

# HACKERSPACES AND DIYBIO IN ASIA: CONNECTING SCIENCE AND COMMUNITY WITH OPEN DATA, KITS AND PROTOCOLS

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Hackerspaces and DIYbio in Asia: connecting science and community with open data, kits and  
protocols

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## 1. INTRODUCTION

While the figure of the “hacker” marked the end of the 20th century fascination with entrepreneurial individuals (Steve Jobs, Bill Gates), technological revolutions (PC, WWW), and anarchism (Cyberpunk SF), the early 21st century “hackerspaces” mark a change in the way we perceive the role of the individual and the society vis-à-vis emergent technologies. Hacking is no longer a “magical” skill possessed by a lonely genius, who dares to challenge the system, described well by Sterling (1994) as part of the bored “romantic teenage punk kids” from the suburbia and epitomized by the young cyberhero, David Lightman, from the 1983 movie “War Games”, and real life renegades, such as Kevin Mitnick. Instead, hacking has become a form of collective experimentation occurring under social, legal and economic constraints, resulting in the formation of tentative collectives of co-working freelancers, who share space and resources in pragmatic rather than utopian or ideal model of a community (hackerspaces, HUBs). The hackers today prefer to be “Anonymous” and collective force, tricksters and jokers rather than typical revolutionaries, with an agenda intentionally left open for case by case and ad hoc responses to collectively defined problems.

This new paradigm of hacking as formation of creative communities with alternative lifestyles rooted in emergent technologies and innovation is best embodied by the Open Source and Free Software movements but also in the new business models based on crowdsourcing and Creative Commons licenses. Recent discussion on the political and social consequences of this ethos of collective rather than individual hacking cuts across a broad landscape, from open source programming to community mobilization around open access to open source experiments with distributed collective innovation (Kelty, 2004, 2006). To best understand how these new models of software and hardware development merge with social experiments, along with contemporary critiques of innovation based on restrictive patent systems, it is invaluable to draw upon ethnographic concepts and those from the field of Science, Technology, and Society studies (STS). A good starting point is Kelty’s call for using traditional ethnographic concepts for describing these hacking subcultures and “pay attention to arcane technical and legal issues and see them as no more or less arcane, and indeed no more or less cultural than those of the Kwakiutl, the Yanomami, or the Trobrianders. Anthropologists’ interest might be piqued, for instance, by the widespread talk of “gift economies” amongst computer geeks or the extensive debates about private ownership, public domains, and collectively managed commons, or the somewhat contorted versions of the classical anthropological concepts of land tenure, collaborative stewardship, political representation, formal and informal norm systems, resistance and domination, partially digested economic and evolutionary theories, and a great deal of talk of culture itself.” (Kelty, 2004 p. 499 – 500)

We are simply starting to witness various efforts to “‘vernacularize’ the high-tech, expensive practices conducted in the lab” (Lounsbury, Kelty et al., 2009 p.55) and to transform the social organization of innovation into a more hybrid and holistic model of techno-science development “that is marked by hybridized arrangements and bidirectional flows between university and industry” (Lounsbury, Kelty et al., 2009 p.52). With the hackerspace movement we are starting to witness not only “hybridized and bidirectional” but even multidirectional flows of both technology transfer and adoption involving variety of social, economic and political contexts and organizations. This global network of hackerspaces embodies these multidirectional transfers and adoptions of innovation, which can lead to “alternative possibilities for the governance of techno-scientific development” (Lounsbury, Kelty et al., 2009). The Hackerspace.org movement is defined by a simple wiki page with a directory of over 500 physical places around the world, which started to appear around the year 2006. The wiki-directory is not only a nostalgic reminder of how information was organized across the internet in the early days but also a medium through which the various groups around the world share and announce regular (Call-in-s, Synchronous Hackathons, Tuesday meet-ups etc.) and irregular events (workshop) and information on projects.

