

## **The Next Chapter**

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(Shortwave broadcast only: Roll 'Simple Gifts' id)

(Anncr:) The folowing program is a produchun of the North American Service of Radio Alexandria. (Begin domestic broadcast: Roll open theme, then under for:)

Hello Team Humanity. I'm Roland B. Hunt & u're listening to The Next Chapter. (Theme up, then under for:)

The Next Chapter looks at where we seem to be headed as a species on this litle blue planet, do we realy want to go there, & what ar our options? On today's program we'll hav an extended interview with a physicist turned farmer who wants to revolutionize the world economy with open source technology. Marcin Jakubowski has already built tractors, machines for compressing earth in building blocks, three D printers, & a variety of other devices, al with local materials. Everything is open source so anywun just about anywhere can create a fully equiped modern comercial farm at a fracshun of the normal cost. (Pause for stations airing 4 min. newscast.)

The Next Chapter is about ideas. It's not about any particular religion, or joining som movment or cause, or buying gold coins or land in Belize. But if u want intelectual adventure, if u lik trying to answer tuf questions & solve tuf problems, u've cum to the rite place. & if u go away from this broadcast without feeling chalenged or even anoyed by som of what u've heard then I hav failed in my effort to rattle cages & stimulate original thinking. We liv in a dangerous age but also wun full of opportunity to advance humankind to our fullest potential. Let's seize that opportunity while we stil can.

Befor we get started tho let's quickly review the ground rules we folow on the Next Chapter. First, we don't do religion on this program. I'm not a theologian & mak no claims to be wun. Everyone is welcome here tho, whether u're a fundamentalist believer, militant atheist, or anywhere in between.

Second, The Next Chapter doesn't pay much atenshun to conspiracy theories, Big Foot, UFOs, or who killed JFK. It's al very entertaining but this is a serious program about serious issues. I keep an open mind on these subjects & once in awhile I mite touch on them but generally I let George Noory, Alex Jones, & others carry the black briefcase on such matters.

Third, we hav no nothing to sel here. No books, no MREs, no gold coins, no land in Central America. We mite look at the pros & cons of owning gold, or if u're thinking of moving overseas, what factors u need to consider. But in the end its up to u to do ur own homework & mak ur own decisions.

Fourth & last, The Next Chapter is neither for or against any government. After living & working for much of my adult life in mor than a dozen poor & often war-torn nations, I've cum to the conclusion that al governments, ours included, ar going to do whatever it takes to keep

themselves in power. That's what governments do. What we as individuals do tho is up to us, not blind, impersonal historical forces...or men in black.

Unlike our ancient ancestors who lived day to day & had no way to anticipate mega-disasters, now we not only anticipate & plan for them, we humans can & hav built vast underground bunkers in many countries that wil allow thousands of humans to liv underground for years until condishuns on the surface improve. The US has them. So do the Russians & the Chinese.

Switzerland reportedly has bunkers that can shelter its entire populashun of eight milyun for up to two years. That kind of capability is a game changer but it doesn't alter the reality that our species has cum up against som extremely dangerous problems for which we curently appear to hav no solushuns. Weapons of mass destrucshun, bioterrorism, & mass unemployment caused by the rise of inteligent machines ar just three examples. So if for whatever reason modern civilizashun does pass into history, there wil be survivors. The question is, wil those who cum after us be able to learn from our mistakes & not repeat them?

The Next Chapter is for the elite but in this case the elite is self selecting. It's anyone who enjoys thinking deeply about serious issues. som liseners may find som of the subjects we talk about on this broadcast disturbing but u can be sure that elites in governments & private research institutes around the world ar also thinking about these issues. Our goal is to bring as many people as posible into the conversashun. In a complex technological society we can't hope to meet tomorrow's chalenges unles we understand them. (pause for stations carrying a newscast to rejoin the program)

Today I'm going to hav the first of a two part interview with wun of the most remarkable innovators I've ever met. Marcin Jakubowski wants to change the world from wun of scarcity to wun of abundance & he wants to do it using open source technology. But before we get to that I want to bring u up to date on som disturbing signals in the world economy & a new warning by international insurance giant Lloyds of London.

In the last several days the Chinese government has released data showing an increase in GDP for the most recent quarter.

That certainly sounds good becaus a lot of people, both inside & outside China, hav been expressing concern that a economic crash is in the making. As soon as I saw the GDP headline I thot, yeah, that's becaus the huge housing bubble in China is inflating the GDP number, making it look better than it realy is. & sure enuf shortly after that London's *Financial Times* published an article stating that the property market was boosting Chinese GDP.

Along with the GDP figure we see the oficial unemployment rate listed as five percent. Just as in the US the Chinese government plays games with its unemployment data. In China's case only unemployment in cities is measured, not the rural areas, & then only for those officialy permitted to reside in cities. Many millions of poor rural people have moved to urban areas without permission so they ar not counted in the unemployment data.

