students of American popular culture is from the film Pulp Fiction from the 1990s. A character played by the spectacular Christopher Walken presents a watch to the son of his dead friend, and in one of the greatest monologs recorded on film explains the priceless nature of the watch in the form of a story. The story is not about the watch itself but about what happened to the watch–it's not really about the thing but the people. The watch ends up representing a four generation story of a male family tradition of warrior values. Within that culture it has truly infinite value. All this is shown as a flashback for a main character, to explain why he is willing to lose everything including his own life to save the watch. None of that is to tell time, to store value for retirement or to hoard metal. The value of the watch is *entirely* based on human values and cannot possibly be translated to finite numbers.

I would propose a system of values where we all have our own personal Christopher Walken telling the best possible stories about our things, which give value the capitalists cannot possibly add up with numbers. There are many ways to do this. In the end what all of them have in common is that they lead to a value system that takes more from the study of folklore than from the study of numbers. So the structure of a post capitalist value system will take its basic shape from folklore.

Just as folklore is incredibly varied, from wood carvings of ancestors to riddles and jokes to songs and epic poems, the tools we use to express value in industrial product should be as diverse as any other kind of lore.

Tales and Lore

This discussion of "lore" brings me to two jargon terms I will introduce for Trash Magic industry/art: tales and lore. Things in general should have both a tale and lore if they are to exist in a value system after capitalism. A tale is exactly like the story above with Christopher Walken and the gold watch. Part of the power of that story is that it keeps going: the viewers of the film see yet another dramatic component of the story, which presumably will be passed on to yet another generation eventually. In this case it is entirely oral, although of course in this case it is a tale within a tale since we are watching a film which tells a made up story of an oral tradition. I

think there are many ways to do this, the most obvious being purely oral, although the universal ability of people to both upload videos to youtube and watch them there using the now-ubiquitous smartphone argues that online video archives might be a way to combine oral tradition with simple and free recordings. Books, poems, carved murals, paintings, decorative rope work and songs all might also be a part of the tale. But whatever we end up doing, the point is everything should have some sort of tale. That tale might be "this was made in part of a giant assembly run of 10,000 units in some factory that actually sold them for money," but that's still a more complete tale than we usually get under capitalism. And it's just the beginning! Over time, a thing will have stuff happen to it, and all that should get added to the tale. The value of that tale will clearly go up as it gets passed around.

Unlike capitalism, which encourages hoarding, it's clear that giving things away to whoever will make the best use of them vastly increases their value over simple hoarding. "This thing was in my closet for 10 years" is clearly a much less powerful story than "this thing was given to someone who hitchhiked across the continent with it" or something else where the use and need are more substantial.

So that is the tale, but what is lore? Lore is the knowledge that is part of building a thing, and all the associated culture that goes into that. In our present so-

ciety, lore already always exists around things that are made, whether it is the lumberjack's knowledge of how to safely fell a tree, the programmers knowledge of how to use some key hardware driver, or the factory worker's skill on a drill press. However, as with the tale of creation, this lore is not passed on to the user in capitalism because it generally separates us so rigidly into separate categories: maker, owner, engineer, artist, user, worker, etc.

No more! We need lore that can really be passed on, the way operating a car or changing lightbulbs is now passed on in capitalist society. Again, this is probably easiest to start with face to face oral tradition, where you directly teach in a hands on way the future user how to make a thing. But just as with the tale, it can be a problem to carry it through a completely oral tradition because of all the times we want to pass goods on to others without having to travel, so we need ways to record both tales and lore. Again, the recording of videos and uploading to youtube is a good place to start. Also for larger artifacts, passing along some type of flash drive or other cheap and small memory which holds all the files for the designs as well as videos and images can help physically transmit tales and lore without the Internet or travel.

Ultimately we should be developing our own memory system which can record analog video in the molecular structure of grown minerals of various kinds after full

nanotech is working. Before that we should be growing interface mineral structures to found flash memory from salvaged trash which can store stuff, and before that off the shelf flash cards can be decoratively incorporated into various artifacts, with graphical artistic instructions which direct the future user to the media.

Note again that capitalists are already using these ideas in their own ways. It has always been common in history for various types of organized crime(including both government and various lords of capital) to patronize the arts to create "priceless" cultural artifacts(e.g. the whole renaissance), then to set up a market system where "stolen" works of art are held in illegal warehouses and traded around as value-holding items outside of the banker system. This is well documented in the literature of art theft history, and proves there is precedent for art being used as a type of currency outside of government and banker control. If the art market has always played a subversive role in capitalism, surely the ability to create infinite streams of art can even more so.

What I hope I have shown with this section is that the ideas required to build value into industrial products without money are already familiar. All we need is to look at what is already there and thoughtfully apply it to the tools we have and we can immediately do interesting work outside capitalism. What, specifically does that look like? My example will be the things I actually build in the process of creating this volume. The fact that they

are the co-products of writing this book is the initial tale of them. The lore will be the documentation I put in later parts of this book about how to make them. And as I give it to you as a gift(which I will do as many times as I can as well as I can) that act of gift will be another step of the tale. And the lore will carry directly from me to you both through reading this book and talking about it and also through the instruction that I hope to deliver to all who seek it over the next few years, showing everyone how to build on and grow and make more of all this. If it does grow, the value of these tales will continue to rise for *all* of us, from me as creator to you as participant and onward to your successors. Just as capitalism tends to lead to a repeated pattern of they pyramid where the lowest and largest level is always crushed by the higher ones, we hope to build a future that also has repeating patterns, but those patterns are ones of abundance.

It's ok to start small! Take meaningless junk, paint it in a way that tells a story, glue stuff to it to make it useful, then give it to a friend, tell the story, and pass that on. If they do the same back to you but with something else, you have now *both* created a greater value than you started with, and with no bank or government intervention and no numbers.

Also note that this is not barter. Economists love to use barter as a club to beat non-money-worshippers over the head with. But as David Graeber tells us, this is largely made up for that purpose–barter has always

primarily been something used with untrusted people in essentially capitalist ventures. It's still number-worship, still numerical values used for everything because you simply have to find direct equivalents for everything. You do not need Christopher walken monologs for barter– clearly a problem. Like bit coin and the time dollar, I cast the ideas of barter aside as capitalist propaganda and religious nonsense, to be mostly ignored as we try to build a better world.

The Feed

People love their feeds! As horrible as they often are, the various social media feeds that dominate modern life are fantastically powerful tools. In Facebook, Twitter, Youtube, Instagram, and probably a hundred other sites I don't know about, users have the ability to quickly scroll up and down though a timeline that mixes the output timeline of many very different entities. Often the timeline you see will mix local news, foreign news, personal announcements from friends, artistic output of various artists, promotions for other artists, weather data, and numerous other types of useful and (potentially)interesting information.

Given that these feeds are easier and easier to build with modern software, are generally free and are well known and liked already, I think they should play a part in how we pass lore and tales along. Perhaps things you

make can each have a tumblr feed, and you pass the password along to the next person who gets it, they keep adding to the tale and lore both on the feed, then pass it along in the same way when they're done. Or a youtube account, with google used to do following, or various ways of using Twitter. I'm not sure, but what I propose is that we keep in mind this basic concept(independent of implementation) and then just try it and see what works. There will be many solutions found by many people over time.

Should those feeds be encrypted? Maybe. That is up to you, I want to be completely open about this, and would hope that some will go a fully open route and others will build something with very strong physical encryption. Many paths for many people should be a constant goal in this value system, and that includes how the feeds are transmitted.

Geometry of Value

In earlier versions of this manifesto I got sucked in to drawing all sorts of strange diagrams of how I see the geometry of capitalist money. You can draw pyramids of many kinds that represent how the top extract from the bottom in capitalism. But who cares? They mostly don't need geometry since their number worship regards numbers higher than shapes.

What is much more interesting than adding to the anti-capitalist crank literature is trying to build up a geometry of value *outside* of capitalism. The first thing that comes to mind for this is the circle. As many people have now pointed out, if we want to make our value systems more sustainable and more like Nature the circle is a commonly recurring shape. Nature is full of circular processes, and often objects, like droplets of water, form in a spherical shape, generalizing the circle. As with the "feed" mentioned above, none of this is literal, but then taking math literally is what got the number worshipers in trouble. It's an image we put in our minds when designing processes. It's helpful to think of a circle when building a mental model for how economics might work with tales and lore outside capitalism.

Other geometric ideas can have a powerful resonance in how we decide to structure value without number. Those include various fractal patterns such as the spiral or the fern-like structure. Also any of the numerous polyhedra that mean things to people, including the various oddly shaped dice used for various role playing games can be useful. The helix has become a universal symbol of life since the discovery of the structure of DNA, and is also used for screws, a fairly universal simple machine. A helix can be a great geometric metaphor for a stable relationship between a pair of entities that are intertwined and move around relative to each other in a simple way. And finally the crystal lattice can be powerful, albeit with

the hazard that it has too much of a number worshipping flavor.

The tree is a powerful image in just about every possible belief system, including the scientific understanding of the living world. Of course trees of all kinds and every possible part of their world should be a part of our value system imagery.

Trash Magic Conveyor

One of the key elements of the capitalist monopoly on control of goods is all the parts of the supply chain after the factory. This includes shipping, warehousing, distribution, display in stores, transport from stores to homes, disposal, and possibly a used market.

We need this as well, of course. How do we get things from where they are made to where they are used? What if I just want to make things and send them on? Or make nothing and just grab things?

There need to be conveyor systems that move goods along on their own without help. This can be lazy rivers, skylines, or air tubes. In the first version of this I imagine them being very localized, making a sort of Trash Magic equivalent of the conveyor belt sushi concept on a creek. I am imagining that one of us will sit by the creek, building up the conveyor and making some things, then put the things on the conveyor and move on, allowing future passers by to take what they want and continue

the story(increasing each things value as this makes an interesting story). If even a small fraction of those people decide to make more and put them back on the conveyor it is easy to see how this can lead to an exponentially growing economic system outside the system of capitalism. It's art, craft, and outdoor amusement. Also some science and technology and industry–but not capitalism, as no numbers are used at all in the "transaction" of making a thing and setting it on the conveyor or grabbing it off the conveyor, watching some videos, and making some more.

Our system of goods distribution can also involve simple self powered drones that dumbly move across the landscape powering themselves, getting fixed by passerby, moving goods where they go, and navigating by some simple formula(head north, head downstream, follow the cold, follow the wind, find a city etc.) This sounds hard at this point in time of course, as we are just getting started. The simplest possible free distribution system I know of is the message in a bottle: you write a message on a piece of paper, put it in a sealed bottle(so the air makes it float) and throw it out to sea. I can personally attest that doing this can result in strangers from far away writing a physical letter in response. Surely innovative technology/art can also be delivered this way, and across national and language and culture barriers as well! Large numbers of us who put these bottle with beautiful and useful art into the water at one end of a major

ocean current(like the Japanese current that pushes water from Japan to Alaska bringing bamboo to all Alaskan kids to play with) and the artifacts will be received in large numbers by people in a far away land with a totally different culture and language and nationality. If you take this route, clarity is key! A picture is worth a thousand words, and videos should not require verbal understanding if it's possible to communicate purely by demonstration. If you know the language of the reader, or even have an educated guess get a translation of at least enough to tell them how to translate the rest(mark the language you use in many other languages).

