“Generative Justice: Computational Mathematics and Social Self-Organization”
This project began with the discovery of fractals in African material culture.
I first modeling the Logon-Birni Palace with a recursive line replacement algorithm, assuming it was unconscious, bottom-up social dynamics responsible for its shape.

The 1st iteration or "seed" shape:
Grey lines active -- they get replaced by whole shape.
Black lines passive -- they are not replaced.

All three iterations:

Third iteration of the fractal model:
scaling gets smaller towards center.
But interviews revealed that there was conscious knowledge of the scaling characteristics.

The spiral path taken by visitors to the throne.

Photo in 1993 taken from the roof of the palace.

Center motif of the guti, the royal insignia, painted on the palace walls.

Le chemin de la lumière.

The spiral path taken by visitors to the throne.
Fractal model of Ba-ila settlement
Recursive construction techniques

Three iterations gives simulation of Ethiopian cross

Fulani wedding blanket

Simulation for blanket
Geometric analysis of the ivory sculpture
So how can we apply this in the classroom?

Culturally Situated Design Tools: www.csdt.rpi.edu
1. Work with artisans, elders, others to ensure we have a basis for collaboration and “cultural permission” (not just a matter of copyright!)

2. Interview artisans and research cultural background to understand the knowledge system from their point of view (“emic” not “etic”).

3. Translate their practices and concepts into equivalents in CS (weaving algorithms, geometric transforms, power law scaling, anti-aliasing, context free grammars, etc.).

4. Embed these concepts in a “design tool” applet that allows students to simulate the original designs and create their own innovations.
Scratch-like interface for CSDTs

http://community.csdt.rpi.edu/applications/9
CSDTs: indigenous ethnocomputing

Virtual Beadloom
Adinkra Grapher
Precolumbian Pyramids

African Fractals
Anishinaabe Arcs
Navajo Weaver
CSDTs: vernacular ethnocomputing

- Cornrow curves
- Rhythm Wheels
- Skateboarder
- Graffiti Grapher
- Breakdancer
- Afrofuturism
Fractal Simulations of African Design in Pre-College Computing Education


• 10th grade computer science class, two sections.
• About 75% minority, over 50% female.
• Control class has 6 days on fractal instruction websites with java applets.
• Intervention class has 6 days on the African fractals website.

• Post-test shows higher scores in intervention group;
• statistically significant at .001 level
Beaucoup de traditions culturelles sont fondées sur des algorithmes que l'on peut extraire de leur contexte pour les utiliser à des fins pédagogiques auprès des minorités. Ron EGLASH

Note

Periodical states and marching groups in a closed owari

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Abstract

Owari is an old African game that consists of cyclically ordered pits that are filled with pebbles. In a sowing move all the pebbles are taken out of one pit and distributed one by one in subsequent pits. Repeated sowing will give rise to recurrent states of the owari. Bouchet studied such periodical states in an idealised setup, where there are infinitely many pits. We characterise periodical states in owaris with finitely many pits. Our result implies Bouchet’s result.

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Social Justice and Science need a Symmetric Exchange

**Society**
Apply science and technology to problems in social justice and sustainability

**Science**
Use problems in social justice and sustainability to drive science and innovation
Graduate Teaching Fellows in Community Situated Research: The Triple Helix of University, K-12, and Community Knowledge Production
Software entrepreneurship in Ghana

Grad Fellow Bill Babbitt (CS): Simulations of cultural processes

Community artists and elders

Grad Fellow Dan Lyles (STS): cultural capital in low-income communities
STEM abolitionist project

CS grad fellow
Kathryn Bennett
educational software

STS grad fellow
Colin Garvey
History of Evolution

GIS software for mapping local sites for abolitionist history

Game for discovering Darwin’s abolitionist connections
Example: 3 grads collaborate on sensor device

Grad Fellow Chris Shing (ECSE): Nanoparticle-based sensors

GR A Kirk Jalbert (STS): Community Situated Sensing

Grad Fellow Louis Gutierrez (CS): Online data analysis for “Citizen Science.”

Albany NY public schools

Navajo Nation Community College and high schools

Langui, Peru study of indoor air pollution
Professor Shayla Sawyer

1) Nanosensors using inorganic molecules could detect Navajo uranium pollution but not for coal and oil (VOC) pollution.

2) Sawyer paused – “come to think of it, no one has tried this—to use organic molecules in semiconductor photodetection”

3) This created a new research path: nano-bio materials in semiconductor photodetection.