It's wun mor example of misleading data put out by the Chinese government & u cud say what else is new but listen to this. The *People's Daily*, the official organ of the Chinese Communist Party, is warning that despite an apparently strong economy people shud be wary of 'Gray Rhinos'. 'Gray Rhinos' ar hi impact events that ar hily probable & which people shud see coming but often don't.

The problem: apparent economic growth fueled by ever higher piles of borrowed money, all of which increases the risk of a crash. & of course if you were listening to The Next Chapter

in recent weeks you know that economists, both Chinese & Western, are warning that if the Chinese economy goes down it cud take the world economy with it.

& here's wun mor item to brighten ur day. Last week I did an extended analysis of the most recent global cyberattack, wun that hit big shipping firms like Maersk & disrupted commerce around the world. That attack reportedly only affected about 20,000 computer systems.

Now Lloyds of London is just out with a study that estimates the damage done by the Notpetya virus at \$850 million. But according to Lloyd's, an extreme cyberattack against say a computer cloud service cud caus up to - I hope you are sitting down - \$121 billion in damage. The scenario that Lloyd's used called for malicious software to be planted in the cloud storage system a year in advance. When it was suddenly activated it wud crash major computer systems worldwide.

Which of course is why I don't recomend using cloud services for storing al ur valuable data. Yes, it's mor of a hasle to manage data & software updates urself but at least u've got som control over how u set up ur backup systems.

Believe me when I say I don't enjoy sounding lik a prophet of doom but the world is what it is. We can't always control the chalenges that life throws at us but we can control how we react to them. Part of that is understanding the threats & being alert for unexpected opportunities to avoid them.

All right. Now for a mor optimistic take on the future. If u're a regular listener to the Next Chapter u've heard me speak many times about the industrial revolushun 3-D printing is bringing to the planet. With such a printer u can mak most anything u need localy. Put 3-Printing together with open source plans & u're no longer dependent on som distant giant factory in Europe or China or Japan for machines & replacement parts.

Open source means there ar no patents on the device. Anyone anywhere can mak wun without having to pay royalties to som company or individual. A lot of people hav been talking about this coming revolution but physicist turned farmer Marcin Jakubowski is actualy doing it. & his goal is a lot mor than just turning out som farm machinery from open source plans. He owns a farm in northwest Missouri & he wants people to replicate his work around the world.

I first learned of Marcin Jakubowski & his efforts by watching his brief Ted talk on the web & decided to give him a call to find out more. I began by asking how, after getting a PhD in physics, he decided to take his life in a totally diferent direcshun.

(Insert Jakubowski, J: "As a little... ...clearly") (interview transcript instandard English)

MJ: As a little child I always thought about the good stuff science can do for humanity. My father's a scientist so I kind of had that. And the father I went in my education career the more I removed I felt from solving pressing world issues so I went from chemistry undergrad, that didn't really cut it. We're studying all this theoretical chemistry stuff at Princeton. And then physics, all right, fusion energy. But then the further I went into fusion I noticed that it was getting quite removed from reality as well in the sense that one time there were a couple of things I remember pretty well from that time and that is these Monday seminars which were just crazy radical stuff that on one hand you've got people starving or deprived in one part of the world and we're talking about this crazy stuff that a lot of times didn't have any real counterpart on the planet or the universe. And then I went to a professor once during my classes in fusion physics. I asked what was this, this equation that stretched across half the wall, what is this, I don't really get it. Is this some wave traveling through space? And then he told me well no, that actually doesn't exist. I just made it up.

RBH: (laughs)

MJ: And it's like all right, that's what we're doing here. It was one of those shocks that made me think about all those issues about relevance. So the second year of the PhD program I kind of checked out if you may. I took on a lifestyle engineering program where I learned breathing, yoga, meditation, and Indian cooking and I turned to a different wavelength at that point.

RBH: And you finally did complete the PhD and I guess fusion energy is still a ways off for us if it ever happens.

MJ: Well, one of the issues that people struggle with there is that if you're making neutrons which are uncharged, highly energetic particles there is no known or foreseen way that we can contain them.

RBH: You can't contain them in a magnetic bottle?

MJ: No, because they're uncharged. So the neutrons, the uncharged particles that are products of the fusion reactions will destroy anything they come in contact with. There is no way to trap them by magnetic fields or anything else. I guess people don't really talk a lot about that. They talk about confining those charged particles which is..,

RBH: That's the easy part.

MJ: That's the easy part but as far as the radioactivity issues that are going to come out of neutrons coming out and smashing up other molecules, that hasn't been solved nor has issue of how you actually extract that energy in the bottled up sun, so to say. It's quite a hot thing. How do you actually extract it when you can't hold it.

RBH: Right, right.

MJ: So I mean fundamental issues that people are not really talking about because that's at the level of let's get break even positive energy return, I think that's the current challenge the last I checked so it gets into those issues, so it's okay, we've got this complexity, this insanity of

following this technology trying to tame the sun and earth while we have solar energy 93 million miles away and we can be trapping it using this solar energy which fuels the entire economy. That's all we have and if you can tell me that we've got 10,000 times more power from the sun than we use even in our current wasteful energy system why are we even bothering with any of these funky technologies when we have all the power we need from the sun and its derivatives like biomass.