The final and possibly most important leg of our basic supply line will be the human courier. Nothing is more personal than personal delivery! Let's try to make things as much as possible tailored to people we meet in real life, possibly in the course of making more things, and give them directly as gifts to those people. This makes tales and lore of a very detailed nature possible, both oral and with various media, and with clear one on one hands on instruction in the actual lore required to make the thing. The hands on courier method will almost certainly by the most powerful vector for spreading exponentially since it will have a higher quality of transmission of the ability to make things. Of course I don't have to start all this. You can just come up with your own interpretation of what all this means, make some useful art, and go out and teach and give it. Now. Or wait until we come to

you, because we will eventually!

Trash Wizard Interaction with Capitalist Economics

Finally, we all have to live somehow, and most of us can't just sink beneath the waves and escape capitalism overnight. We need money to pay rent to live in a city where our loved ones are, to pay for medicine, get around on capitalist transit etc. How do we do this ethically without just selling out?

Here are some proposed rules for Trash Wizard capitalist interactions:

1. Try not to buy raw materials and other peoples labor; salvage trash and rely on mutual aid for free, and build your own stuff
2. To make money, selling labor is best, then selling stuff made from trash, always try to avoid labor and materials arbitrage: don't buy stuff then sell it don't pay people then re-sell their labor.

3. Do not sell misery, try to only work on things that are fun, while they stay fun, each product or service should be an ADVENTURE.

We create. As long as our fed debt money comes from our labor and trash, we will always have a net gain of

capitalist currency into our system, making the direction of change right to allow us to survive best in the current system.

Chapter 9

The Great Junk Car Feed

To the beat of the drum:

ROBOTS that turn junk cars into robots
that turn junk cars into ROBOTS
that turn junk cars into ROBOTS
that turn junk cars into ROBOTS
that turn junk cars into ROBOTS
that turn junk cars into ROBOTS

Cars are Death, Death to Cars

Cars are the enemy of humanity. Every year in the US cars kill over 40,000 people, and maim countless more, similar to the *total* carnage for America of the entire Viet-

nam war which lasted many years. Globally, the death toll is well over 1 million, or 10 million in a decade. 10 million dead.

And that is just the beginning. Cars are central to the industrial system which has crushed our humanity. A huge amount of our oil based economy is used by the car system, adding to climate change massively, as well as bad urban air which kills millions worldwide. Cars create a society in which anyone who cannot drive is disenfranchised, punishing anyone without perfect health and significant funds as well as the willingness to actively destroy the world and possibly kill living things just to get through their day. Cars have filled up the USA with enough pavement to provide solar power to the entire nation(no small feat given our absurd energy consumption now). Runoff of oil and other toxic chemicals leaks from cars into every water system in the world, poisoning every possible ecosystem.

The companies that produce cars are some of the most evil on the planet. Several of the major global brands, including all the German ones, have actively participated in genocide, an act for which they have never been properly brought to justice. The endless stream of minerals required to feed the input end of the planned obsolescence conveyor belt also destroys the world in the ways that mining always does, with its usual disproportional impact on indigenous people around the world and on many other marginalized populations.

In America and many other countries, car companies actively work to undermine democracy and civil society, campaigning to make sure society is built around the profits of their companies rather than basic principles of free movement of people. The ability to move from one place to another within a city for free should be a basic part of any social contract that people would actually consent to. Car companies have built a society where there is no universal social contract in regards to mobility: all mobility is held hostage, under threat of violence, by a group of psychopaths(all car makers) who force all transport to make them money. Even "public" transit is always based on giant machines made by the same monsters, and is deliberately priced high enough to make sure the poor pay at least as much per mile for getting around as those who have the money to buy into the car system. Every time there is an economic downturn, the corporate backed local government will use that as an excuse to further crush the lives of the poor, raising fares and cutting services at the very time those without resources are likely to be the most desperate. Again, this shows the fact that there simply is no social contract in the modern industrial city which all citizens consented to. There is only the raw law of force: whoever has the most control of the industrial machines has the power of life and death over everyone else. Of course the rulers dress this up in nice language about the "rule of law", but there simply is no such thing. It's a costume raw force wears in our

world.

So the car companies and their collaborators in government are enemies, and cars form an almost living enemy of humanity world wide. What should we do about this? The Trash Magic answer is always the same: first find the trash stream(which always exists under capitalism since destruction is inherent in their ways) and then find ways to organically incorporate this into something good rather than bad.

Magical Answers!

And what treasure there is in cars! Name any precious metal or special type of polymer or gas fitting or mechanical device and you can find them in a car. A single automobile also has numerous computers of all kinds, which can be stripped and used for integration in our electronic systems. And given the spectacular waste of the current system, cars really are free: while there is a used market for junk cars, it's clear that for society as a whole the global stream of junk cars, like other industrial waste streams, is a net liability not asset. This negative value creates a global and ongoing opportunity for us to get the parts we need from it.

Another advantage of using car parts for industry is the way in which the car is standardized. There exist millions of units all over the world of certain popular car and truck models, and it can be possible to very accu-

rately duplicate a complex design which uses parts from a certain make and model because of this.

In particular, the parts of cars are great for building robots. As discussed earlier in this work, robots in the right hands can have a fantastic positive impact on the human condition. And this is really what this story is about: the robots built from cars which destroy cars. If they are easy to build, and it's easy to *teach* people to build them, they can self reproduce, creating an exponential destruction vector through all cars globally.

Robots must be designed and built and grown which first find cars, then rip them apart for scrap, then sort and catalog the parts, then reform them into more robots. These can all be different kinds of robots, possibly used separately, possibly together, made by many people with many methods. The point is they should be easy, and create positive value(unlike what the capitalists build, ever.)

End Game: End All Cars

Destroy every single car. rip out the individual atoms. Rip them apart. Smash the engines, destroy any vestige to show that they ever existed. Rip up the roads. Build structures to live and work and grow crops in. Make them all green, smash them but don't replace them with private property, this is a wedge to build more non private property space.

The end game is this: when the thing a car turns into after it ceases to be a car has greater value than even a functioning car, cars will start being consumed by our technical ecosystem even before the end of their capitalist lives. As non-capitalist ways of living expand, the companies that make cars will be increasingly starved of the consumers they need to keep building and growing their death machines. Eventually the companies will die and the existing cars will be destroyed faster than they can be made, eventually making the capitalist industrial system simply physically unable to keep making any cars. Without enough car consumption to fund the corporate government, there will no longer be military force protecting roads and they can also all be ripped up for use by humans and other living things.

Free Lives Don't Need Cars

At this point, the capitalist will whine: "but without roads and cars how will I get around?" First of all, you have to ask why you need to drive around all day in the current system. Do you really need all that? Do you need to go to an office miles away to do things no one needs done?

No. No you don't, and that's how all your errands are. Errands are unpaid labor you have to do for industrial civilization. Stop doing errands. Stop working. Build and grow what you need, then go have adventures as

needed. You should have everything you need for a good life, except adventure, within easy paddling distance of your main bathtub/bed. You travel when you want to for adventure or when you are part of a larger migration which will use larger vehicles, mostly boats and giant spider pods, for moving whole populations.

Chapter 10

Factories Everywhere and Nowhere

Slipping Between the Cracks

Where can we build? Where can we work and play and live? Between the cracks. Between the cracks of the industrial system, between the cracks of empire, between the cracks of cement and steel. Just as we seek to build from the discarded materials and energy of the old world, we seek to thrive and grow in the spaces they have cast aside.

As with materials, those spaces are incredibly rich in every possible way, when looked at outside the value system of capitalism. Often these spaces are considered off limits by the powers that be, and are supposedly private

property. However the spaces I'm thinking of are not monitored and indeed must be ignored for the system to work.

The foul waste filled waterways of suburban New Jersey are one example. Often spaces under freeway bridges are ignored and abandoned yet centrally located in a city. Abandoned factories are a fantastic place to restart industry in the places abandoned and destroyed by organized capital. The dark, unkempt corners of various parks have places where someone can vanish from sight and be centrally located with access to people and infrastructure.

In general, our first choice for location will be somewhere that has naturally flowing water. This could be either a flow of fresh water or a tidal flow, but it is important both for a source of unlimited energy and for a source of materials. Deep water is useful for being able to move very large freight such as salvaged trucks or airplanes found underwater into position to work on in the production zone.

Water also serves as a source of coolness for protection against hot climates. Evaporation can be used for added cooling power using water driven pumps. plumbing which can be taken apart, moved, and put back together should purify and move the water around, making hot bath water and god drinking water, as well as building the input for the biological and chemical reactors which will process human waste.

After water and energy, concealment is probably the next priority for the "between the cracks" model. The easiest way to do this is to be very low key and work on existing land. If you can camp somewhere, and the Trash Magic industrial production is quiet and small enough, perhaps you can simply do it un-noticed wherever you happen to be. Setting up in the factories the industrial system has abandoned en masse in places like the industrial Midwest of the USA is another great concealment strategy.

Camouflage in design is also an important tool. We should be prepared to build infrastructure that does not look like infrastructure. One of the ways in which the symbology of Trash Magic can be used is in an extension of Hobo symbology which allows for cryptic marks to indicate what infrastructure exists where. Part of the art we study is building working technology which looks like the environment because it simply *is* the environment: boulders, logs, sticks, rocks, patches of seaweed, etc. Substantial infrastructure for industrial production of all kind can be designed, built, and deployed in this manner where only the initiates in our Magic will even know it's there.

Bring the Means of Production to the Action

Most communists and anarchists direct us to turn the factory into a place of political action. I propose to do the opposite: to bring the means of production to the action. Where there are protests or occupations or refugee camps or war or poverty, Trash Magic can shine a light in the darkness.

One of the great tragedies of every radical commune project is when the forces of Law and Order inevitably come in and destroy everything. In the case of Occupy, there were libraries, various other services, first aid tents, all sorts of art and carefully built spaces, which were all deliberately destroyed by the New York Police Department in their repression. I see this as very avoidable. Rather than building static infrastructure which mirrors capitalist infrastructure, I propose that infrastructure built during various occupations and insurrections should always be dynamic and mobile. And *all* of it should be art of the kind which can be easily gifted to others, to spread what has been made.

practical considerations, examples, actually go do it and record it and put it on youtube

Production in Autonomous zones

One of our goals is to erase arbitrary lines between things that are currently separated. Just as some people have tried to erase lines between protest, occupation and party. I want to erase lines between industry and art, between protests and factories and workshops and squats. Anywhere there are people and materials there can be industry.

It's worth mentioning that I don't mean just crafts or hobbies or art in the current definitions. Part of what separates industry from those activities today is how they all scale. Art gets its value partly from a deliberate non-scalability. Crafts are almost deliberately set up to be non scalable as well, to create some kind of perverse joy in doing things slowly and with a lot of specialized skills. One speaks of a "craftsperson" as someone who has mastered some difficult special skill, and who therefore has special privileges associated with that skill.

In Marx's day there was such a thing as an industrial worker, and maybe in some places there still is. The industrial worker is part of a larger whole which uses economies of scale to change how people, energy and materials move in such a way that it will always beat out other forms of production on efficiently and "price". This has led to a historical dead end as the capitalists have carved up the global working class so effectively. And good riddance! Do we really all want to work in

some giant factory doing identical boring tasks for many hours, even if the IWW "owns" the factory and we all have free food and health care? Fuck that future. We bring the factory to the streets where the party is, inject art and culture in it, and make it able to thrive and grow fast in the current world.