4) Later we brought in a grad Fellow whose faculty advisor Chris Bystroff was in biology; he “tunes” genetic sequences to detect specific biological molecules.
Example: Grad, faculty, community collaborate on HIV awareness

Grad Fellow David Banks (STS): Mobile technologies in civic sphere

Kumasi, Ghana community health professionals

Prof. Audrey Bennett (LL&C): visual communication for HIV prevention

Condom machine sends text when it needs to be refilled. Users can text to find locations.
Grad Fellow David Banks (STS): Mobile technologies in civic sphere

Kumasi, Ghana community health professionals

Prof. Audrey Bennett (LL&C): visual communication for HIV prevention

SANKOFA
"you can always go back to your roots"

"Wait honey, I have to go back for my condom"
Example: Grad, faculty, community collaborate on HIV awareness

Grad Fellow David Banks (STS): Mobile technologies in civic sphere

Kumasi, Ghana community health professionals

Prof. Audrey Bennett (LL&C): visual communication for HIV prevention
Outcomes at year 4

1) Anti-relativist alternatives to social construction


Outcomes at year 4

2) Alternatives to socialism and liberalism

Why assume that we already have our politics settled, and only need to bring science and technology “into compliance”?


Socialist solution: distributive social justice

1) Capitalism extracts self-generated value, creating injustice and alienation

2) Capitalism raises profits by "externalizing" costs, damaging health and environment
Ecological disasters in the USSR

Above: Scarred landscape caused by overgrazing in USSR

Below: Lush grazing land under indigenous Mongolian community control
Liberalism is also based on **distributive social justice**

1) Socialism attempts to return that surplus value by state ownership
2) Liberalism attempts to return that surplus value by taxes
Confusion over social justice in the case of Open Source Software

Kevin Kelly is wrong: Open source software does not fit the category of “socialism”

Yet it is relevant to “social justice” – how do we resolve this contradiction?
Open Source is a case of generative social justice
Generative justice reconfigures the flow of value: from labor back to labor

Previously the software developers labor value can be privatized (extracted)
But Open Source ensures that value is available to its source of generation via the public commons
Generative justice reconfigures the flow of value: from nature back to nature

Previously nature’s value can be privatized (extracted). But Critical Growing (Lyles) ensures it is available to its via the natureculture commons.
Why should small scale waste recycling be better than large scale industrial waste systems?

Because the small-scale case offers greater opportunity for Generative justice.
Generative social justice
Increasing the public capacity for self-generating practices and resources

**Social entrepreneurship:** capital at the service of social justice

**Generative public spaces:** Community gardens, murals

**Generative technologies:** DIY, Maker-faire, Arduino, fan fiction, citizen journalism

**Generative educative practices:** Recovering heritage, history, futures
Come to the Generative Justice Conference!

Generative Justice: Value from the Bottom-up

A conference at RPI, June 27-29 2014

Social problems are often addressed through the top-down forms of “distributive justice”: intervention from government agencies and regulations for example. But science and technology innovations have opened new possibilities for “generative justice”: bottom-up networks that strive for a more equitable and sustainable world through communitarian value generation. Some examples of generative justice involve lay innovation: maker spaces, DIY movements, and “appropriated” technologies. Other examples are more focused on nature as a generator of value, such as urban agriculture, food justice, and indigenous harvesting. Some focus on the framework of Open Source, putting code, blueprints and manufacturing processes into the public domain. Generative justice can apply to social entrepreneurship, restorative justice, community media, social solidarity economies, and many other structures that allow those who generate value to directly participate in its benefits, create their own conditions of production, and nurture sustainable paths for its circulation.

We invite presentation and panel proposals on the theory and practice of generative justice. What theories of ethics, law, epistemology and politics can help to define this concept and improve its utility? What research methods are best used to explore it, and in what analytic frameworks can it be deployed? Are the relations between distributive and generative justice best viewed as opposite ends of a continuum? As mutually supportive symbiosis? How might generative justice experiences and outcomes differ across identities such as race, gender, class, and sexual orientation; across geographic and national differences; across ideological and institutional spectrums? How can we distinguish generative justice from bottom-up forms of exploitation, oppression, or unsustainable ecologies? What kinds of technologies and scientific programs might foster more generative justice, and conversely, how might generative justice contribute to better STEM education, research, and infrastructure? (For more see the Generative Justice wiki)

Please complete the form below to submit a proposal. Proposals will be considered through April 30, 2014.