RBH: Right.

MJ: And that's what fuels our economy today. It's canned biomass and its fossil fuels. It's all solar energy. Why are we even bothering with other insanity when it's all right in front of us? It's one of those inconvenient truths that we don't really want to talk about but that's a reality. We can go the sun as our energy source.

RBH: So you came to that realization so after you got your PhD you decided to go into farming.

MJ: Yeah, I got the realization quite early on in the program, like the second year of the program so I suffered through five more years but I didn't quit because my daddy told me not to and I listened to him but I wish in retrospect that I was self educated because I would have gotten myself to this kind of point of breaking out of the system pretty much more quickly. I did finish up and that's all right but it didn't help me with any of my entrepreneurial skills.

RBH: So you eventually started a farm in northwest Missouri and you decided that a major component of this would be open source technology.

MJ: Right. The idea there was that as I said in my TED talk I bought a tractor and then it broke. I paid to get it repaired. Then it broke again. I basically paid \$2,000 bucks and it broke a week later and I was like okay I cannot go about this if I don't have appropriate technologies like tractors that I actually control, that they don't control me. So very early on I came to the realization that in order to do powerful production you need powerful appropriate technology for support. Otherwise you are a slave to the technology. So I decided okay if we're going to do this we need to solve this issue for good.

We need solve it for everybody so that's where the idea of open source equipment came about but actually the open source idea once I got to the farm I already had the open source ecology project started in name because in my PhD program I actually could not talk openly to my peers or people at other universities because we had some hot information research material that if we let out of the bag people might copy it. So in the competitive environment when I noticed man why is this so ridiculous. This is waste. Why can I not communicate openly and learn openly even at our so called institutions of public learning here? So that contradiction got me to thinking about open source technologies in the first place.

RBH: And somewhere along the way you actually built yourself a real tractor.

MJ: Yeah, yeah, absolutely. So the first thing I started to do was build stuff taht was required for survival. Basically it was an experiment of taking a raw piece of land and bootstrapping it to the modern comforts. So it started with a compressed block earth press. That was the first device I built. Then built a workshop using that machine and then further housing so basically bootstrapping ourselves from primitive construction to more advanced building techniques like compressed earth blocks which are natural and advanced contruction materials. And then I built

the tractor because that tractor broke down. So I just started building machines and yes it was an incredibly liberating experience. When I staved that wow I can actually do this. It's not rocket science. There are certain principles you follow and you succeed. Now of course I had a fire under my pants because I needed to do this to survive there, so I did it.

RBH: So I guess along the way you learned some welding and machine shop techniques and skills?

MJ: Yeah, starting from pretty much no experience because as a PhD student you don't get to touch the workshop a lot. You get people doing that for you so I didn't have any experience welding or torching so I just picked it up. It's something you can pick up relatively easy. With a few hours of practice you can start with basic proficiency with some of these tools and then you just continuing developing that.

RBH: I saw on the website you've got an open source combine and machinery that's a whole lot more complex than just shovels and hoes. It's the real thing.

MJ: Yeah, it's the level of complexity there. Now those are all the machines that are in the set. A lot of that has not been built yet. For exmple we haven't built the combine yet. We've got about 20 or so of the different machines that we've built the prototypes of. Some of them that are really at the product release stage like the brick press, the power cube, the 3D printer, soil pulverizer, some other things but a lot of it is not at the completion level. So a lot of people come to look and they're thinking well we've already got this civilization built. Well we don't. We're in active development. We're probably 20% done or so.

RBH: And one of things that occurs to me is having the energy in terms of fuel to run this machinery. I guess you're working pretty hard to develop ways to produce that.

MJ: Well one very interesting low hanging fruit on that front is charcoal for gasifiers which are able to fuel regular engines. While the modern steam engine is one of the technologies, and solar concentrators and steam power is in there too, windmills and some other devices, but the thing that's really low hanging fruit that I don't think a lot of people are really paying attention to is charcoal made from abundant biomass so that just by creating charcoal - charcoal is the hard part - otherwise the gasifiers are old technology. That's well proven. And we're talking about charcoal, not wood. Wood has the tar problems associated with it. I don't think there has ever been any vehicle in history that did not run into taring problems with wood. But when you use charcoal you get rid of all the tars and you burn everything. You retain pure carbon as your fuel source.

So for example chacoal pellets are a flowable fuel that could be a complete replacement for gasoline. That's at least the way I look at it and that's how I'm going to live my life. Wood is abundantly available but charcoal is a little harder up front because you have to generate the charcoal in the first place but after that it's completely safe for your engine and doesn't tar it up and that's why we're making that clear distinction between charcoal and wood power.