Here's how it happens. Anywhere there are people, energy and materials, we just start building industrially and creating art as part of that process. We build processes and document them(this used to be called culture) which can be spread and expanded quickly, which allow any group of people with minimal skills to rapidly build an effectively infinite inventory of useful industrial products such as air conditioners, water purifiers, massagers, grinding tools, communications infrastructure, blenders, coffee machines, electric wheelchairs, soaring surveillance drones, and medicine. All these goods are immediately entered into the global decentralized database of free artifacts, which allows them to be immediately taken by courier by hand to users who absorb it instantly into society.

This totally changes the balance of power in any occupation. If instead of occupying the center of town and putting ourselves in conflict with current society we imagine a bunch of yuppies having to go down into a Sacrifice Zone to get some awesome artifact they can't get anywhere else, which they also can't pay fed debt for. There is no transfer of fed debt or "ownership", so all the normal

regulations that apply to commerce do not apply. We slip between the cracks to build up the factory, make stuff, absorb trash, improve the environment by putting in infrastructure easter eggs, and disappear. Often the people who come together to do this will simply not exist as a coherent organization before or after the industrial/art event.

The powers that be know how to protect "property" and to keep the have nots from getting it from the haves. Much of this has to do with regulating money. What they do not have experience with is free people giving away free stuff from trash and ambient energy in on and around their system. They're prepared for a broken shop window, but not a free beer fountain in the park. They're prepared for a black bloc in the middle of the town square but not a boat factory in the middle of a polluted-to-death river. They are prepared for half a dozen commercial surveillance drone sent to spy on the cops. They are not prepared for 10,000 soaring drones built from trash, soaring over the dead land of the American West looking for pollution and mapping it for future use by our industry.

And this process is within reach now!!! I still think the first industrial process is the coil winding process which is used to make more of itself. This means both a coil winding machine and the power tools needed to quickly break down electrical appliances to get the copper wire out and the infrastructure required to track down rare earth mag-

nets, as well as power tools to make lots of Skeletron and plastic parts quickly. So this means drills and grinders and saws and also heat tools for working plastic, grinding tools for taking stuff apart, and good sensors for tracking down magnets. Also free decentralized access to all the needed data. Energy must be ambient, not oil or human.

This set of tactics then informs the overall strategy and vice versa. It tells you where to occupy and for how long and with whom, at least to some extent. We need ambient energy. That means the sun, the wind, and moving water. Moving water is usually going to be the best choice because the energy density can be so high. With 1000 times the density of air, a relatively slow river can be much better than even pretty fast wind. And way more pleasant to work around. Also waves and tides can be used, as well as in some cases water that has been pumped uphill over a long time before the establishment of a industrial occupation.

We reflect the industrial occupation of today through the looking glass: rather than not building stuff in a factory we build stuff in a not-factory.

So the first choice for a site is on flowing water, with tides and waves especially helpful. Also note that natural water, even very polluted water, is also a source of many useful industrial feedstock. At minimum you have H2 and O2, but usually a vast wealth of other chemicals. So a very polluted wetland in the mouth of a river is an ideal site. With a combination of skeletron and plastic

we can build an amphibious set of shelters and transports and food and water production which add up to self sufficiency.

Then we need materials, raw materials with a clear path to an industrially produced artifact or set of artifacts and raw materials to be moved by courier to another post capitalist industry node.

metal and plastic. And wood. And stones. This can be many places. Rivers with trash in them, with littoral robots that go out and find it is easy pickings. Also any dump of car or electronics related junk by a river or lake or sea. And there are so many of these! Sacrifice Zones are often near water. And usually have unlimited trash available.

We roll in, we build and distribute, set up infrastructure easter eggs, and move on. While where there, we create a one-off unique culture for that time and place, which propagates through the physical artifacts which carry data that includes the artistic culture of that unique time and place. This also means that the phenomenon that replaces the current protest model can be more long lasting. Imagine if any of the famous protests or occupations, such as for instance the AIM occupation of Alcatraz had been run this way. You could, today, use an artifact with a piece of iron from a rebar salvaged from Alcatraz and painted by one of the occupiers there. Such an artifact could then have been used for an electromagnet in a big motor that ground coffee beans in Zuccotti

park during Occupy Wall Street, which was then incorporated into a sort of Jawa art car that roams the toxic waste deserts of Arizona, collecting minerals for another future project, all with added stories and media and art.

How different this would be! We could all be participating in various insurrections, art communes, famous science experiments, and huge parties at the same time, endlessly remixing artifacts that carry all that culture with them.

I need to find the Sacrifice Zones that exist in the coastal waters of the East coast.

Searching my memories of such places in Souther Connecticut and also looking at maps and charts of coastal DE and MD, I'm reminded that simply finding the "free" material input in such a place is non trivial. What i think I propose instead is the same courier system used to distribute artifacts is used to acquire raw materials from the trash of mainstream society.

Also, if production happens in such coast waterways but materials come from elsewhere it should be possible to disappear. A combination of counter-surveillance to always monitor the monitors and camouflage and totally mobile amphibious infrastructure should make it possible to avoid detection in un-used land indefinitely. This should be possible all over the world, anywhere there is a fractal water system. The areas around Boston, NYC, DC, the SF Bay Area and Seattle are all like this, as well as many of the great cities around the world.

Trash Pirates. Southeast Asia has marine sacrifice zones where ghost ships with slave crews fish for the grocery stores of the rich world. If a guerrilla industrial movement were to appear in this environment with vastly superior technology to the capitalists, we'll see very rapid change with no physical opposition from the nation-states. Why? Because they have built a system where they have a vested interest in these lawless zones existing. They have to either impose the rule of law on these places and lose their slave-caught industrial fish slaughter or they have to accept that our pirates can operate outside their "laws" just as readily as our capitalist enemies.

What if Somali pirates could offer legitimately better employment than the European companies the crews of the hijacked boats work for? It's hard to negotiate for "hostages" who don't want to return, and dangerous to negotiate for them if when they return they all just quit and disappear into some swamp. Let's fill in all the spaces the capitalists have chosen to neglect with new industries that combine art and culture and science and technology as one thing!

Life in the Delta

The future of humanity is in the deltas. just as the past. And it's easy. SO many cities have out of the way places an amphibious trash magic industrial culture can flour-

ish without detection. Freight transport powered by tidal energy driving electrochemical cells can be used as a universal industrial supply chain, with vast amounts of trash gathered for free from underwater salvage and swamp and wetland salvage. Distribution of goods into the capitalist economy in the heart of a city via water front parks can then easily happen, also under the radar. By under the radar, I literally mean under the actual radar, with boats of such a low profile that they are not distinguishable from wave action by radar. Fabrication will be right on the edge of water and air, with object able to be moved in and out, water to be sprayed and pumped and mixed.

The capitalists have had nanotechnology all wrong. They have been looking for a clean technology with perfect control. That's wrong. You want only fractal control, and very dirty, to in fact eliminate the concept of dirty. Dirty is a capitalist delusion. Must look beyond it. Under water, fire is also less of a hazard. H2 and O2 plumbing everywhere, as well as compressed air, fresh water, DC power, various materials which can be sent in tubes via plastic cells that get pushed along and tracked. Just the ability to make QR codes in plastic combined with floating plastic and pumps can make a amazing network demo. Also for data transmission, when you have material transmission like this, it's always trivial to send data by putting a piece of physical memory onto a boat that runs along the channel just like in the pure infor-

mation based networks of today. Thus one of the many lines we seek to erase that arbitrarily divide the world is the line between data and not data. Data is another capitalist delusion. Information is physical.

Also agriculture. If it were in stormy seas or tidal shallow water with strong currents it should be much higher density. With both the atomic feedstock of seawater and the energy content of the tides and waves, infinite amounts of fresh water, minerals, nutrients, and light(possibly from electric lights, to get 24/7 underwater agriculture), also things can be 3d with light generated electrically, water coming in from all sides, temperature control. The density of crop cultivation should go up by way more than an order of magnitude, probably at least 2 orders of magnitude. Thus a few acres of swampy wetlands in a strong tide with a good river current could sustain hundreds of people comfortably if the infrastructure is built right. And since it's all mobile and modular and can be built from trash, even if we all have to move or the State takes the stuff, infinite infinite.

In addition to deep ocean and river delta areas, this process can build up land out of the ocean where it is shallow as it often is in the tropics. Trash can be built up into reefs of industry, designed to draw energy out of and thrive in storms. Total global game changer.

Guerrilla Fairy Art

I have figured out the nature of the first phase of technology development: guerrilla faery art. I've been getting distracted by the long term goals of functionality for industrial production, but for this first volume aimed at non technical readers, it makes sense to focus on technology which will make sense and be obviously worth spreading: guerrilla faery art. What is this? Art outside the capitalist system, installed without permission, built from trash and powered from freely available energy, and with a view toward exposing people to the of magic of the physical world. There will be oscillators and motors and pumps and strobe lights and magnetic pickups and all kinds of blinking lights and speakers for sound and microscopic views of living things.

The electrochemical probe and full robotic system belongs to the second volume on Trash Magic. That is geared to people who want to delve deeply into the way electromagnetic trash magic works, focusing on fluid ion transport to interact with living systems, along with the basic infrastructure needed for a good life. The more advanced stuff will be just described in the first volume, not built out with detailed plans.

What does this mean for things to build?

Materials and how to mount things in place matter. This gives me an excuse to go down to all the creeks and find the right sticks and rocks and trash locally that

can be repurposed for an installation. Some missions will require stealth.

Viewing of microscopic objects must be extremely robust and require no turning on or off or care on a day to day basis. Obviousness is key here, the view port has to be so obvious that everyone will automatically use it. Also the subject has to naturally flow in constantly, with some trickle from a living stream so that something interesting, whatever the subject is, is usually present.

What specifically needs to get built to have finished products, and where do they go? Some things will be deployed in wild areas, some in urban areas, and some will be gifts to artists.

A tentative and partial list of Guerrilla Faery Art:

USB charger with water wheel water wheel that generates electricity which drives oscillator stick with rocks on it, just vibrates forever with feedback same, but with LEDs with a pattern to make 3d POV art in the water water wheel turns triboelectric generator using bottles and such to build up high voltage which creates an arc over the water between aluminum covered plastic bottles, very visible at night! art piece as gift where a vibrator vibrates water, making waves, which can be observed using a strobe, and turned into audio with a magnetic float and amplified magnetic pickup. With the magnifier built into the wood/plastic/stone water containers, this connects the main technologies if it's USB powered, and is the perfect Main Gift for this phase. 3d manipulator

with 3d input, hung from a tree or bridge over the water, which powers all motors and control circuits. Anyone happening by and seeing the setup can grab the input rock and move it around, which will drive the moving platform around in 3d space above the water. This probe can have the crude sonic electrochemical probe tuned to respond to depth in the water, so that the user can make sound by controlling the probe around in the water. Here art, science and technology are all one thing, built from trash, and in a public place with no declared ownership. water channel with strobe and vibrational drive for visual effects at night, driven by water wheel, runs all the time evaporative cooling refrigerator driven by water wheel hotplate driven by water wheel warm water pool heated by water wheel and generator steam powered organ using tubes and steam generated from water wheel datalog of creek which can connect to phones and twitter

Focusing on the main thing for now it's probably the USB driven art piece without the generator, just a wall charge for a off the shelf lipo battery, or left plugged in. A wave tank with a strobe can have a tunable 2d shape projected by the sun down onto an area, with musical output based on the wave patterns. This could be installed in a tree, projecting through glass, with water piped from the top of a waterfall. But what powers it? No, I need the charger for the guerrilla installation, but not for the art gift.

