0.1 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.

0.2 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 the sense 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.

0.3 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 capi-

talism and its obsession with short term growth and profits we can have time scales of 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.

0.4 Earth Robots

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

mechanical 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 an 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

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.

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 ever 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.

0.10 . . . 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.

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 free 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.

0.5 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 turbo-

tures 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.

0.9 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 building, 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 an 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

0.8 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 crea-

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

0.6 Water Robots

Littoral robot rumbles which can use tides and river currents to generate electricity to propel themselves upstream should be built. 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 under capitalist government, 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.

0.7 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.