RBH: Okay, very good. One of the books on the (Radio Alexandria) list is The Knowledge by Lewis Dartnell. That's a best selling book and I interviewed him for about an hour from his office in London. He was kind enough, I even wrote a piece for his website about restarting civilization with tube equipment and home made tubes. There's a French ham radio operator who

makes his own vacuum tubes. There's a video of that (that is) 17 minutes. But if you've got the vacuum tubes and can make your own transformers and whatever you can make radio sets and teletype is all basically electro-mechanical. You can have a worldwide teletype network like we had during the 30's, forties, and fifties. So you're not starting from the stone age. Even if civilization came to an end you could recreate that with basement workshop equipment.

MJ: Now if you talk about vacuum tubes yes I've seen that actually. I think that also the simple equipment you can build with the production machinery within our set, our goal is actually quite exotic. We are talking about also getting up to semiconductors and metals from the materials that are found on any parcel of land on this planet. So for example can get you bricks but clay is aluminosilicate. You can get alumina from that. You can smelt aluminum from clay as well. That has been done historically by places like Russia that do not have access to the bauxite mineral. So sand is silicon dioxide. You have silicon everywhere so we're talking about the semiconductor industry. So part of our deal is showing that we can have semiconductor fab on any part of the planet like on a 40 acre scale.

RBH: Wow, that's absolutely amazing. I talked to man who is a chemical engineer and used to work for Motorola exactly in the fabrication of microcircuits and the chemistry involved in all that. But I was asking him what it would cost to build a small plant to make semiconductors. His estimate was, because of the high cleanliness and the purity of everything, might cost five million dollars but it sounds like to me you've got in mind a lot cheaper ways to do it.

MJ: To begin with if you talk about any proprietary systems the typical cost reductions of open source may be five to ten times so if you talk about, based on standard technology, talk about simply open sourcing that you're talking about not a five million dollar facility but a \$500,000 facility let's say and I'm sure there are ways to go still lower cost. For example you've got our compressed block machine). You make clean rooms with very clean plaster, whatever you've got, to make clean rooms. What are the basics you need? You need structures. You need vacuum pumps. You need machines that are made of metal and vacuum chambers but that's all right. Those technologies are available. There's no magic to them.

There is a high level of advancement that people have already gained to get to the high technology but we can, I've been looking at 1990s level of semiconductor fab I heard somewhere that you can make in a facility that's like an acre in size and costs like a million bucks. I've heard that elsewhere too so you might not be able to make the most advanced semiconductors but we can certainly do something and the question is what exactly are limits of what you can do on a small scale. That's a question we trying to answer as a benchmark for humanity.

RBH: That's really, really impressive. Because I'm thinking of the ultra purity of germanium and selenium and all these kind of rare minerals that go into fabricating even bipolar transistors so that's really amazing what you're talking about.

MJ: There are scarce resources like some of the dopants and stuff like that but a lot of times in technology there's one way to do something and then someone comes up with a breakthrough and there's an alternative way that turns that from a scarce way to do it to a much more abundant way. Like for example aluminum was more costly than gold.

RBH: Right, right. And then we found the electrolysis method in the late 1870s or something like that and suddenly the price of producing aluminum plummeted.

MJ: Yeah, there are some open source buddies of mind that are talking about semiconductor manufacturing on your desktop with 3D printer like devices. I don't think there's any limits to the technology. It's human imagination here that we're talking about.

RBH: So you were saying that you've got about 20 of these machines that are actually prototyped and I wasn't quite clear. These are actually ready for people to take the plans and go build something. Is that what you meant?

MJ: There are several that we recommend for wide replication and that is the brick press, the power cube, the 3D printer which is our current one and the soil pulverizer. That's about it for now

RBH: I see, but one by one you're adding to the list.

MJ: But the point is that as a plug in for developers we have a program where we call them OLC (?) developers, people who commit ten hours of volunteer time per week. We have about 15 people who are doing that right now but we encourage anyone in the audience if you really want to get involved and learn about open source product development as well as open sources tools such as Free CAD for 3D design we'll teach you that and you can design with us. We even have an english major who learned that and who is on our team as well.

RBH: Do I understand that you have some training programs coming up as well here in the fall?

MJ: Yeah we do have workshops coming up so actually a plug for a build in we're doing for the 3D printer. So what we do is manufacturing builds where you get to actually build one of these machines in a single day. So the next one coming up is for the 3D printer. We're actually posting that tomorrow but we're going to build 24 printers in a single day so when people sign up for that workshop and you have an event of your life building that and coming out with a machine that perfect prints at the end of the day.

RBH: That's amazing!

MJ: So the trick here is the efficiency we have attained basically by documenting everything and paying attention to the work flows, simplicity and modularity we can get a large crew of people to do a modular build, meaning that all the people work on modules in parallel and then assemble them rapidly into place. That is for example how we can build the one ton brick machine in a single day with a team of about a dozen people build all the parts, do some welding, other fabrication duties and then we come up with an automated brick press in a single day. No body does that in the world. We claim to have the highest efficiency in terms of the time compressing an otherwise big, drawn out event in time by using a parallel line build process. So that's a major breakthrough that we've achieved that we think can revitalize the world's manufacturing system towards simply localized open source micro factories that can produce anything within communities. That's very exciting. We quite excited about that. Not a lot of people know about this concept we've developed but that's going to be getting out as we get more exposure.