Art gift should be simpler than that, project up and

along the side, with lights under transluscent plastic in the stick. Vibrator stick with rocks on it bounces, with a stick that can be adjusted to agitate the water with different wave shapes and frequencies and amplitudes. The magnets and rocks can also be moved to change the properties. Water propagates down carved channels in a fat bottom stick with the drive stick bolted to it as well as the bouncing stick which is fixed at the end opposite the water. Lenses can be put above the water to magnify what is in it as well as to project light in various directions both for art and for observation. A little wave pool at the opposite end of the water agitator has a float with a tiny magnet in it, and the audio flux amplifier is wound around this pool, so that the sound is picked up and amplified and has an audio out socket. A beautiful carved wooden knob is used to adjust the strobe properties by changing a 555 circuit.

This is the first thing! Build this art gift first, before the water wheel, it's self contained and can be distributed and used in classes I can teach and spread the work. Lack of water wheel is not serious for most people since they charge devices anyway with USB and can get a lipo at a gas station for 10 dollars.

Chapter 11

Visions of a Better Tomorrow

Ent Moot

An Ent is a slow moving giant tree robot that can walk, it can take years for them to gather but they do gather, and along with their human care takers build stuff together then move on, very slowly. An Ent Moot is the event where the Ents gather to communicate and build greater things as a group. It can take decades ore centuries.

The story here will thus take many lifetimes of humans but still have a narrative story. Which brings me to the next part of this story: you need to tell it. I'm not a fiction writer. I'm writing these random sketches from vague images in my mind but one or more of you read-

ers need to re write this into various fiction works, then combine them into this document. This should become a flow of fiction through our world, where those who are into that sort of thing can create and collect it. More tales!

Memoirs from a Bathtub

The Universe is in my bathtub. All things and all people. And today is bath day. Well, yesterday was also bath day but today is *epic* bath day. Today the bah goes out to the world. I wake up in a roost under a bridge made from the usual Trash Magic infrastructure. I do some basic hygiene stuff, then roll over the side into the tub waiting below, plop. I reach up and work the controls on the roost to reset it for the next person, then lie back in the tub as the current starts to pull it into the main stream.

The journey begins with setting a flag in the tub to summon a coffee drone, and just lying back to watch the morning clouds above. To set the mood for the day, I put White Rabbit on loop on the Trash rig, nice and loud. Then I kick back and wait for it all to get rolling. The coffee drone soon paddles along side my tub, and I grab a cup and bagel and focus on those for a bit while the main current drags the tub toward the Center.

Go all over town, things get interesting! I don't know how, though, you have to tell me, sorry.

Storm's a' Commin'

A storm is coming! So many joules of energy! We will build everything, set things on fire, move heavy things around, describe the world of the sunken city built back up from the water out of trash wizard components. There is a story here. Go.

Witches Rolling in the Valley

Rolling robots going up and down the water, littoral robot ideas, using the creek for power and trash sources, clean up the river, make habitats etc. Many groups of wizards and or witches all around, going up and down the creek, making things happen, things appear from nothing and there is much rejoicing. Go.

Riding Against Thor: the Story of Warriors of the Storm Stealing Clean Water from the Gods of Thunder

Like the other storm story but more epic and a smaller group of more risk tolerant people, the warriors of the future, riding to glory by harnessing the storm

Living in the deep ocean, on the surface, in the storms, giant systems of mechanical oscillators that absorb the incoming energy of the storms and turns it into useful work, processing sea water and trash at the same time,

storing energy, moving around, and making head, having a fucking party.

Lazy river should be the main form of transportation in the future. Humans should live in the river deltas of the world, in clean water channels, in a civilization based on trash magic industry.

Bathtubs, where we are all The Dude in his bath with his joint and his whale song music. THAT is the FUTURE.

The inundated cities of the future can be a paradise, with storms making an ultimate comfort environment, light, sound, heat, air conditioning, breezes, smells, vibrations, motions, lazy rivers, free drugs, all made as the storms churn through, free energy free trash magic tools, free food, free space and time.

Must build electric kayak ASAP.

Really huge diamondoid matrix going for a mile on each side around the eye of a pacific storm, all made from trash, giant artificial mushrooms float around inside the matrix, hookah smoking caterpillars.

Poop Story

DOOM DOOM DOOM DOOM

I can hear the drum beat over the hill, it makes me want to poop. Climbing the hill, as I come over the crest, I hear the guitars before I see them, with several epic metal interpretations of the infamous Brown Note. As I

come down the hill into the clearing, the drums start to shake the ground, lines of shirtless drummers across the earthen mound pounding for hours, a couple with joints hanging out of their mouths.

The guitarist is, as usual, suspended from a hydrogen aerostat floating above, strapped into a harness hanging from several cables that allow for full 3d motion, while shooting 10 meter flames from the flame thrower in the guitar in all directions.

Down on the far end I can see where the open pissers are peeing around in a stone and glass area that funnels the liquid into containers made from reclaimed glass beer bottles, converted to alchemal extraction tools, to get all the precious minerals and drugs out of the pee, as well as the pure water which is removed and used to make lemonade for the musicians above. But we segregate our bathrooms in a logical way, for good reason, I have SERIOUS business to attend to and head to the opposite end of the toiletsphere, where people with serious latrine business must all go.

I choose a particularly awesome looking stone throne, head into the chamber, close the door, and now have a well lit one person sealed stone room all to myself. I sit on the heated stone throne, kept at exactly 88 degrees F using temperature controlled oil flowing through holes carved into the living rock by various cyborgs built from genetically modified rock eating fungus and some constructor drones. I now brandish my stick around in an

easily recognizable way, alerting the local music machine to play sounds that correlate with the booms and shreds above, but with my own spin: stream and rain noises, with some German industrial noise music mixed in.

More brandishments of the stick call up a math paper I've been working on in the cloud on the shit paper unit, which I stare at for a while while nature takes its course. Having dropped an epic deuce, I again brandish the trash magic stick, summoning the turd courier drone, which grabs the turd for further study and use. I now clean myself up with the paper which was a math treatise a minute ago, throw it into the toilet, and have it get dragged off by another drone to the compost chamber where it will be turned into food for fungi which will be food for the hemp plants which will make the next generation of toilet paper for future users(watered by the water extracted from the urine).

Now I wash up in the sink, indicate to the chamber that the cleaning robots can flush the space clean and remake it for the next user, and move on through the exit door which leads to the opposite side of the berm that the toilet room is in. I stroll out the door, which closes behind me and locks, ready for the next user from the other side. From there a short path leads down to the Science Swamp. Here I see a bunch of nerds in goggles, some with surgically added gills, wallowing around in the muck, hair covered in duck weed.

"Hail E Coli!" I greet them as I give the proper ges-

ture of rubbing the gut and hopping around.

"Hail E Coli!" they shout back.

I tell them I just came down from the Lemmy Pod up in the severe end of the shithouse, just now, and point to the one I came from. Oh yeah, they say, we just saw yours roll in. An image appears in phosphorescent swamp muck across the surface showing a turd being carried by a spider-like droid through a underground tunnel and dropping it into the fluid pool of an analysis pit with a plop. I see the closest turdNerd who answered before reach out and grab a pair of stones hanging suspended under the water from some nearby steaks pounded into the swamp. I can suddenly see the screen on the surface of the swamp come alive with the images that the coli witch sees in their goggles. What do they see? Both what the probe "sees" and what the infrared camera sees, as well as another screen that shows genetic information, with some strong artistic liberties taken by the local group here as usual.

"Oh yeah. Good stuff, good stuff."

"What?" I ask

"I don't know yet, but I see something in the genome here. Something metal as fuck. Something that should help with The Project, which we've been working on here. And my sensors are picking up some sweet metal here in the turd which should work for building nanoelectronics. Here, since you used our toilet, I'd like you to take this, and make some more, does that sound cool?"

"ummmmmmmm. . . ."

"It's cool. It's a methane and hydrogen dirigible drone designed to go spot trash for you. Pretty standard, but with more metal shit and turd iconography than usual."

Well, fuck yeah metal is why i shit here. "yeah, i'm in, hell yeah, i'll spread the word, I can show some of those cliff diver people how to make this version when I head down there for the Big Storm."

When they hear I'm heading down there, they get excited, and start laughing. What, I ask? What is your deal?

Well, they've used their methane fire tools to build yet another invention: a human cannon. they offer to fire me in their cannon down to where the cliff divers chill, and I agree, and off I go, folded up Heavy Metal Shit Drone safely in my backpack.

When I reach the peak of the trajectory, I hail a skyhook from one of the aerostats with my magic stick, grab onto the cable, and start riding down over the trees toward the Cliffs.

Chapter 12

Free Everything

We must Build these:

- free medicine
- free transportation
- free food
- free water
- free communication
- free robots
- free energy
- free clothes
- free art
- free sex
- free love
- free books
- free sports

- free games

Free Medicine. This is perhaps the most transformative on the list, and the most important. It is also a huge challenge and potentially dangerous. Perhaps a good place to start is with medical metrology. There needs to be technology which is free in the ways described in this work which can be used to measure the purity of drugs. Many illegal drugs are as dangerous as they are largely because they are mixed heavily with mysterious random chemicals added by the capitalists to increase their profits which are often poisons. We need to build up the ability to measure the chemical content of street drugs fast and accurately and with verification anyone can understand.

The other main points of early research effort should focus on either the most ubiquitous or the most expensive life saving medications. We must learn to use the techniques of brewing and genetically modified microorganisms to make designer medicines, We need to build up the post capitalist drug industry in a safe way by building the metrology into every step to insure purity and safety.

The very early phases of Trash Magic need to focus on building techniques and tools that are maximally general which can be used for all drug development and production. The only way to do this efficiently given how many life saving drugs we now depend on is to recruit heav-

ily from inside the existing biotechnology establishment. We need to find the disgruntled geniuses in that system who are sick of it and desperate for a way out. They often signed up for that industry to save lives and find out they're part of a giant scam to rip off or kill the poor and bleed everyone else and it's depressing and leads to a desire to leave as well as to change our broken society. I do not anticipate that it will be hard to find talented biotech experts who want to join us once we've shown that our movement can do good science.

In keeping with the philosophy of Trash Magic, we want to integrate the more traditional "magical" views of medicine with the *techniques* of modern medicine. That is, as with chemistry and physics, the goal is to take the very valuable information contained in modern science and reorganize that information in more human ways looking to other models that exist in our history(various healing traditions outside conventional Western medicine).

Finally I want to bring up another important technology to develop fast in this process: imaging. We need FREE medical imaging. I have thoughts on this, which will go in the second volume and probably the third volume of this work, but I put this here as an open problem for the reader in this volume.