This global and informal network is identified by a set of shared technologies, procedures, and values, which relate to the idea of open source software, hardware and data, rather than to any formal governance structure. The physical location of the space (from industrial buildings to office spaces, private garages or even heritage houses) or the legal status of the organization (non-profit, company, informal gathering) are secondary to the actual processes of governance and innovation, which are rigorously tested and described on the wiki. The wiki describes the various experiments with how to manage co-working spaces for freelancers and geeks involved in various design and technology related projects and challenges (software development, hardware hacking, mobile applications etc.), and serves as a crowdsourced management tool for fostering further development, cooperation and exchanges between hackerspaces around the world. The global network is simply a platform that enables hackers worldwide to share best practices concerning how to manage independent spaces based on open access, open source software and hardware ideals, while working on their individual and collective prototypes. In this sense, the main Hackerspace.org

page and wiki radicalizes both libertarian and communitarian politics in favor of ongoing crowdsourced and open source experiments with community, technology and even personal life. The important issue is not how this wiki enables individuals to conduct their neither projects nor communities to share knowledge and resources and develop a common identity, but how such network creates resilience and how it adapts easily to various individual and collective needs and contexts. The growing global network of this alternative and process oriented, R&D form of governance of innovation is focused on exploring local issues and interests, making the whole hackerspace movement an invaluable unique form of life worthy of careful investigation.

Hackerspaces offer a rich material to understand how communities negotiate emergent technologies, and how to define these novel 21st century forms of public engagement with technologies. The goal of this paper is to grasp the evolving dynamic between community, technology and science around hackerspaces, as well as the interaction between the global and the local context of this emergent technological "International". To get a handle on this evolving dynamic I followed the work of several hackerspaces in Asia and got involved in form of an action research (Heron, 2006) in some of their projects in 2010 and 2011. The present article summarizes the preliminary findings in the context of both anthropology of material culture (Hicks & Beaudry, 2010) and STS discussions on public participation in science and science policy (Brown, 2009). Both of these intensive research streams have opened up the critical issue of how communities interact with and negotiates scientific and technological innovation in an everyday context.

Hackerspaces in Asia offer interesting case studies because of a rich knowledge and crafts tradition that coexists with rapid industrialization, along with post-industrial and super-modern regions fully transformed into service-based economies of special economic zones reducing any specific culture to global flows of data and money. Hackerspaces negotiate these paradoxes between traditional, industrial, post-industrial and hyper-globalized modes of production and knowledge, offering a model for integrating emergent technologies with communities in a situation where all these modes of production co-exist. They support vernacular and technological "folk" knowledge creation and sharing remarkably close to the notion of "indigenous knowledge" because it is "developed by a given community as opposite to knowledge generated through universities, government research centers, and private industry" (Warren in Grenier, 1998 p.101) giving rise to "participatory technology-development techniques" (Grenier, 1998 p.vii), in which various groups and stakeholders can negotiate their interests directly.

While innovation is typically seen as a disruptive and foreign force in a given society that we have to study as an issue of "adoption", in the holistic, pragmatic and integrative view of knowledge production and sharing embodied by Hackerspaces around the world it is simply defined as community building. The models of interaction between community and knowledge are similar to the indigenous and pre-modern forms which react to local needs and contexts supporting "unique, traditional, local knowledge existing within and developed around the specific conditions of women and men indigenous to a particular geographic area" (Grenier, 1998 p.1). With Hackerspaces we are witnessing a "technological folklore" developed by post-industrial (Singapore, Japan) as well as more traditional or industrial communities (Indonesia) around technological solutions and scientific interests, in which vernacular and cosmopolitan blend together.

## 2. HACKERSPACES IN ASIA

The unofficial birth of Hackerspaces in Asia in May 2009 relates to the registration of Hackerspace Tokyo followed shortly by Hackerspaces in Singapore and India, which were all linked to the striving Barcamp (unconference) movement. The Tokyo Hackerspace official page even mentions that link directly: "The Tokyo HackerSpace initiative was created from discussions at TokyoBarCamp 2009. It's a collective made up of programmers, engineers, IT administrators, artists, chefs, musicians, and people interested in geek culture. The goal of the group is to converge technology, arts, crafts, and music..." (Tokyo Hackerspace, 2012). The so called "Unconference" and Barcamp participatory workshop-events started in India and South East Asia (mainly Singapore) in 2007, and normally there is still at least one monthly Barcamp with participation varying from several thousand people (Yangon in 2011) to ones with just 30 participants in different cities in Malaysia and Indonesia (Preetam Ray interview, 2012).