RBH: Actually I've talked about that a number of times on the radio program but I couldn't cite any specific example. The principle of being able to do so much decentralized when you've got things like 3E printers. It's a game changer in terms of world commerce where you don't have to import everything from China or Europe or wherever. You can actually make it locally and repair it locally. But it sounds like to me you've gone way down the road on all of this.



MJ: Indeed. Just to give you an example, plastic as unexciting as it sounds but still that is one third of the productive economy. There's plastic, there's metal, and there's biomass, some of the major centers of production. So if printing is a trillion dollar industry by open source 3D printers where you also recycle all the plastic that you make using a filament maker that is also open source. We're working on it right now by the way. But if you do that imagine getting your footprint in plastic down to zero because you can make printing filaments from scrap plastic and then turn it into a useful object. For example a cordless drill. Instead of that lasting a year and then you throw it out, you grind it down, you make new parts or replacement parts for a lifetime. So we're talking about the promise of going from a throwaway society to lifetime design, much more cyclical material cycles happening in society and 3D printers can help a lot with that.

RBH: Sure, and I understand that the filament is some of the most expensive part when you buy it commercially but if you can make your own out of milk cartons and things of that nature you're way ahead of the game.

MJ: Yeah, absolutely and the numbers on that is for a finished 3D printing filament it'll cost you ten bucks a pound if you buy it off the shelf. Well that gets pretty expensive very fast unless you're just printing small parts which is what everybody does. It's okay but if you're going to print any larger things such as what about plastic lumber, plumbing, things that we use to build our house with, things like polycarbonate twin wall glazing for the greenhouse? The material costs would add up so that's where if you go to get a trash barrel from a recycling place and then you grind it down to make your own filament you could be talking about 50 cents a pound or so as opposed to \$10 a pound.

RBH: I was talking to one of the Michigan Tech students involved with Professor Pearce's program there and he or she was talking about things that need development is that all the plastics are different chemically. They all have different characteristics in terms of melt temperature and what happens when they reach this temperature or that temperature. But you really have to understand all of that or else you really risk doing serious damage to your printer.

MJ: Yeah not so much damage to the printer but definitely what happens there is that each plastic will require a certain temperature of the nozzle that extrudes the plastic. So if you've got bad plastic or a mixture that's got junk in it you'll just clog up your nozzle but that's the damage. That's easily fixable.

RBH: So you've got this workshop for building 24 3D printers in a day. Do we have dates for that yet?

MJ: That's planned for August 12. It's a Saturday. So a simple one day build. You start at 8am. We go through the whole build in a single day. So I'm posting that event tomorrow. We're working on a video here right now.

RBH: I presume there's some fee to participate in this?

MJ: Right. The fee is going to be either \$650 or \$750. Our business model for the non-profit organization that we run, we are pretty much funded by bootstraps. So what we do is charge \$300 over the materials cost per seat for someone who takes a working printer home. So for \$650 you can take a printer home with you and we generate revenue to continue our research and development and we put all of that back into our work.

RBH: And even so that \$650 is still a fraction of what it would cost you to go out and buy 3D printers on Amazon or something.

MJ: That's exactly right. It's probably half of what you would pay.

RBH: Right so anyway you go you're learning extremely valuable skills and also helping your projec by participating in these things. Do you have some kinds of workshops later in the year?

MJ: We're also planning - we don't have a date yet - for the aquaponic greenhouse and see ecoholm so we can not only build small or large machines. We can also build entire houses during our extreme build events. So for example last year we had 60 people and we built our seed ecohome in five days. And then we built our aquaponic greehouse in a nother five days so we're able to get the large team working in parallel once again all the different modules of the house with rapid assembly into place. So we can do everything from our smaller machines to houses using our techniques. Tractor workshops, tractor builds, backhoes, you name it we're going to run these kinds of events. Even a tractor could be a single day build.

RBH: You can build a tractor in a single day!

MJ: That's exactly right. So basically we've got a lot of the modules like the power cube, the structural frame, the wheel unit, the loader, the hydraulics, they can all be built in parallel by a large team and that's how we are able to compress that build time and prototyping time from weeks to days and as far as the finished build, it takes us months or even years to develop it but then we can build it in a single day with a team of people.

RBH: Now you've mentioned several times the power cube. You want to describe a little bit what that is?

MJ: The power cube is a universal hydraulic power unit. Currently it has a gasoline engine that runs a hydraulic pump and the power that is given to the machine goes out through hydraulic hoses. It's fluid or oil at high pressure that drives all your motors or cylinders or everything to make a machine move or to power a machine. The useful thing about it is that it is modular. Basically the hoses that come from the unit are plug and play. They're quick disconnect couplers so you can build your power cube. You can put one or two or more of them onto a tractor. Just plug them right in and they power your tractor. So instead of an engine you take out a couple of bolts and there you go. You've got the unit installed in a machine or you can use it standalone like the brick press or to power your heavy duty lathe or mill. It's a completely universal power source. And of course you can run it with electrical motors if you use solar power or you can run it with a gasifier. You just put a gasifier on it and you're running it on charcoal.