Free Transportation and shipping. The ability to move freely from one place to another is yet another basic human right which should be guaranteed by a civilized society but which is denied in our current system. What

does free transportation look like? I think the lazy river is a great example of a potentially free transport system. A lazy river is a popular attraction at water parks in which an artificial river is created which flows in a loop, allowing humans resting on inflatable tubes to drift around the full loop over and over, getting in or out anywhere.

I would propose that one of the most human friendly ways we could move around is with a larger and more robust system of lazy rivers. We could make waterways which are pumped using water power from the overall net current. Ideally the water could be floated on with a variety of inflatable personal watercraft which float around with no owner, waiting to be used. This could involve staying dry or being partially immersed or totally immersed, and it should include craft which can carry substantial freight, also an essential use of transportation.

Obviously a giant lazy river with free boats is a massive challenge for the early stages of this movement. I propose that a way to build useful infrastructure now is to focus on rivers, and building transport for goods that goes both ways with cables under the sea that can haul freight upstream driven by the downstream flow. This could run indefinitely with simple repairs over time, and could immediately be used by many people for both utilitarian and artistic purposes. One could put free stuff in the feed, let it flow up and down the stream, and it could be grabbed and used by someone anywhere along the line. This would mimic the basic functionality of the

rotating sushi conveyor belt, where a stationary person can see all possible types of sushi pass by and grab what they want.

Another type of transportation which I think should exist after capitalism is skylines. This is difficult, but worth building. As with the lazy river, they will always go in loops, allowing people to get on and off anywhere for free, ideally in either direction, but with ropes or cables going infinitely, powered by ambient energy such as flowing water or wind. These should have built in measurement technology that allow users to see various safety parameters in real time and fix the system as time passes. Skylines can also be suspended from various types of aerostat, both hydrogen and soaring types.

I also imagine very slow moving giant spider robots which freely roam the countryside, and which anyone can get on or off of at any time. These might be many meters high, and have a whole industrial ecosystem on board, including growing food, and a local culture which is spread as the great lumbering spiderbot roams the world.

Finally, I must address the underlying issue of transportation in capitalist society: much of it is to do things we don't really want to do, and we won't have to do it anymore once capitalism falls apart. We often travel to get things which should in be available locally but which capitalism make only available in certain central locations, and we *mostly* travel to do work we don't want to do which no one really needs done. We must end central

industrial control of goods and food and we must end the wage system. With these changes, and with a free type of medicine anyone can get anywhere, we would only travel to see friends and family and to have adventures. This changes the goals enough that it will inevitably lead to drastic and unanticipated changes in the structure of transportation in a post capitalist society.

Free Food. This is almost too obvious to go into much, as it's where most anti-capitalists start. Food needs to be *really* free, though, using the stricter definitions of free from the second chapter of this volume, rather than just "no money" type of free. This means not only should you not have to spend work or time or money or minerals to get food, food should simply exist in your world, around, moving on its own using the types of transport systems described above. If you want a carrot, just keep an eye out and a carrot will drift by on a skyline or a hydraulic channel or a spiderbot. Since the technology of automated food is so extensively studied in other people's work I will be brief on this topic here.

Free Water. Water should be free! Truly free! Why is this so hard for capitalists and their collaborators to understand? From our standpoint, this means dirty water that will kill you should be turned into clean water you can drink on its own, without any work, all the time, with such plentitude that it is essentially a part of the natural process of the world we live in. Capitalists already sort of do this with their system of reservoirs that

collect rain water, which is essentially solar-purified water. They then hoard this and charge money for it and centrally control it, of course.

Constructing infrastructure which directly converts smaller amounts of water forever in different ways is key for freeing ourselves from the Machine. This should exist, floating freely, in the ocean. Humanity must return to the oceans, and we should bring fresh water with us. Huge floating fresh water habitats should appear in the oceans.

Also, water purification should never be about just water. It should be about the things we can remove from the water: heavy metals, salts, biological chemicals, microorganisms, etc. All these should be constantly observed by people, who can then use them as needed.

Free Communication. This is another place where I have to distinguish between this project and the "maker" or "hacker" movements. To a typical mainstream hacker, a "free" phone would be one with enough encryption to ensure total freedom from government interference. This is not a useful definition of free. The world they are building is one in which you replace the government snoops with corporate technocrats who build your "free" gadgets. Nothing built by a corporate technocrat is ever free. I would argue that free communication means you don't have to have any interaction with the technocratic priesthood at all. That means it is so simple to build, edit, artistically enhance, and use that it's *obvious*, and

can be done by anyone anywhere any time.

What does this mean in terms of practical technology? For one thing, way more use of analog. One of the ways the technocratic priesthood has built a strangle hold on our communications is by having so many layers of horribly complicated digital software infrastructure that is needed to do anything. End that.

I would say the starting point for our free communications network is free space optical point to point analog voice links. This can be done with the magic sticks in the earliest phase of this project, leading to immediate deployment. Could encryption be used in this system? Sure, yes. But do you really need encryption if you're using a system like this? You're basically shining a flickering flashlight at someone. Going optical(without lasers) is also important because it avoids conflict with the government bodies that tightly control the frequencies normally used for communication.

To be specific about what this will look like, it's the Trash Magic Stick with all the aspects that go along with that. That means you get it free as a gift normally, can easily build more and gift them on, and it needs no grid energy to function, anyone can use it, etc. Using vibrations of air and water to modulate fire, analog voice signals should be made with light, and then photo diodes and amplifiers demodulate the signal from a telescope built into the stick and play the amplified sound directly out a speaker.

Free space point to point optical can be(and is being by capitalists) scaled up to the global level. The capitalists have built so much dark fiber in their speculative bubbles that we should be able to augment the free space optical with free optical links in tunnels after things start to fall apart on that side. Also while the capitalist Internet still IS running, it should be possible to extend their networks all over using optical repeater stations we can put in free in our between-the-cracks infrastructure.

Free Robots. This topic is so important obviously it got its own chapter but I'll briefly add here the reminder that a robot is not really free unless you can build it yourself modified for *your* needs. That is, you can see a need, then build and program and use a robot to fill that need, for pretty much any arbitrary need within the scope of what a kind of robot can do. That is what makes it free. It is very easy to fall into the trap of building robots that appear free but still need a technocratic priesthood to function. Avoiding that is probably the largest challenge of making truly free robots, as good people have already been working on the other parts.

Free Energy. Another obvious but important one. I disagree with much of the "green" Left who believes in giant solar and wind projects, as they have a tendency to perpetuate the existing industrial systems, just with lower carbon impact. Unimpressive. I believe truly free energy has to come directly from your environment right where you are. It's *personal*. And it should al-

most never be just energy. Flowing water can and does fuel whole civilizations, and is not just a "energy resource" to be used(generally by those with money) and dumped(generally very polluted and on top of those without money), as is so often the case. Moving water should be our first choice in most cases for an energy source. Ultimately I claim humanity needs to return to the sea and that the best long term source of energy is the waves and tides there. I would place wind as a distant second place for sources of constant energy for electricity and mechanical work after the various hydraulic choices.

There are two other kinds of energy worth discussing here, though. First is heating and cooling, which we spend a lot of energy on, and which are critical to both our survival and comfort. I believe that heat should be solar or geothermal and cooling should be from water and/or cooling from the deep cool earth. There are almost always major heat sinks and sources around us if we bother to look and are not bound by the limitations of our private property religion. Migration should also play a role. Why should the same number of people live in a far northern city in the summer as in the winter? The answers now all involve private property, wage labor, and national borders, all of which I believe should be abolished, leading inevitably to more natural migrations. The final type of energy is Storm Energy, which is where a vast amount of energy is used to complete a mechanical and or chemical and or electrical task in a

short time during the duration of a storm. This will take lifetimes to build and perfect but as the world gets more stormy and we move back to the oceans we will build it.

Free Clothes. Enough of buying clothes made by wage slaves and sold by criminals! We need to start getting all our clothes not just from the trash of the dying society but we need to build more free technology into them. If we're building our own clothes from trash, that should include things like goggles that can see microscopic organisms, infrared, various data visualization etc. Also, illumination should be built in standard, as this is an obvious safety issue at night, where the capitalist forces you to go buy a flashlight.

Free Art. This is the seed! This is how it all starts. We are, first and foremost, an anti capitalist artistic movement, meaning we make art, give it away, and teach others to make more art. The elements of this are throughout this book so I will not dwell on them here.

Free Sex. How do the capitalists put a cost on sex? For one thing, by holding all the various technology to detect and treat sexually transmitted infections hostage behind their absurd paywalls. A full battery of tests can cost many hundreds of dollars in the USA, seriously impacting peoples freedom to control their own sexual health. Also birth control and abortion and other forms of basic body autonomy are not free until they are *freed* from the "ownership" claimed by the capitalists. This is addressed in the medical sections of this work.

Free Love. What do capitalists do that most hurts our love lives? It comes back to the same reason we don't migrate in response to drastic weather changes: private property, wage labor, and centralized industrial production. Without these, you would be free to go meet new people, and when you meet someone free to live *near* but not *with* them, making a much smoother transition to different stages of a relationship. After you are in a relationship, the freedom from wage slavery and its associated devaluing of non-wage labor creates a much better environment for that relationship to thrive.

Free Books. No more dead trees! And not hemp paper either. We need books that are as physical as what we use now, but which can be made from plastic trash and thus are waterproof. This technology already exists, we simply need to build a free version of the machine that prints that way, and adapt it for use with really raw trash, and integrate it into the rest of our industrial ecosystem. It is my intent for the physical versions of this book to become closer and closer to this ideal as new editions come out, so this volume is a physical manifestation of wherever that process is right now.

Free Sports. Capitalism distorts sport. The focus on numbers creates an obsession with making and following a score and rank system as much as possible. The wage system forces coaches to also be business owners, which seriously undermines their roles as coach. Sports need to be free. That means no scores, no leagues, no

tournaments, no wages, no money, no mining!

Free Games. Industrial manufacturing should be a game! And we should all be able to play that game for free. This is not just a manner of speech. Augmented and virtual reality are likely to play a large role in future industrial production and those are always a grey area between "game" and "work" and "art". I say we call it all art, seize it, and integrate it with the rest of our creations.

Chapter 13

Techniques

In this chapter I discuss the fundamental techniques that I have used and plan to use in the near future in the actual practice of what I call Trash Magic. This chapter will change drastically in future revisions, and inevitably older editions of the book will look very dated as this part changes. It is tempting to work on this for years and to withhold publishing this manuscript until these techniques actually work well and can be used to make a variety of really nice things. But since a large part of the purpose of this manifesto is to provide my own guide for my work, I will plow ahead with some rather immature technology here, and it will be saved for posterity and will serve as a starting point.

I begin with sticks, because they're fun and easy and do a ton of things.

Finding the Right Sticks

Don't hurt the trees! We want sticks that are no longer part of a living tree but which have not yet been consumed by fungi and other organisms which turn logs into dirt. Drift wood is also often too far consumed to be of use, although this really depends on the drift wood. What we want are freshly fallen sticks from living trees, mostly. And we're looking for them to be between an inch and 2 inches in diameter, mostly straight, with not too large knots if possible.

A lot of electronics projects are perfect for sticks about 1 inch around and 4-12 inches long, so gathering and preparing these is a good idea. Load bearing parts for larger constructions should be more like 1.5 to 2 inches in diameter, or bigger in some cases.