The close connection between Barcamps and Hackerspaces seems almost routine for Asia, but we must of course bear in mind the more common model from the EU and US, where Hackerspaces from Berlin, New York City, San Francisco and other large cities served as anchored models and inspiration for the rest. In an analogous fashion the Hackerspace Singapore inspired the hackers in Bandung, Indonesia, to open their own place in 2011, and they in turn have become a model for the rest of Indonesia. Kripe incisively connects the dots: "Hackerspaces appear to be gaining momentum in Southeast Asia, especially in Indonesia, where within one year four new establishments have arisen: Bandung, Surabaya, Yogyakarta, Medan. One is also in the planning for Jakarta. Interestingly, the HackerSpace in Bandung was created after a group of Bandung geeks, gathering under the name FOWAB,<sup>12</sup> visited the Singaporean HackerSpace and were inspired by the venue, activities and great vibes. It is no surprise that the Bandung HackerSpace has, in turn, inspired other geeks in Indonesia to gather the resources, both human and financial, to establish their own places..." (Kripe, 2011)

To be sure, there were also a formidable number of earlier examples of art and design oriented organizations in the region (new media centers, art laboratories etc.) with a similar agenda, some of which eventually transformed into a Hackerspace (Jaaga in Bangalore in 2009) or at least included a Fablab in their structure (House of Natural Fibre – HONF in Yogyakarta established in 1999 and opening a Fablab in 2011). The hackerspaces are closely connected to the fablab movement, which also started around 2007, with a specific goal of enabling people to share not only space, code, and hardware, but also tools for fabrication and physical production of things, mainly used for rapid prototyping. Fablabs form a network of small scale workshops with a shared set of open source tools that enable digital fabrication and open design. The independent design and geek run organizations, described euphemistically as new media centers in the late 90s, always kept a close connection with similar organizations in Europe, while Hackerspaces have tended to develop closer relations to the USA. Local and regional issues and interests play a far more important role in the EU inspired new media centers like HONF, with its preference for unique projects related to citizen science. The strength of these local contexts, often reinforced by indigenous languages such as Hungarian or French, etc. can and does hinder uptake of the global Hackerspace scene, such as is in Singapore or Tokyo which identify with their 3D printers, Arduino

hacks and robots projects. In Indonesia, a typical HONF project would usually involve the local villagers (for example around the Merapi volcano near Yogyakarta), some local artists, geeks and academics (very often from the Microbiology Lab of the Gadjah Mada University) who together organize workshops around DIY (Do It Yourself) solutions to local problems. These can range from the vital issue of the infertile land around the volcano to dangerous moonshine to internal migration pitfalls, etc., or even to just simple scientific curiosity about the Cosmos. In the process, a scientific solution offered by the academic elites and scientists from the region may be transformed into a sound and visual performance — but also useful data and DIYbio protocols for local villagers who sometimes invest money in the research.

While the HONF projects often work within the local rural context, and successfully integrate various communities around science issues and technological challenges, Singapore is predominantly active in entrepreneurial initiatives. The Hackerspace in Singapore supports and fosters the development of entrepreneurial culture around mobile apps and web services. As a side project, some members are tinkering with molecular gastronomy and design related food projects, in some tacit ways reinforcing the local reputation of a culinary superpower. However, in the last year the most important project in Asia convincingly proved the ability of Hackerspaces to react to local challenges and potentially influence policy by mobilizing citizens. The “humanitarian open source hardware” (Baichtal, 2011) initiative in Tokyo after the earthquake and tsunami on March 11 supported ordinary lay people in their building of DIY Geiger counters for participatory monitoring of radiation and various low tech solutions.

From hyper-modern Singapore and the post-apocalyptic Tokyo to the booming but still developing Yogyakarta we can notice the same enthusiasm for DIY and maker activities, low tech solutions and citizen science experiments. Should we label these citizen science activities as popularization and dissemination of professional knowledge or as a special case of applied science? How should we evaluate the emphasis on startups and the entrepreneurial ethos behind some of these projects, and its search for commercialization of various technologies similar to the goals of any start up incubator? How are we to connect these mundane, technical and entrepreneurial goals with the ongoing art and design activities? Are we witnessing a tension between the US and EU models of independently run, co-working spaces for geeks, designers and entrepreneurs?