RBH: And the whole idea is that you're building up the pressure inside so that the fluid coming out through the hydraulic tubes are at high pressure and they're going to do all this work for you in other devices.

MJ: Yeah, that's exactly right. Basically a half inch line gets you 50 horsepower so that's pretty amazing. It's flexible so it's not dangerous like a shaft typically can get wrapped around and kill you around the shaft whereas these hydraulics are just much more user friendly, modular like legos. So any novice can play with that and make it happen. The nice thing about it is you can also make like even a solar panel with a very small power cube still generates that very high pressure. It might have very little power. In other words the amount of work you can do with it,

but the pressure is still the same. So for example a couple of years ago we took a small electric power cube that we plugged into the wall and we put it on our tractor. It would move very slowly but it still had that 4,000 pounds of drive to work.

So that's the unique thing about hydraulics. If you have a very small power cube you can still get that extreme force but it will move very slowly, which is fine. Say for example you have automatic autonomous weeders or like using a tractor to draw around chicken tractors or pig tractors for growing your chickens or pigs in cages. For example you can drive around the whole field passively just by the sun. That's a cool idea. A single solar panel could let you do that. So you've got your cages. Say it's like ten feet by ten feet or you can have a whole train of them but because you're moving on a field you can have that effectively like grazing over acres of area because you're moving. It's only moving like a thousand feet in a day. That's a very cool concept.

RBH: It really is. That's clever times six. That's really ingenious. Okay, you're obviously doing some work with Joshua Pearce and the MTU folks. Are you in contact with some of the international NGO and things like that?

MJ: Not so much. We really haven't gotten many contacts with NGOs. Maybe it's because all the NGOs are corrupt. They're not part of the solution. I don't know. We just haven't struck any meaningful partnerships. But I would say in a serious way a lot of the NGOs, the way they operate, a lot of it is kind of wrapped up in the current system that we just haven't been able to find meaningful collaborations. I think the cultural barrier for a lot is simply the open source of our work. A lot of people when you tell them we work open source, a lot of people aren't, like even the non-profits, they're not open source typically so we can't collaborate with them.

RBH: I guess the thing I always worry about is that when you come up with really neat ideas the giant corporations are going to come along and figure out some way to patent it and kind of lock you out so to speak. Do you ever have concerns about that sort of thing?

MJ: Not really because there are so many ways to innovate that you can really sidestep and make different things. Also a lot of things that work perfectly well the patents have already expired.

RBH: Long ago I expect.

MJ: Just like the 3D printing patent which expired I believe in 2004 or something like that recently. And then the whole 3D printing industry came to totally dominate the market.

RBH: It kind of exploded, didn't it?

MJ: A great story, just like the steam engine when Watt's patent ran out innovation on the steam engine doubled its efficiency in a way that's shown as a historical study. You can see how the patents were simply suppressing innovation. So that's just historical fact. But for us we're not typically concerned because there's a lot of different ways to innovate and it just hasn't gotten in our way yet.

RBH: A little later on if you want to talk about the issue of currency and money and things like that but while we're on machines and open source, anything else you want to say about that?

MJ: The main point being that, and this is a challenge to anybody out there. If you're a non-profit or profit or whoever you are, if you're going to tell me that you're going to change the

world and you're not open source I think you're kidding yourself. So that's a huge put down for a lot of people but look, if you're really interested in the whole world benefiting and becoming better why not share your information openly so that you unleash innovation. That's just how we believe. I also believe that without that notion becoming mainstream in the whole world we will always get into the scarcity mindset and the deprivation where one person has and another doesn't. The inequalities and poor distribution of wealth will always keep happening unless we take an open source approach which says that hey we've got something good that's worth sharing with the whole world if you assume that the whole world is connected because you cannot have one person prosper while another person is dying of bombs being dropped on them or starvation. It's just incompatible and we just have to recognize that as a species we're all connected so we're not free until everybody else is free.

We address that issue head on. That's a core platform. We pursue what's known as distributive enterprise, meaning that whatever enterprise we develop we publish not only the technology but the blueprints for the enterprise level. That means all the financial documents, business planning strategies, marketing, all that so that anyone who wants to can replicate that. Our business model relies around training people to replicate. We want to get ourselves out of business because we want to spread that wealth like Jeffersonian democracy.

RBH: Very good. And interestingly enough you use slightly different words but on The Next Chapter and Radio Alexandria we talk constantly about species consciousness. If we don't start thinking of ourselves as a species and acting like an intelligent species we're going to wind up destroying ourselves.

MJ: Yeah. Clearly. (end of interview-part 1)

Marcin Jakubowski, a leader in the open source revolution, speaking to me from his farm in Missouri. His website is [opensourceecology.org](http://opensourceecology.org). I'll have part two of my interview with Marcin next week.