Do not be surprised if finding nice sticks is harder than you think it should be. It can be surprisingly hard! If you live in a humid place with a lot of rain and water and life, you'll find that sticks get rotten *very* fast. Sticks that have been out in the weather for a long time in a dry climate might be rotten while still attached to a tree in a more humid place. I've spent a lot of time using pine as well as maple at various times. Pine is pretty soft which is nice for getting started, it can get frustrating to spend a lot of time trying to cut a maple or oak stick by hand, especially if you're just trying stuff.

One more thing to mention about pine is that aside

from being easy and fun to work and very common all over the world there is presently an epidemic in the American west of beetles killing large numbers of pine and spruce trees. These trees, once dead, are simply a giant fire hazard that no one wants to deal with, making an unlimited supply of sticks for the Trash Magician to use should they choose to go forage in that area.

Processing Sticks Into Skeletron

After locating the sticks, you'll want to saw the ends off flat so that they're not jagged. I often find that it's easiest to gather sticks by hand without carrying a saw with you when you go out. You can often rip the branch off by leaning on it with your whole body, be careful you don't hit yourself in the face!

I also find that for this stage it's good to have two hand saws: one is a big rip saw with huge teeth that very quickly will cut through wood but is specifically not intended for metal. The other is a much smaller screwdriver-like saw with a more hacksaw like blade for easy carry and use on random materials including plastic and metal. This tool is also useful for removing knots and branches from your main stick branch.

Once you have your sticks of about the right size, you want to shave off all the bark. This is done with any of various types of pocket knife, and I find it useful to have a multi-tool of the kind that is also a pliers and

screwdriver and such for this. Ideally you'll do this where the massive pile of bark and shavings will be useful for something, like grinding into sawdust which can be used for a compost reactor. At the very least somewhere there is already mulch will mean you don't have to clean it up because it's adding to the existing mulch.

Once your sticks are shaved and cut at the ends, you cut them to size, shave two flats, and then file the edges smooth(simply for making it nice, this is not really functional). I generally shave at least enough flat space to make a nice point of contact when connecting them using the quarter inch bolts, so at least a half inch of flat space is called for, maybe more depending on the application. For simple electronics projects I'll tend to shave the stick down until the whole thing is about half an inch or maybe 3/8ths of an inch thick.

Finally, I generally drill a series of holes down the middle through the flat, spaced by at least an inch, sometimes more like 3 inches or more if I don't need many holes, or with one strategically placed at the "base" for an electrical project as a strain relief for the power cord(mentioned soon!) At this time I drill the holes using a power drill and a quarter inch bit, generally clamping the stick with a c clamp to my work bench, which I drill holes in all the time. My bench is a cheap door on a pair of sawhorses. I also often use a small vice clamped to that bench for holding the stick while cutting holes. Trying to cut holes with a drill without some form of clamp is usually a bad

idea, is dangerous and is not recommended.

Finding the Right Plastic

I have found that the best plastic for our purposes is LDPE and HDPE which stand for low density and high density polyethylene. They are indicated by the recycle symbols 4 or 2, and are mostly cross compatible.

The easiest source of HDPE for most of us is bottle caps. Standard plastic soda bottles which are made of PET or similar plastics that I find more annoying to work by hand usually have caps made of a opaque material which is typically some color like red or blue. Anywhere plastic trash can be found, you can probably find these caps. You don't care how much they have been smashed, but you do care a bit how dirty they are. You can always grind or cut off the really gnarly dirt with a knife or file or similar sharp tool if there is too much crust on the cap. It's generally a good idea to have a small bin filled with these caps near your work area.

Another great source of plastic, which I use for small electronics work especially, is the translucent(but not transparent) plastic generally used for plastic milk bottles. It is also used for various citrous juices such as orange and pineapple, so if you don't drink milk that's probably a better bet. Some 1 gallon water containers from generic brands of bottled water also come this way, and those can be found in plastic trash piles by various

creeks sometimes. I avoid milk bottles I find that way due to what happens to milk when it's been out a few days. I drink milk at home and when the bottles are done I try to immediately wash them out, rip them up, and put them in my plastic material bin.

One way you can get some containers like this if you don't normally buy them or drink milk is to have a party where the main drink is maitais or some similar fruity cocktail. You can get orange and pineapple juice in these containers, and mix them. If you want maximal containers, get the smallest they sell, and invite a ton of people who like to drink and you'll have a few containers to work with in a few hours.

Finally, another source for LDPE for very large scale projects like building boats is traffic barriers, the big orange kind. Don't steal them, they'll end up in the trash eventually, take those and cut them up with a hacksaw(they're too thick to cut with a regular knife, although maybe if you have a giant sword that will also work).

Plastic Welding

I'm sure there is a way to do this using really free tools, which I do plan to build. However for now I'm using a very capitalist tool, the temperature controlled hot air rework tool which I also use for surface mount soldering. It can be purchased for 50-100 dollars online. I believe

that a hair drier will also work, although the weld process will be harder to get right due to a lack of continuous temperature and flow control. I set the temperature to 130 C. If you're using a flame or hot air gun without temperature control it should be possible to measure the temperature to target that or just figure it out by trial and error, which is how I ended up at 130 C in the first place.

The goal with working with HDPE and LDPE is to get it to transition from solid not to liquid(which you'd use to do injection molding, and that's well documented on youtube by others) but to glass, which lets you bend it and weld it but it still has structure. When is it a glass? With the translucent stuff it's easy to tell: it goes from the milky translucent color to fully transparent pretty suddenly as it hits the glass transition which is actually very neat to watch! Obviously all this is hot, so don't touch it, and be aware that it stays hot after you stop heating it for a few seconds at least unless you hit it with water or something to cool it down. Just because plastic is below the glass transition doesn't mean a 100 degree C thing won't burn you!

As a first weld project I'd say take bottle caps, cut them up, heat them until they're kind of floppy, and are right next to the, moving the heat source back and forth between the two bottle cap shards, then when they're clearly a bit gooey, touch them together, and they should stick, then heat the combination a bit more, maybe an-

other 20 seconds. Then when it's clear that they're both gooey and are sticking a bit, get your pliers or tweezers and start smashing and squashing to get the two to plastic parts to mix. This is the same basic welding technique that is used for various food technology like the calzone: the weld joint on the top and bottom bread in a calzone looks just like the plastic weld joints you'll make with bottle caps.

Salvage Components From Busted Electronics

This section is going to be short because right now I still buy a lot of electronics from the capitalist enemy. As capitalist enemies go, however, Digikey.com is awesome. There are several companies that sell electronic components online, with fairly similar prices and selection. If you want to compare them, the site to use is octopart.com, a startup company out of Boulder, Colorado which compares all the prices and stocks of the different companies. That being said, I use digikey exclusively so that I can have a consistent bill of materials for everything, which uses digikey part numbers. Digikey can often deliver a part to you within one day in most of the USA.

As for salvage, the main electronics components I've been salvaging so far are power supply related. I have

found the the best way to get a power brick open is to swing it by its cord in a huge arc over your head and smash it on concrete repeatedly. It's sort of like a particle accelerator, you want the largest possible swing with acceleration the whole way to get the maximum velocity of impact. It's best to do this on clean cement with a broom so you can easily sweep up the bits as it explodes. The plastic case will explode but the components should be largely unaffected by the smashing. The good stuff in there is likely to include transformers, capacitors, diodes and bridge rectifiers. Other things in there will be used more in future versions of this work.

I will leave this section brief since it's very much a work in progress. I'd rather finish this book and then extend this later than delay the book while I do the research required to have good specs in this section.

How to Solder

The best way to learn to solder by far is to find someone who can solder and get them to teach you face to face, it's a very physical learning process. One thing all forms of soldering have in common which I want to mention here is the need to get the actual metal being soldered hot, not just the solder. The biggest mistake beginners make is not being patient enough in heating the other metals that are not the solder. Also note that whatever

is the most massive metal piece will need the most heat applied, be it by soldering iron or hot air gun.

When I use the hot air gun to solder, it's always with solder paste, and I set the temperature to 230 C.

Sticks for Hydraulic Machines

This is another section that has to be a bit of a placeholder in this first version. Sticks can be used to make various direct mechanical machines driven by water. Water wheels made from simple arrangements of sticks should generate electricity to be used in that same apparatus, as well as to move various belts and cables to move things around in the world. Water wheels should also be used as a replacement for many electric power tools, and a high research and development priority is building a power drill replacement that runs on water.

Sticks for Fluidics

Ultimately, the stick technology should have fluidics built into it. This means channels, chambers, pumps, valves, and electrical/chemical interfaces. I've done some very crude experiments with this, but since nothing is really complete this is a place holder for now.

Chipping Rocks

We must bring back stone! Not just for decoration but for weight, for fluids work, for electronics, and for many other applications. Part of the Trash Magic skill set and tool set must be for simple stone work. I have been pounding rocks with other rocks and reading a bit about this, but still have not fully developed the skills.

The one rock skill I have acquired over the years is that if you grind a rock against pavement for long enough you can polish one side smooth enough to "skate" on, and can push that rock around under your shoe like a skateboard. This can be amusing, and led to all rock grinding on pavement being banned at my middle school.

Measuring real time voltages and fluxes with an Arduino

Measuring voltages in real time should be easy. And yet it's often a huge pain to transition from doing this in a over-equipped over priced lab to doing it as a rogue element. The trick is to use the Arduino's analog to digital conversion, with the new Arduino software's very handy plotting feature. I generally make a voltage divider with a pair of 10k resistors from 5V to the Arduino ground, with the midpoint connected to one side of the thing to be measured, and the other side connected to the ADC. This is not useful if you're measuring something connected to

the Arduino ground! But if you want to measure something like induced electromotive force in an inductor it's great, as long as you don't go over voltage and blow it up. More on this in future versions.

Measuring Electrical Transport of Slime

This will be covered in very great detail in volumes II and III, and I don't expect this to make a ton of sense now, but basically my method involves putting small amounts of charge onto and off of a capacitor quickly and observing the voltage response. Doing this fast can create an audible signal that depends both qualitatively and quantitively on the impedance, and can also be used to observe nonlinearities through various doublings etc.

Finding Creepy Crawlies

The real Trash Magic Sticks will have optical microscopy built in, along with the plumbing to move water with little creatures around to observe them. For now, I have a very cheap plastic toy microscope that I carry around on my bike and try to find tiny bugs with. I've seen some paramecia, some bacteria and the occasional tardigrade shooting by in the water. Finding water rich in life in Colorado is a bit tricky, but where it's slow moving and covered in bugs is generally a good bet.

Design a new 3d Thing

Blender! Blender!! Blender is a free open source software package used for 3d design, primarily for artists. I used to use commercial CAD software but that is not compatible with the values of Trash Magic so I had to switch to something free. It turns out that while the professional CAD packages are better for professional CAD, that when we abandon the concept of professional engineering and take an artist's approach that Blender is actually superior. I will not digress with my own very poor introduction to Blender as I'm still learning the basics myself. It is, however, going to take a larger and larger role in the manufacturing and design in Trash Magic as more virtual reality and augmented reality systems get deployed in the future.

How I Wrote This

My creative process is to think on things for a long time, then write fast as a synthesis of that thought. The thinking process combines long library visits, long walks, long bike rides, Brazilian Jiujitsu and extensive use of edible THC products purchased in Colorado.

