

Creative Agency and the Space Race of the 21st Century: Towards a Museum of Natural Futures

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ABSTRACT: Reimagining and redesigning our relationship to natural systems to improve human and environmental health, increase biodiversity, build soil, and improve air and water quality is the Space Race of the 21st Century; i.e. the most complex systems design challenge we face, and one that current and emerging interactive technologies provide the opportunity to address. This assertion is intended to reframe the discourse of contemporary environmentalism in terms of creative agency that transcend market and regulatory incentives and disambiguates from “sustainability” which in research universities internationally seem to have been institutionalized as non-academic*.

The second, but most novel and critical assertion, is that we can design infrastructure, and specifically the built environment, data, energy, food, waste and distribution systems to IMPROVE human and environmental health, rather than lessening negative effects in efforts to reduce energy use, food miles, waste, emissions, greenhouse gasses or more conventional maintenance and labor costs. For instance, (1) the ELEVATORxPITCH project upgrades the sky-line-defining vertical transportation to create both cultural venue that produces views, and transforms this electric vehicle infrastructure into a building’s power plant. Simultaneously the combination of sensor-actuated venting and fire-code upgrade can create cross-season passive air circulation that removes the need for heating, ventilating, and air conditioning (HVAC) systems (typically approx. 40% of the energy use in cities is building related and most of this: HVACs).

Or, (2) the example of the Pier2Pier from the Cuban Mussel Crisis Collaboratory (for open source Leapfrog Technology), is an integrated system for a pier structure that exploits buoyancy and tension, vs. mass and rigidity, a paradigm shift in coastal engineering that is approx. >10x stronger and >1000x more cost effective /meter² sans the catastrophic failure modes of conventional piers and boardwalks that become battering rods in extreme climate events (for instance, Brisbane’s Riverwalk or Far Rockaway’ Boardwalks). This new pier also creates infrastructure for mussels – the only aquaculture system that improves water

quality – and furthermore the mussel cultivation ropes incorporate “bioscillators” for wave energy conversion¹. The main surface structure of inflated ETFE (ethylene tetrafluoroethylene) “artificial clouds” facilitates full solar throughput to drive photosynthesis and couples the cascading biogeochemical processes (unlike the dark ‘wet-deserts’ under conventional over-water structure), in addition to passive desalination / distillation within the structure.

The TREExCLOUD data infrastructure is a third example in which cloud data storage service offered by the TREExOFFICE co-working space (owned, operated and in the canopy of a tree / landlord) is powered by a pyrolytic waste-2-energy system, which is indexed to the Leaf Area Index (LAI) – a significant determinant of human (and environmental) health and therefore a potent metric to couple into the expanding demand for data storage. To increase storage capacity we increase the LAI achieved through strategies including increased canopy complexity; integrating vegetation into vertical urban surfaces; micro-ecosystem based afforestation (not monocultures). TREExCLOUD energy is generated from the lingo-cellulosic waste and food waste (the two largest of urban waste streams) that has the co-benefit of producing Biochar and anaerobic digest, which in combination not only sequesters carbon when worked into the soil (for ~>5000yrs) but in urban environments, can immobilize heavy metals with potential to reduce / prevent the body burden of neurotoxicants including lead (Pb) and mercury (Hg).

Thirdly, I assert that the way to redesign our urban infrastructure (UIs) is through Mutualistic Systems design (MUSTs) and Natural Systems Engineering – into which I put an “i” (as a call to independent action) for the NiSE!(est) acronym. I have developed these terms to describe generalizability from many distinct “public experiments” in mutualistic systems coupling to improve human and environmental health. These experiments have occurred primarily in non-STEM cultural spaces – art museums, galleries, university exhibitions / college campuses and public spaces where creative agency is privileged (over critical technical evaluation); and use participatory research, convivial learning and interactive systems to raise standards of evidence in the design of social and environmental transformation and invite diverse participants and non-traditional people (and other intelligent creatures) into radical systems and infrastructure innovation and development. Moreover, I assert that our collective response-ability to this C21st Space Race, to COP21, to the UN’s Sustainable

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Development Goals (SDGs), and socio-ecological justice will be measured by human and environmental health**; but rather the agency each one of us has to act in our own – and our children's – interests; with the knowledge that whatever we can do to improve our own food systems, air quality or environmental health, the benefits are shared by anyone with who we share that environment / health. While the medical model individualizes health, the math of mutualism and benefit-benefit analysis aggregates collectives. This reflects the exponential power we see in natural systems and megabiodiversity. i.e. Malthus was wrong!