Let's take a break & when we come back I'll have some additional thoughts on a future world where most everything is made locally. I'm Roland B. Hunt & you're listening to The Next Chapter, a production of the North American Service of Radio Alexandria.

### **PSA: Listener feedback**

Feedback is important here at Radio Alexandria so I hope you will take the time to email or write & share your ideas. Did you find yourself agreeing in part & disagreeing in part? Did we make you cheer or did you want to throw something at the radio? The whole point of Radio Alexandria & The Next Chapter is to get people to thinking. Send us an email & tell us your opinions. Please be concise & to the point. We can't respond personally to every email but with your permission we may include some of your comments & ideas in future broadcasts. You'll only be identified by first name & the name of the state, or province, or region you're writing from.

Radio Alexandria is named after the greatest library in the ancient world, one that was founded several hundred years before the common era. That center of learning was burned to the ground by religious zealots in the fifth century AD so almost all of its books were lost to posterity. Radio Alexandria's mission is to make sure that doesn't happen again. The goal is to spread ideas far & wide across the globe to the remotest village & mountain top, ideas about government, society, & the future of our species on this planet.

As a radio station we can't physically spread the great books of today but we can share the

ideas contained within them. Our goal is not to tell listeners what to think but how to think, how to use logic & evidence to make rational decisions about the future drawing upon lessons learned from the past.

We live in a busy world so if you tuned in late or have to leave early you can always listen to today's program as a podcast. Just go to [radioalexandria.net](http://radioalexandria.net) & click on programs. Transcripts of all the programs in The Next Chapter series are also available on the website. Once again the web address is [radioalexandria.net](http://radioalexandria.net). If you have comments or questions our email address is [radioalexandria@yahoo.com](mailto:radioalexandria@yahoo.com). That's [radioalexandria@yahoo.com](http://radioalexandria@yahoo.com).

One more reminder. Radio Alexandria is in the demonstration phase right now. We're distributing our programming domestically on FM & internationally on shortwave radio while we evaluate the feasibility of buying & equipping a radio ship & deploying it to the central Pacific.

If you know something about shortwave you've probably already figured out why we would choose such a location. It has to do with the physics of shortwave broadcasting. Unlike conventional AM or FM radio, a shortwave signal can travel thousands of miles by bouncing off a layer of charged particles in the atmosphere called the ionosphere.

The signal may bounce between the earth (or sea) & the ionosphere several times before reaching an audience 5,000 or even 10,000 miles away. Sea water to a shortwave signal is like a polished glass mirror compared to a very dirty windshield. It's a thousand times more reflective than ordinary earth. If you want to put a powerful radio signal into Pacific Rim countries like China & Russia using medium sized shortwave transmitters there is no better location than the central Pacific.

The reason for putting Radio Alexandria on a ship is safety. Pacific islands may bring to mind swaying palm trees & white sandy beaches but the reality is the Pacific can be a dangerous place, what with volcanoes, typhoons, earthquakes, & tsunamis. The place to ride those out is not at anchor in a harbor. A small ship like a converted trawler or lightship can put to sea on short notice & has the endurance to withstand severe punishment on the open ocean.

The programs you hear now are typical of what you will hear if we decide to go ahead with the next phase but first we need to know if there will be enough listeners to justify such a large project. If you have some ideas or suggestions for foundations or other organizations which might fund a project like Radio Alexandria please feel free to share them with us. Also we're accepting donations from listeners so if you would like to support our efforts to build a more enlightened world just go to [radioalexandria.net](http://radioalexandria.net), click on 'programs', & then the 'donate' button.

Right now our greatest out of pocket expense is paying for airtime. If we had additional funding we could buy more airtime to beam Radio Alexandria into Europe & Russia. The longer term plan is to offer The Next Chapter not only in English but in other languages as well. The goal is not to get involved in the domestic politics of countries. They have to solve their own problems. What we at Radio Alexandria are trying to do is look at issues all modern governments are confronting & see if there might be some common solutions.

Transparency is such an issue. It's one of the best ways to combat political corruption & boost popular confidence in democratic government. There's a major anti-corruption campaign going on in China right now because the current administration understands that they're not going to be able to keep the Mandate of Heaven unless they govern responsibly.

The USA & other western democracies are also suffering from a major lack of public confidence in their political institutions. The presidential election here in the US as well as

elections in Europe show deep dissatisfaction with elites & the kind of leadership they have provided in recent decades.

Humanity is entering a period of profound change, driven by technological forces we have never before encountered as a species. Radio Alexandria's mission is to explore solutions that will benefit all in society, both individually & collectively.

In the coming months we may try some crowd funding to begin raising the money to implement these plans. In the meantime all of you as listeners can do your part by spreading the word. Tell your friends about our website, transcripts, & podcasts. Also the podcasts are available free for rebroadcast on non-commercial stations in the US. If you'd like to see The Next Chapter more widely available in your community tell your local community or public station about us.