Actual writing generally takes place in a coffee shop, on the couch at home or in the library, usually in quick bursts of under 2 hours of work. I did the writing on a MacBook Air purchased around 2012. Most of the

writing took place in the Markdown editor known as Mou. I used GitHub Desktop to manage the versions and backups on Github, which I used for my cloud backup as I went. Each chapter is its own Markdown file. A shell script uses Pandoc to convert all markdown files to tex files. A file I call main.tex then imports all those tex files as chapters and provides the format using the LaTeX package "memoir" to generate the actual book pdf(main.pdf).

Illustrations were generated by drawing things in pencil, inking in the stronger lines, taking a photograph with a small cheap Sony digital camera, importing the bitmap into the free art software InkScape, and then tracing into vector graphics. The vector graphics are then re-sized to fit in a four inch width, saved as .svg files, and then exported as 100 dpi png files which are used for the actual figures in the document.

How to Color Your Wood Stuff

Wood things should often be at least partly colored, not just for art, but to code different parts differently so they're easy to follow. I generally try to have electrical nodes connected to positive supply voltage be surrounded by red, and the minus supply surrounded by black or green. I also tend to use yellow for signal and blue for higher current lines that are not power supply.

I have a set of colored pencils in my work area, which work great on raw, carved wood, but badly on plastic. I also have a set of acrylic paints, the smallest and cheapest I could find, which goes on just about anything.

I believe most of what we make should be colored and that the colors should always serve both artistic and practical purposes.

Rope Work

I will not elaborate on this too much in the first edition, but I will just mention some rope techniques that are of use:

- coachwhipping
- Turk's head
- clove hitch
- bowline
- bowline in a bight
- dragon bowline
- carrick bend
- figure eight knot
- double figure eight knot
- monkey fist

Chapter 14

Let's Build This!

Resonance Magic Stick

This machine is to make anything with a spring or spring like thing or pendulum vibrate. Vibration is generally part of the physical phenomenon known as resonance, which I will discuss much more in the next volume. For now suffice it to say anything you think of as a wave or vibration is probably an example of some kind of resonance.

The way to drive pretty much any resonance is the same: push only when your push is in the same direction as the natural motion from the vibration. We do this with magnets, which both serve to create something to drive against with the drive coils and also indicate motion direction to the circuit which does the driving.

When electrical current goes through a wire in a magnetic field, there is a force on that wire. The wire also creates a magnetic field, and we can think of this system as an electromagnet(which we turn on and off fast) and a permanent magnet(which is always on) either being pulled together or pushed apart(either will work).

Detecting the motion of the magnet is done using induction: moving magnetic fields generate voltage in a coil of wire, which we detect with an amplifier. That amplifier is designed to be all or nothing: if there is even a tiny voltage, it will go all the way to 5 volts(the power supply voltage used in elementary Trash Magic as well as USB), and at below that(including negative voltages) it's stuck at zero. What this means is that it essentially detects the *direction* of motion of the magnet. Linking the output of that amplifier to a power switch(this role is played by a type of transistor in the first version presented here) which controls current through the drive coil(the coil that actually drives the magnet) causes force to be applied to the magnet on only one side of the cycle of motion.

Perhaps this is all confusing. It's just an electrical way of doing what you do when you push someone else on a swing: you see when they are going forward and push then. Thats' all we're doing! But with a pair of electrical devices, one of which takes the place of your eyes watching the moving swing(that's the amplifier) and one playing the role of your hand pushing the swing(that's the transistor and drive circuit).

The drive coil is a coil of wire about 1-2 inches in diameter with 200-500 turns of wire. This is 30 AWG(American Wire Gauge) copper wire, and it's a few dozen meters, which makes it a few ohms of resistance. At 5 volts, this means it's generally 0.5 to 2 amps or so, that's the target. The sense coil is 50 turns of the same wire, wrapped around the outside of the drive coil.

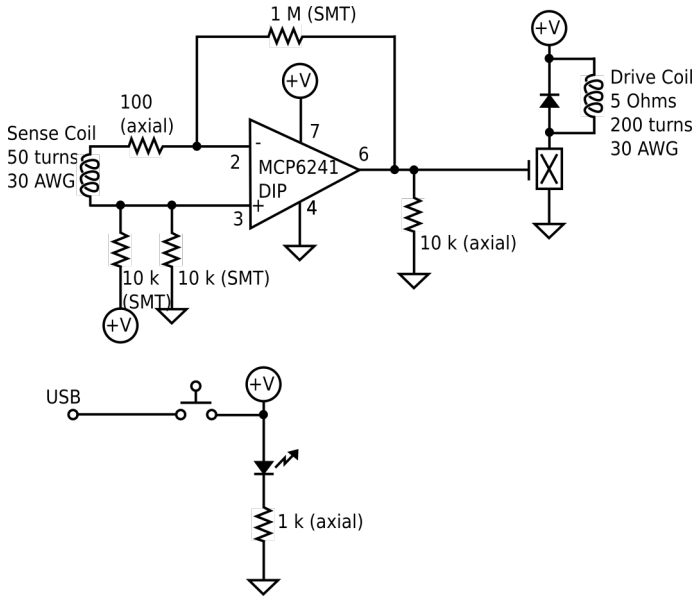

Figure 14.1: Circuit schematic for resonant driver

The amplifier is a circuit using the MCP6241 operational amplifier, a very low cost(less than a dollar), easy-

to-use and generic chip from Microchip, Inc.(also a very generic name!) The voltage gain is 10,000, so 1 millivolt input is enough to saturate the amplifier all the way to 5 volts.

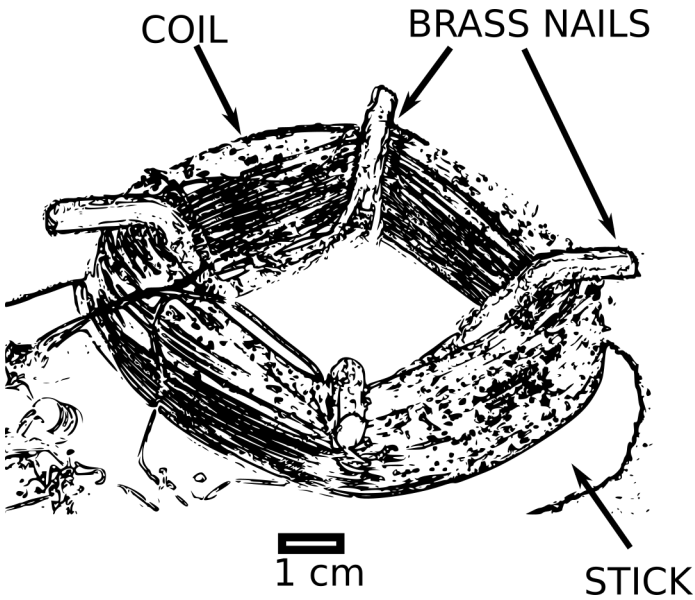

Figure 14.2: Coil

A core of ferromagnetic material such as steel ball bearings filled into JB weld steel epoxy can increase the inductance considerably, and also making it possible to drive steel or iron objects without permanent magnets.

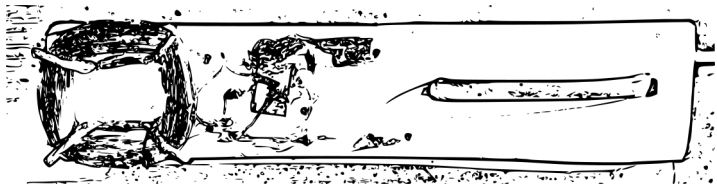

Figure 14.3: stick

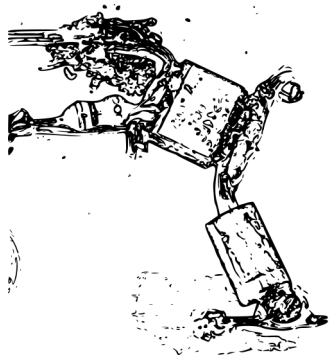

Figure 14.4: transistor

The strobe light is a high power small LED flashlight driven through another identical power transistor, controlled by the output of a 555 in monostable mode driven by the output of the amplifier. The user can turn a knob that is a potentiometer that controls the time delay, generally some number of ms or 10's of ms or 100's of ms. This strobe is thus perfectly timed with whatever the

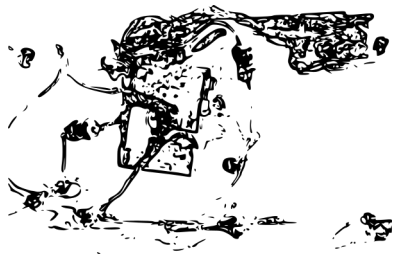

Figure 14.5: amp

resonant frequency is, and varying the time delay varies what phase of that wave we can see.

The combination of a wave drive and a strobe has many applications in both science and art. A wave tank can be made which projects water waves in a shallow clear dish onto a large screen(2 m across), and waves can be generated using the vibrational drive and a small agitator of some kind(a wood stick or blunt wire will work). This can be an interesting art piece that allows you to observe wave behavior with the strobe. Is it art or science? Both. Also the strobe can be used in microscopy with vibrating water, and the *observed* position of a floating object in the fluid can be controlled using the phase knob! This can be extended into a whole world of optical microscopy, as well as other phase controlled measurements in a vibrating fluid.

A phase controlled standing wave illumination can be used to make living art by growing tiny plants in large

arrays in such light, and controlling the phase to control the relative illumination across the green surface, making waves in the living plants. Many different art pieces could be made like this, including growing bansai trees with this illumination over a many year period to make trees with standing waves of vibrational motion and light.

Art can also be constructed by making the strobe illuminate various interesting steel objects which vibrate. This can also be used for pure light art with more LEDs on the steel.

Vibrational drive can also be an alternative to rotational drive for tools to work stone and wood. A coil with a iron core can be used to pull on an iron nail on a spring, which then vibrates along the long axis of the nail, making a sort of small steel jackhammer. Used under water with patience and some automation, this could be a tool to slowly and safely chip away at stone to make arbitrary shapes with minimal energy or time or effort input. The same technology can of course be used for wood.

Vibrational oscillators can also have a variety of applications in massage and health, both for humans and other animals. Vibration applied to various compost reactors and other types of chemical and biological reactors can make a simple method for mixing or increasing reaction rates. What effect does vibration have on microorganisms in loose soil? Is it ever good? We must study this and find out.

Another simple vibrational machine that our driver

can drive is a pendulum with full swing. This can be as simple as a stick with a hole in it and a metal rod as axle running through a plastic bottle stator, with magnets on the ends of the stick. The driver will periodically drive the magnets with just the right frequency and phase using feedback as with the linear oscillator. This leads to an accelerating rotational motor limited by the friction of the bearings, which has several applications. One of the most useful is the high voltage generator, where the rotation causes a rubbing between two materials that built up voltage, and then metal pickups transfer charge to a big metal ball and thousands of volts are built up which can be used for various things such as plasma physics. These types of rotational pendulums are also a nice demonstration of Josephson Junction physics and can be useful for building models for that field of research.

Vibrational machines can also be used for simple propulsion of robots and for pumps of both fluids and gasses. It is also amusing to see how destructive resonance can be by putting magnets on glass things and smashing them with the driver, which should be done very carefully if at all!