It is exactly this tension that makes such experiments in social and technological innovation so dynamic. Hackerspaces around the world seem to have a prolific ability to integrate various personal and group interests and goals, creating a certain balance between technological tinkering, creative pursuits and social interaction and experimenting. Beyond being fascinating material for talking about policy issues tied to emergent technologies, there are also philosophical issues concerning materialist ontologies and pragmatist insistence on bringing tools and social structures together. In this sense, these novel institutions revive certain indigenous (but also pre-modern) practices of knowledge creation that are primarily deeply integrated with the life-world of the community, and only secondarily with the metaphysical and scientific search for truth or other ontological goals. We will start with this core thesis on the close connection between prototype testing and community building, and continue with several examples of such spaces of convergence in Asia. These specific cases will jointly illustrate a particular type of vernacular cosmopolitan technocultures typical of Hackerspaces as sites, in which the “local, parochial, rooted, culturally specific and demotic may co-exist with the translocal, transnational, transcendent, elitist, enlightened, universalist and modernist – whether boundary-crossing demotic migrations may be compared to the globe trotting travel, sophisticated cultural knowledge and moral world-view of deracinated intellectuals” (Werbner, 2006 p.496) and where the prototypes of the future co-evolve with equally strong social structures given by our past and tradition.

### 3. THE GENEALOGY OF HACKERSPACES: FROM ACADEMY OF PLEASURE TO COSMOPOLITICAL LABORATORIES

There is broad diversity in the forms of organizations that have appeared in the recent years around emergent technologies, DIY subculture and novel economic models of innovation and entrepreneurship resemble. Examples of “R&D labs” that are part of some existing cultural and art centers are HONF in Indonesia, Ars Electronica in Linz, ZKM in Karlsruhe, FACT in Liverpool, Laboral in Gijón, or the alternative, Hackerspace, HUB, MAKE fair and DIYbio labs. What these among many others all have in common is that they resemble some earlier ideals of scientific research institutions such as the Academy of Sciences and various learned societies of the 17th (Kera, 2010). These experimental social institutions have revived the bottom-up relation between community building and experimenting with new knowledge and technologies. Design of new products and tools becomes a community building effort, creating new networks between multiple actors and stakeholders. Monitoring, sharing and making sense of various “objective” and “scientific” data and protocols or creating DIY kits, they actively explore and perform the relations between various types of agencies spanning a vast spectrum of scales (molecules, traditions, new hardware tools, social institutions etc.). In this sense, Hackerspaces embody what Bruno Latour and Isabelle Strenger (Latour, 2004) label “cosmopolitics”, new networks and alliances between various human and non-human actors that extend the notion of political and social participation. Policy in such contexts is neither a matter of finding the right ideal of progress or sustainability nor about dividing the “powers” for the sake of justice. Au contraire, it is an experimental and tentative process of bringing everything together — with an ambition to allow everyone and everything to become an active part in both the research and the decision making.

These novel forms of community organized and financed science and technology labs revive an original idea of science, technology and public interactions envisioned by G. W. Leibniz in his famous “Odd Thought Concerning a New Sort of Exhibition (or rather, an Academy of Sciences ; September, 1675)” (Kera, 2010). In this original vision of the academy of sciences the advancement of sciences and technology ceases to revolve around the metaphysical or philosophical issue of truth and the limits of human mind, or an issue related to the nature of reality. Leibniz defines science and technology by their ability to generate new ecologies of interests and influences, new institutions, networks and relations between different actors. Science, technology, business, art, entertainment, tourism are all part of this effort to raise human curiosity and our wonder and to transform society. This version of Leibniz’s academy is becoming a reality today in the global Hackerspace movement and its various initiatives that use design prototypes as well as art to experiment with various connections. The famous quote from 1675 that introduced Leibniz’s manifesto on how science should be organized (“I had almost forgotten that we might establish an Academy of games or more generally, Academy of pleasures”) summarizes well the variety of functions and creativity involved in today’s

Hackerspace, Maker and DIY approaches to science and technology (Kera, 2010).

The various functions of these spaces — that start with the presentation of research and collective investment in innovation and often culminate in daring creative experiments with new and strange ideas — in effect syncing research and development with social experiments. These alternative research and development places perform, foster and accelerate the ability of science and technology to serve different purposes, connecting various actors in new networks and ecologies; all together form a new paradigm for policy defined as cosmopolitics (Latour, 2004). The very democratic form of these institutions, in supporting and thereby legitimating bottom-up projects, defines these spaces as true “cosmopolitical” laboratories, in which we can examine and evaluate various versions of how we want to live in the future with new technologies. The direct experience of developing certain technologies to foster relations in a community inside and outside the Hackerspace offers a model for policy and decision making different from the traditional division of powers between people doing the research and people representing the interests of the citizens.