Whereas, the outcomes of the COP21 of December 2015 have some ambitious if non-binding quantitative goals, these require translation into imaginative challenges to engage the design community. Lord Kelvin's "to measure is to know" may have informed big-data and the so-called smart city, and guided the Sustainability and similarly the Effective Altruism movements, which implicitly claim that environmental and social transformation can be achieved through accounting and evaluation schemes, such as LEEDS, Energy Star, Life Cycle Analysis, Embodied Energy, and various labels, certification, and regulatory frameworks (such as UN-REDD and REDD+); or by ranking the worthiness of a cause in terms of measures of quality-adjusted life-year (QALY) or career choice in terms of excess wealth for charitable contributions. Of course these approaches conflate political power and purchasing power and have no accounting for the disruptive innovation possible with and through the Creative Agency of young people in particular.

Design professionals have articulated zero waste, emission, impact or similar as the highest bar of collective design. Tesla cars', for instance, default plates state "zero emissions," and Masdar City claims zero waste, zero carbon. If artists or other professionals, for instance, doctors, aspired to "zero-impact" they would struggle for credibility.

Finally, several of my students (in their early 20s) plan to present Plan B mutualistic urban system UNEA2 in Nairobi for each of their home cities including: Barcelona, Bogota, Beijing, Boulder, Berlin, and on my behalf for Brisbane (my own lovable floodable city). Each of these systems is transformative, radically inexpensive, and coupled through benefit-benefit (rather than cost-benefit) analysis. These include distributed local and hybrid energy systems (beyond renewables) and most substantially small-scale waste-2-energy. Waste benefits and is neither distributed, polluted nor wasted, to achieve energy transition. Reintegrating vegetation into the urban environment (through floriculture and canopy complexity) to increase Leaf Area Index (LAI), support pollinators and create significant human health benefits. These and others combine to significantly exceed the COP21 goals, but also to transform them into direct, local, wondrous and convivial benefits.

Kelvin claimed, "if you can not measure it, you can not improve it." And it is this metric, LAI, that is both easily measurable (via satellite and terrestrial LIDAR, and informal qualitative metric) and meaningful as a proxy for human

health and biodiversity. The central question however is not how / if we measure but who feels creative agency, why do they have it; how do you teach, facilitate, learn, exercise and institutionalize creative agency in diverse people? Can we each feel thrilled by or be invited into the grand design challenge to redesign our relationship to natural systems so that the built environment, data, energy, food, waste and distribution systems – our environmental commons – improve human and environmental health? Who holds the design keys to the possible city; the possible energy system, et al.? We have the technological opportunities; the educational and cultural capital, the environmental urgency AND the creative agency to reimagine, redesign and coproduce desirable, delicious and delightful possibilities.

*at NYU, for instance, the Sustainability Task Force is within the Public Relations department and assigns student grants (rarely with or supported by faculty) rather than long term 'sustainable' research questions develop the professional connections through intellectual networks)

** that has little to do with the interests of venture capitalists, political agreements between 200 country; policing regulation; market incentives, and perhaps even less to do with trickle-down technology from x-prizes for billionaires-to-the-moon.

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BIO: Jeremijenko directs the Environmental Health Clinic – facilitating public and lifestyle experiments that can aggregate into significant human and environmental health benefits. She is also an Associate Professor in the Visual Art Department, NYU and affiliated with the Computer Science Dept and Environmental Studies program.

Jeremijenko's practice develops the emerging field of socio-ecological systems design (or xDesign) crucial in the Anthropocene, using attractions and ongoing participatory research spectacles that address the C21st challenge to reimagine our collective relationship to natural systems. This integrates diverse strategies to redesign energy, food and transportation systems that can contribute to the common good, increase soil, aquatic and terrestrial biodiversity and improve human and environmental health.

In 2014 VIDA Art and Artificial Life International Awards Pioneer Prize was awarded to Natalie Jeremijenko "for her consistently brilliant portfolio of work over the past two decades" – a prize only awarded once before to Laurie Anderson. She was also granted a Most Innovative People award in 2013, most influential women in technology 2011, one of the inaugural top young innovators by MIT Technology Review, and 40 most influential designers.

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¹ Bioscillator and Wave Energy Conversion, ongoing developments.
Dr. Craig Stevens www.niwa.co.nz