Noise Magic Stick

This stick allows us to both listen to and create noise magic. Noise magic has many forms, and we will work with several. First of all this will be designed to measure

the noise in tiny magnetic fields, amplify it, and make audio noise for the human ear. This means you can literally hear magnetic fields, and by brandishing your magic stick you can control very sensitively what fields you're listening to: changing direction with a tiny twist of the stick and location by waving it around your head. Also this can be used to track AC lines with current for various reasons, and can be used to trace underground signals, which can be planted using thumper sticks.

Two stages of high gain amplifier and one stage of buffer amplifier get from the detection coil to the speaker. All amplifiers and the speaker are powered by a 5V source from any USB type supply and like the Resonant Stick the input will be a USB cable. The top of the stick is the speaker and the bottom is the pickup coil, with many turns and a ferrous core. Potentiometers are used to tune so that all signals are centered in the middle between 0V and 5V. This then goes through a isolator to the last stage to let all AC through but not any DC into the speaker. Large, obviously labelled, wires connect to the feedback resistors in the gain stages, making it easy to make summing or differentiating amps as well as oscillators. Magnets can be used to couple vibration to electricity to sound, for direct vibrational amplification. Knobs and switches can thus choose gain, keep DC at zero, and make musical effects for art.

In the highest gain mode with a resistor at the input the stick can be used to measure thermal noise of the re-

sistor. This can be repeated for various fluids, making a Johnson noise detector of fluid impedance which should also be sensitive to drift currents from whatever is going on electrically in the fluid. In addition to thermal noise there will be shot noise observable from quantum tunneling through various native oxide layers. This can be accomplished with an old beer can found by the creek, immersed in a sports drink. Direct interaction with the properties of the oxide using acoustic feedback should thus be possible using quantum tunneling noise.

Properly wielded and modified, the Noise Magic Stick should be our ears into a vast world of electrical impedance, voltage, current, and ion magic in general. This is a precursor tool to the generic electrochemical probe that will be made in Volume II of this work. Again, with practice, it should be possible to do physical measurements on arbitrary materials using the Stick, both electric and magnetic.

Another extremely important mode of operation for the Noise Magic Stick is for optical pickup. A very simple and cheap optical sensor can be connected to the input of the amplifier chain, converting an optical signal to an audio signal. This can be used to demodulate voice signals sent using fire and smoke and vibration in a faraway location. Optics can be built into the stick to focus on a specific point, which might be a transmission fire far away. Another magician may thus transmit via one fire on a mountain top and be picked up and amplified as a

loud acoustic signal by many other magicians miles away in different locations! This can also be done with fluids and at the microscopic scale with different optics to create an audio signal from a microscopic system, generally a biological one. We can thus listen to the motion of the cilia on a moving protozoan for instance as an actual audio signal. This is both art and science and also technology.

Finally Noise Magic gives us another useful resource: truly random numbers. Using physical noise like thermal or shot noise we can have a signal which is physically provably random which can generate numbers using a simple analog to digital converter and microprocessor, at least for now. In the future, the better way to do this would be to have the random bits get directly encoded into something physical in multiple copies which can then be used for a physical one time pad with no interaction with any microprocessor ever. We can thus have provably secure communication based on face to face contact, which can then be deployed over any distance using the trivial one time pad encryption. The attacks against the one time pad key generation generally involve compromising the hardware in ways that involve access to the industrial process by which that hardware was made. We make our own hardware as art built from trash and then distribute it face to face, so these problems to not apply. I don't generally believe in the cypher punk world view, but near-theoretically-perfect encryption can be useful

and it should be so easy with our system there is not reason not to do it.

Whirligig

Whirligig and charger: - all kinds of stick pendulums that just spin around for a long time - just a simple whirligig that runs forever as an undershot water wheel - small bucket overshot whirligig that does nothing but spin - generator that charges 5 V capacitor with any magnetic induction with either sign - magnet rotor with stick bearing and big iron core pickup connected to generator - whirligig that runs a light and that's all - whirligig that charges USB - rooftop wind whirligig that charges USB

Lesson Gifts

My problem is the same as that of Kano in forming the Kodokan: how I teach the first students and how I organize the information conveyed to them shapes how they pass it on, and that will propagate through the whole subsequent series of events. How did Kano start? How did Ueshiba? Why was Kano able to build a more functional system than Ueshiba?

We must encourage collaboration so that those who don't want to learn electronics can get free electronics from those who do, and can find other ways to contribute,

with art, assembly, craft, and the important courier service that needs to happen for distribution.

Courrier Gifts

Recruiting couriers might be the most important of these construction tasks, as I will be always building more artifacts myself and spreading the teachings of how to do it face to face, which can't spread as fast as the book can. The book can spread *very* fast, and build a courier network so that physical artifacts can also if the book spreads the courier network very fast(it should also explicitly encourage readers to spread the word fast), and I can make artifacts fast, the limiting factor in growth will be the spread of the craft of artifact creating and the use of the new things.

Version 1 of Tale and Lore

Deploy Guerrilla Faery Art

how to do installations, how to fix them how to document them, how to expand them how to move them, documentation of installations around the world, USB chargers are best to start with

from the blog:

I have figured out the nature of the first phase of technology development: guerilla faery art. I've been getting

distracted by the long term goals of functionality for industrial production, but for this first volume aimed at non technical readers, it makes sense to focus on technology which will make sense and be obviously worth spreading: guerilla faery art. What is this? Art outside the capitalist system, installed without permission, built from trash and powered from freely available energy, and with a view toward exposing people to the of magic of the physical world. There will be oscillators and motors and pumps and strobe lights and magnetic pickups and all kinds of blinking lights and speakers for sound and microscopic views of living things.

The electrochemical probe and full robotic system belongs to the second volume on Trash Magic. That is geared to people who want to delve deeply into the way electromagnetic trash magic works, focusing on fluid ion transport to interact with living systems, along with the basic infrastructure needed for a good life. The more advanced stuff will be just described in the first volume, not built out with detailed plans.

What does this mean for things to build?

Materials and how to mount things in place matter. This gives me an excuse to go down to all the creeks and find the right sticks and rocks and trash locally that can be repurposed for an installation. Some missions will require stealth.

Viewing of microscopic objects must be extremely robust and require no turning on or off or care on a day

to day basis. Obviousness is key here, the view port has to be so obvious that everyone will automatically use it. Also the subject has to naturally flow in constantly, with some trickle from a living stream so that something interesting, whatever the subject is, is usually present.

What specifically needs to get built to have finished products, and where do they go? Some things will be deployed in wild areas, some in urban areas, and some will be gifts to artists.

A tentative and partial list of Guerilla Faery Art:

- USB charger with water wheel
- water wheel that generates electricity which drives oscillator stick with rocks on it, just vibrates forever with feedback
- same, but with LEDs with a pattern to make 3d POV art in the water
- water wheel turns triboelectric generator using bottles and such to build up high voltage which creates an arc over the water between aluminum covered plastic bottles, very visible at night!
- art piece as gift where a vibrator vibrates water, making waves, which can be observed using a strobe, and turned into audio with a magnetic float and amplified magnetic pickup. With the magnifier built into the wood/plastic/stone water containers, this connects the main technologies if it's USB powered, and is the perfect Main Gift for this phase.

- 3d manipulator with 3d input, hung from a tree or bridge over the water, which powers all motors and control circuits. Anyone happening by and seeing the setup can grab the input rock and move it around, which will drive the moving platform around in 3d space above the water. This probe can have the crude sonic electrochemical probe tuned to respond to depth in the water, so that the user can make sound by controlling the probe around in the water. Here art, science and technology are all one thing, built from trash, and in a public place with no declared ownership.
- water channel with strobe and vibrational drive for visual effects at night, driven by water wheel, runs all the time
- evaporative cooling refrigerator driven by water wheel
- hotplate driven by water wheel
- warm water pool heated by water wheel and generator
- steam powered organ using tubes and steam generated from water wheel
- datalog of creek which can connect to phones and twitter

Focusing on the main thing for now it's probably the USB driven art piece without the generator, just a wall charge for a off the shelf lipo battery, or left plugged in. A wave tank with a strobe can have a tunable 2d shape

projected by the sun down onto an area, with musical output based on the wave patterns. This could be installed in a tree, projecting through glass, with water piped from the top of a waterfall. But what powers it? No, I need the charger for the guerilla installation, but not for the art gift.

Art gift should be simpler than that, project up and along the side, with lights under transluscent plastic in the stick. Vibrator stick with rocks on it bounces, with a stick that can be adjusted to agitate the water with different wave shapes and frequencies and amplitudes. The magnets and rocks can also be moved to change the properties. Water propagates down carved channels in a fat bottom stick with the drive stick bolted to it as well as the bouncing stick which is fixed at the end opposite the water. Lenses can be put above the water to magnify what is in it as well as to project light in various directions both for art and for observation. A little wave pool at the opposite end of the water agitator has a float with a tiny magnet in it, and the audio flux amplifier is wound around this pool, so that the sound is picked up and amplified and has an audio out socket. A beautiful carved wooden knob is used to adjust the strobe properties by changing a 555 circuit.

This is the first thing! Build this art gift first, before the water wheel, it's self contained and can be distributed and used in classes I can teach and spread the work. Lack of water wheel is not serious for most people since they

charge devices anyway with USB and can get a lipo at a gas station for 10 dollars.

Future Work

I will list the things I'll leave for other projects/publications:

1. robots that roll around
2. 3d input manipulator
3. 3d probe
4. stepper motor
5. water powered drill
6. microscopy
7. fluidic pumps
8. cable to move goods around mechanically driven by whirligig
9. water pump driven by water
10. generic air pump for inflating anything, which is also generic water pump
11. electrostatic generator driven by whirligig
12. stone cutting machine
13. boat
14. heated composting reactor
15. oxygen and hydrogen generator
16. electrochemical probe
17. optical free space communications system
18. soaring high voltage drones

19. temperature regulator using stepper motor and solar concentrator with parabolic mirror from trash
20. thermometers

- how to make a thing
- how to ship a thing
- how you can get finished goods and join a value circle
- how you can make stuff and start a value circle
- how you can do a research project and start a value circle
- how to transport a thing from the maker to the user
- how to find your ambient energy resources
- what you can do to spread the word and build community
- Other academic work you can contribute as a scholar
- Machines you could build outside this system which can start a new value circle

This section should have some basic assembly plans and information to get started even without the second volume.

Things to make here:

- vibrational oscillator with musical pickup
- 3d input device
- 3d manipulator, linked to input device
- wood cutting for circuits techniques

- plastic welding techniques
- waterwheel generator to 5V USB charger
- skeletron guide, with pictures, cartoons, detailed instructions, several plans:
  - tent
  - water wheel
  - tripod for manipulator and probe
  - vibrational musical instrument
  - boat
- high voltage generator
- strobe microscope
- LED art vibrator display
- basic electrochemical probe
- temperature regulator with hoist and thermometer and fire
- ambient art pieces powered off water and wind that use electricity to do things which can be repaired forever by anyone and moved and rebuilt and replaced by anyone
- vibrator with polished stones as massager
- Josephson junction pendulum
- build a heated shit reactor with a giant tube and air pump to send gasses to the top of a tree