When we compare the three case studies from Indonesia, Singapore, and Japan it is possible to detect that the way in which society and science are integrated in varying degrees in these projects is based on the local context. While the DIYbio and molecular gastronomy activities in 2010 and 2011 in Singapore seem almost a parody of political activism turned into dieting rebellion, the Indonesian projects on safe DIY protocols for brewing alcohol are provocative, clearly a radical response to a local issues related to high taxes on alcohol introduced in 2009. The projects in Singapore have been successful in creating new networks between elites outside the common technocratic discourse of the city state, which is driven by fear and constant reference to “survival”. The aim of the local Hackerspace is to create a “kiasu-free” zone driven by different more positive and experimental goals, and becoming more open to risk: “The first slogan, “The Zouk of Geekdom”, refers to the popular nightlife venue, and considers the HackerSpace as the place to celebrate ‘geekdom’ with likeminded people. The second slogan, “*Kiasu* free zone”, indicates the geeks’ desire to establish distance from certain parts of the cultural environment they find overly ambitious, greedy and selfish (*kiasu*).” (Kripe, 2011)

The HONF projects in Yogyakarta are more interdisciplinary, having their base in a booming cultural and art scene in a city quickly becoming the creative hub of the entire South East Asia region with many international networks. These projects also empower local communities by offering simple and efficient means to resolve problems affecting particular groups, such as Merapi villagers and their depleted land, traffic accident victims needing of cheap prosthesis and those poisoned by bad moonshine, etc. The Tokyo Hackerspace initiatives due to the 2011 devastating earthquake, tsunami and nuclear disaster go even further in this direction, mobilizing citizens to collect independent data on radiation and to build tools as a response to the deeply traumatic situation. Together with other citizen initiatives in Japan, they helped transform the politics related to the future energy needs of Japan into a type of geopolitical experiment, with switching off nuclear power plants and pushing production to China

## 4. HACKERSPACE SINGAPORE: DIETING PARODY OF ACTIVISM AND QUANTIFIED SELF-POLICY

Singapore Hackerspace.sg is based in a beautiful old shophouse in an older Malay neighborhood of Kampong Glam, a city whose rich and complex history parallels the paradoxes involved in the local Hackerspace movement. Kampong Glam together and the nearby Bugis district are were traditionally occupied by Malay and Arab merchants and Bugis tribal people coming from the south of the Sulawesi Island from Indonesia. The latter were famous seafaring nomads of the region with a history of naval exploration dating to the 12th century, often being stigmatized as pirates and Sea gypsies: “They were extraordinary shipbuilders, sailors, merchants, slave runners, warriors and adventurers. The Bugis were once the most feared pirates of the Java Sea, their ships armed with bronze bow rammers shaped like dragons’ gullets. In the 14th century, the Bugis were a formidable naval power, they established the kingdom in South Sulawesi known as the kingdom of Makassar which dominated Borneo, Sumatra and even maintained colonies as far away as Singapore.” (Choy Lee, 1999 p.320-321).

During the early colonial era this area was designated for the Sultan, and the Malay and Arab merchant communities dominated the place. Nowadays, Kampong Glam still retains its strong ties to the ethnic-Malay community and remains a key hub for Singapore Muslims. Kampong Glam is also one of the centers night life in Singapore where young people gather to smoke shisha on the streets and visit the local bars. While it remains difficult to find a place serving alcohol because most Middle Eastern restaurants have a strict halal policy, Kampong Glam remains one of the most popular and loved neighborhood of Singapore. Its ability to integrate and accommodate the most traditional and bohemian cultures creates a unique blend and authentic experience. Even the businesses that operate in the area bring a similar strange mixture of very innovative IT and design oriented companies and fashion boutiques with very traditional, textile and carpet shops.

