

Pecha Kucha Script, Swedish Embassy Presentation

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The theme of the evening was Cities Beyond 2020, and most of the other talks were on solar power or energy-efficiency programs.

NOTE: A Pecha Kucha is a presentation of 20 slides, each up for 20 seconds. It is intended to be fast-paced and usually amusing. Here is the script to accompany the 20 slides of my presentation.

1. Hi, I'm Tom Ligon. I'm here for SIGMA, a volunteer think tank of science fiction authors. I write mostly for Analog, the oldest US Science Fiction Magazine. I've had some of my short fiction translated into Russian and published there. I do deal with the Russians, but I only sell them lies.

2. Just so you know I walk the walk, here's our future retirement home, a design with Swedish roots, built of cellulose-lignin composite. It is heated with solar, and I supplement the heat with biofuels. I'm thinking fueling the truck with biofuels, too. So I'm into solar and alternative energy sources. I know how much trouble and expense are involved, but know these technologies can work.

3. But when I left home for a couple of years to work on a fusion project, I learned my wife was not too crazy about living "off the grid." She wanted to hook up to the power company. Her dad's comment was, "You're going to like it." So that's how I know what people really want. And it is not experimental homes made of rusty metal and with a tight energy budget.

4. My old boss was R. W. Bussard. He was all for saving the world, but what really rocked his boat was the prospect for spaceflight. He wanted to retire to a place he had

picked out on Mars “A little south of Syrtis Major.” He has been famous in science fiction since about 1960 when he proposed the “Bussard Ramjet.” His fusion research company is Energy/Matter Conversion Corporation, or EMC2.

5. I’m a fusion promoter, and am frequently blamed for the Amateur Fusion Movement. This all started when I published an article in Analog back around 1998, and the next thing you know, people were building their own little hot nuclear fusion reactors. These have become popular high school science projects.

6. The idea for my first fusion article was from Dr. Bussard. Doc wanted to start a generation of young scientists and engineers on the fusion path, but he wanted them to understand that “hot” fusion does not necessarily mean raw heat. The smart way to do it is using high voltage to get the ions going fast. So here’s a list of some of the kids who have built working fusion reactors **while still in high school**.

7. I’ll just pop this slide up for a few seconds. This is a smart crowd and I know you all find this intuitively obvious. What I think is really neat is, the kids who are building fusors in high school can follow this stuff. Keep these equations in mind because they pop up in the next slide.

8. The holy grail of fusion is a fuel system called proton boron 11. It is the most aneutronic fuel system. No radioactive waste. The waste product is helium. It opens the possibility of turning fusion energy directly into electricity, so it is incredibly efficient. It is also widely considered impossible to do, but you, of course, can see a potential bremsstrahlung radiation mediation strategy in the bottom equation.

9. Dr. Bussard’s fusion brainchild is machine called the Polywell. It is basically a spherical electrodynamic particle accelerator, and it works on particle velocity rather than raw heat. This approach is radically different from the big government tokomak and laser fusion programs. It has a lot of buzz going.

10. Several other small programs are also going after p-B11 fusion. One of my think tank buddies has worked on Tri-Alpha and thinks they are close to building a big

demonstration machine. Focus Fusion, which surprisingly enough is not a Ford project, is making some noise too. Both of these are novel approaches.

11. So, what would p-B11 fusion from any of these outfits mean for you? Yeah, unlimited cheap power. Planes, trains, automobiles, all that. Hopefully it would stop all the bitching about global warming. No need to fight wars for fuel. Make lots of fresh water. No competition for food sources. Recycle all the junk. But then what?

12. What if the Large Hadron Collider does not swallow the Earth into a black hole, but instead discovers The God Particle, the Higgs Boson, the basis for all physical laws? What if we could use fantastic physics discoveries that take a lot of energy to do things we can't even imagine today? What people want is a world without limits, not one where they have to limit their options with a meager power budget.

13. But I'm a Golden Age SF kinda guy, and like Dr. Bussard, I want to see us go into space. I'm eager to see Polywells powering a fleet of spacecraft designs he dreamed up. A compact, lightweight, and powerful source of electrical power improves rocket performance dramatically. Space becomes affordable. The Solar system is ours!

14 This is a slide comparing two existing electric propulsion systems, neither of which has the power of a Piper Cub. We need way more power. NASA's VASMIR concept is promising, but it needs a power source. Plugged into Polywell, it would work. But at the bottom is a real rocket. Each main engine produces 6 gigawatts, about what Dr. Bussard though a Polywell might produce.

15. This is one of Dr. Bussard's ships, an air-breather that could get into orbit. That price per kg says it could get a person into space for less than a Concord ticket used to cost. It is roughly based on the scramjet idea, which until recently had not been capable of running for more than a second or two. But that changed early this year

16. ... when the X-51 scramjet was successfully tested for a 200 second burn. I think they have since flown for a full 300 seconds. It is starting to look like these things might

be able to hold up well enough for going to orbit, which would probably take a burn of around 900 seconds or more.

17. Doc liked fast cars and fast rockets. Better rockets make space transportation dramatically more affordable. Here are the bottom line numbers for some of his other ship designs, and remember, Bussard literally “wrote the book” on nuclear rocket propulsion, way back in the 1950’s. Check his figures if you like.

18. These could be the locations for the new cities beyond 2020. We actually could afford to set up major colonies, each of these examples for the cost of a few 1970’s Moon missions, but establishing hundreds or thousands of people with huge amounts of stuff instead of fleeting two-person camping trips.

19. But then what? I suppose the next step is to head out to the stars. We may find a way to get Dr. Bussard’s interstellar ramjet running. We could send out colony ships, spread across the Galaxy, and become the nightmares in somebody else’s science fiction. But first we have to find a way to get *to* 2020.

20. I wrote an editorial on the subject for SIGMA proposing to use Haiti as a laboratory. Try out all our ideas head to head, competing in a real market. Some would fail, but if any nation could benefit even from the poor performers, Haiti could. The payoff for us is knowing which of the ideas really work. Haiti could show us the way to that future beyond 2020. And I can guarantee new forms of folk art!