If you see something you think your friends would find interesting, copy it off the website & share it with others. Maybe you see something you disagree with. That's fine too. Radio Alexandria is not the source of all truth. We're all about looking *for* the truth, wherever it may be & whether or not it's politically correct.

By the way free Radio Alexandria buttons are now available so if you'd like you just send us your mailing address & we'll get you off to it. You can see a sample on our website radioalexandria dot net. Just click on 'resources'. The buttons are an experiment so supplies are limited. Our email address once again is radioshipalexandria at yahoo dot com.

If you find value in what we are trying to do & would like to help financially just go to radioalexandria dot net, click on programs & then the 'donate' button. Any financial assistance you choose to make will be gratefully appreciated. Radio Alexandria is radio for the future. (end promo)

Before the break we looked at two very different systems of production with profoundly different implications for the future. In the case of a potential collapse of the Chinese economy we're seeing how the world works today & how such a collapse could threaten both the world economy & - we have to be brutally realistic here - world political stability. It's the domino effect written in bold letters with underlining.

An economic collapse in China would threaten its political system & we know from history that political systems, especially authoritarian ones, do not go down without a fight. & it's not limited to China. Create mountains of debt around the world & sooner or later very bad things will happen. This is what happened in 1929 & the Great Depression & there's absolutely no reason to believe it won't happen again, only this time it'll happen in an age of weapons of mass destruction.

The Next Chapter is about the future. We focus on science, technology & public policy & not economics but science & technology have made possible the highly interconnected & therefore fragile world we have today. You might not think what happens in China has much relevance for your life and if this were thirty years ago before the Chinese economic miracle, you might be right. But this is NOT 30 years ago. I can assure you that in this present world we live in, it does. China is the second largest economy in the world and our largest trading partner when it comes to manufactured goods. American companies large and small are utterly dependent on spare parts from China to continue functioning. Most everything you buy in the store these days comes from guess where.

Now add to that many billions of dollars of investment by private Chinese citizens in American real estate, real estate that in a financial crash they will want to quickly sell to generate cash to cover their debts back home. And then there's the grossly inflated price of agricultural

land in this country, driven to the stratosphere by speculators trying to cash in on Chinese consumer demand for American grain and livestock. In a financial crash that demand will evaporate in a heartbeat and with it the value of farmland in Iowa, Kansas and Nebraska and a lot of other places as well. The speculators will rush to dump those land holdings and you can see how what started in China will quickly spread around the world.

A moment ago I spoke of two very different production systems with profoundly different implications for the future. The other system is all or almost all open source. Most everything a modern society needs can be made and consumed locally. Speculation in farmland or much of anything else becomes largely irrelevant. Such a world would be far less interdependent and therefore fragile. It would be far less vulnerable to severe upsets that can trigger political upheaval & lead to wars.

Building such a world is what Marcin Jakubowski is up to and we'll find out more about how he plans to go about it when I have part two of my interview with him next week. Whether or not we can make such a transition without a total collapse of the present system is an open question. There are a lot of powerful interests who want to cling to the world we know, even with all its inherent dangers.

Regardless of which way the future takes us I believe that if we're ever to have any hope of surviving as an intelligent species we have to start acting like one. A shared vision of species consciousness is the key, a vision that must transcend our identity as members of a race, or ethnic group, or nationality. It's not that those are not important or that we should give them up. But in an age that understands the immensity of the universe & our small place in it, the time has come to adopt a new & more sweeping vision of human existence.

If we can spread the idea that we are members of one intelligent species among many in the universe, working toward a common goal of greater enlightenment...if we can spread that idea to the remotest village, to the most isolated hamlet on our planet, then no matter what catastrophe might befall us in the coming years, those who survive will have a common vision of humankind, a shared ideal of who we are & where we want to go in this adventure we call life.

This is our planet & we are its stewards. Everyone has a part to play in the drama that is human existence. & that's what Radio Alexandria is all about. You, our listeners, are the wild cards. History could one day turn on your knowledge & insight. Until next time think deeply & act wisely. The future is in our hands Team Humanity. Let us embrace it! (music up until end) (announcer:) You've been listening to The Next Chapter with your host Roland B. Hunt. A transcript of this broadcast is available at our website radioalexandria dot net. Tune in again next week at this time for a new exploration into alternative futures on The Next Chapter, coming to you from Radio Alexandria.

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Definitions of commonly used terms on The Next Chapter:

The Hunt Paradox, sometime called the Strangelove Paradox, was inspired by the famous 1964 motion picture *Dr. Strangelove or How I Learned to Stop Worrying & Love the Bomb*. The more advanced an intelligent species becomes the more likely it is to destroy itself.

The Hunt Paradigm is a conjectural premise that states there are quite a few carbon based intelligent species in the universe. After reaching a certain level in their evolution they all go through

a similar process of development until the point they encounter the Hunt-Strangelove Paradox. Some find a solution to the paradox & advance to a still higher level. Others do not & destroy themselves.

Note: It is not necessary that the conjecture be true. It is merely a useful mental construct for integrating ideas about evolution with ideas about the rise & fall of civilizations.