Tourists, local expats and Singaporeans start their evening out in this area by dining at one of the Turkish or Egyptian restaurants, followed by a drink at an air-conditioned shophouse on the edges of Kampong Glam. The Blue Jazz café attracts many, and hosts Hackerspace events, notably “blinkBL-NK” nights, a more public version of Hackerspace “Lightning talks” mixed with a TED format of a 20 min presentation, usually followed by a 10 min discussion introducing creative projects from a variety of fields (art, business, science). “BlinkBL-NK is an event where regular people share their expertise about fascinating subjects in a laid back environment. Part brain food and part social event, blinkBL-NK is about sharing intriguing and off-beat ideas while mingling with an unexpected cross section of artists, academics, designers, entrepreneurs, geeks, hackers and media practitioners.” (BlinkBL-NK, 2010)

The paradoxes represented by Kampong Glam’s mixture of religion and hedonism, tradition and innovation, are also mirrored in the local Hackerspace negotiations between business, design and art. The majority of activities and projects in Singapore relate to entrepreneurship, no doubt an expression of the cultural roots of a truly legendary port city and its main focus on business and commerce. Nevertheless, the “BlinkBL-NK” nights, which started in February 2010 just three month after Hackerspace was established, as well as the first regional DIYbio meeting organized in July 2010 defined as a gathering of artists, philosophers and scientists “doing strange things in their bathrooms and kitchens”, document a shared need to bring together the creative and business communities. The first DIYbio meeting in Singapore (July 2010) presented projects loosely connected to the idea of DIYbio, such as hacking rice cookers into so called *sous-vide* cooking baths (DIY molecular gastronomy with Meng Weng Wong from Hackerspace.sg), or shooting parody fly porn with hacked webcams as microscopes supporting the research of a local evolutionary biologist (DIY bioporn with Denisa Kera, National University of Singapore, Yuchen Ang,

National University of Singapore, and Isabel Löfgren, Lasalle College of Arts). The event also included an interactive debate with Brian Rappert from the UK (University of Exeter), an expert in the field of biosecurity policy, on the threats of bioterrorism. This brought together Hackerspace IT geeks with Biopolis scientists who are part of a large government project, a science city in southern Singapore devoted to biotechnology.

The first DIYbio meeting was soon transformed into series of “Biotech Start-up Nights” in the Hackerspace (October 2010, January 2011) that brought together local and international biotech entrepreneurs. Overnight the artistic edge dissipated and was soon entirely forgotten. However, the initial focus on molecular gastronomy and food continued, gradually giving rise to a network of underground food events and restaurants gathered around the project “Secret Cooks Club” <http://www.secretcooks.org>, which steered controversy in July 2011 and January 2012 due to one dinner organized in May 2011 by a member of the Hackerspace and the Secret Cooks Club, Florian Cornu, who used a traditional Japanese format of a sushi dinner served on a naked woman’s body (*Nyotaimori*). Part of Singapore society is critical of the government’s efforts to attract so called “foreign talents” into the country and has used this event to provoke nativism and skepticism about what types of foreigners Singapore recruit and support. Inasmuch as the controversy around the Secret Cooks Club’s dinners and members is ongoing and relates more to the changing political situation in Singapore than to the Hackerspace movement, we will discuss it elsewhere.

The Singaporean DIYbio interest in molecular gastronomy, food and health is interesting from a different perspective. The fashion trend surrounding *sous vide* cooking enabled a strange form of science activism, which is particular to a very wealthy society with its unique political culture mixing extreme liberalism and communitarism. Business and culture, government and community projects often go hand in hand in Singapore, and the local Hackerspace reflects these paradoxes. For example, one of the most serious public engagement activities of the Singaporean Hackerspace became a rather geeky campaign against the government health program promoting a balanced diet. The local geeks rejected the government “command” asking citizens to eat more veggies and grains, deploying technocratic and “scientific” advocacy for the so called “paleo diet” promoting meat consumption and molecular gastronomy techniques of “sous vide cooking”.

The dieting anti-campaign was organized by one of the founders of the local Hackerspace and a proponent of a paleo-diet, Meng Weng Wong. The war against “carbohydrates” and other residues of “agricultural” conspiracy happening in the last few thousands of years is rooted in the belief that our genes are optimized for meat consumption, common in older original hunter-gatherer societies in which we developed as humans. Meng Weng Wong is fighting the government balanced diet campaigns by organizing large *sous-vide* dinners and parties where he teaches how meats should be cooked in *sous-vide* baths. He typically stresses the time-honored fundamentals by displaying visually mathematical formulas and sources on how many hours and days different kinds meat must be properly cooked. He uses his blog (Wong, 2012) to promote paleo-diet by giving detailed descriptions of his cooking experiments and techniques related to *sous vide* baths. Paleo-diet paradoxically combines ideas on caveman’s diet with very modern *sous-vide* technology and cooking practices, embodying Kampong Glam’s unique blend of traditional and bohemian cultures.

In April 2011 the Hackerspace together with the Secret Cooks club initiated the first ever personalized dinner based on the DNA profiles generated by the consumer genomics service 23andme (<http://www.23andme.com>). These unique forms of techno-activism related to food support an extreme libertarian views on responsibility about your body and its genetic makeup. It offers a model, which we will call a quantified self-policy alluding to the quantified-self-movement obsession with monitoring and sharing stats and data on our bodies, DNA, dieting habits, etc. To be a good and responsible citizen means to become a biopolitical subject that takes seriously information on DNA data, nutrition etc., changing habitual practices of eating and cooking for the better by using science and technology as guide and mentor. It is no surprise that the Quantified-self movement became very popular in 2012.

The global DIYbio movement enabling citizens to take an active part in biological and medical research was mainly inspired by synthetic bio and iGem competitions, gaining vital momentum worldwide in 2008 with the emergence of the “Quantified self” movement. In Singapore the QS movement became very active in February 2012 after a few attempts in the Hackerspace to organize workshops on citizen, participatory sensing DIY tools for CO2 and radiation. The interest in low-cost protocols and DIY lab devices based on open hardware and shareable kits developed by enthusiasts defines various Hackerspace communities around the world like “Biocurious” in Mountain View, the DIYbio projects connected to “Noisebridge” Hackerspace in San Francisco, and DIYbio in NYC connected to one of the oldest Hackerspaces in the world “Resistor”, etc. While the interest in such open source portable tools is more typical and fully developed in Tokyo Hackerspace, the DIYbio activities remain more visible in Yogyakarta, and Singapore is becoming one of the main QS centers in the region with bi-weekly meetings with more and more participants.

## 5. INDONESIAN FERMENTATION-HACKING: BACTERIA WANT TO BE FREE

In South East Asia, the whole DIYbio movement remains closely connected to the workshops and projects organized by HONF and their Education Focus Program (EFP) in Yogyakarta (rather than Singapore). The DIYbio activities are an important focus not only because of the rich food culture, but also because of the rural context. The “House of Natural Fiber” (HONF) in Yogyakarta organized a series of DIYbio workshops in 2009 and 2010, led by artists (*Marc Dusseiller*, Shiho Fukuhara, Georg Tremmel) in cooperation with the Microbiology Lab of the Agriculture faculty in the Gadjah Mada University (UGM). The central focus of discussion were the fermentation techniques commonly employed and the key role of bacteria and yeast in our environment. They used hacked webcams and even Sony’s PS3 Eye turned into digital microscope as haemocytometers and bacteria counters, and explored several other alternative functions for micro-organism detection. The same tools were simultaneously used as a source of data for the audio-visual performances, simple DIY protocols responding to urgent social needs, as well as a protest medium against government policies. For their project “Intelligent Bacteria – *Saccharomyces cerevisiae*” (2010 – 2011), which embodies this citizen science and holistic strategy, they were awarded a prestigious Transmediale 2011 prize for media arts in Berlin. The original use of simple scientific protocols as forms of a peaceful protest against high government taxes on alcohol, and as a source of data for VJing and art installations, created a synesthetic experience around fruit wine. Artists, scientists and local villagers worked together under this project and defined a simple kit for alcohol brewing of Indonesian fruit (jackfruit, pineapple, and salakto). These cheap and safe procedures for brewing wine (Hujatnikajennong, 2009) were a form of a protest against the newly imposed exploitative tax laws tripling the already high price of wine and beer, pushing the local people into often lethal experiments with distilling and brewing their

brews. .

This project created not only interesting performances and installations shown in galleries around the world, but also a solution to a plague of unsafe unsterilized alcohol production leading to dangerous methanol poisoning. In today's 24/7 news cycle such cases were often mentioned but quickly forgotten by local media. However, due to a April, 2010 regulation from the Ministry of Finance increasing the duty on alcohol, local traditional alcohol drinks containing very dangerous methanol substances became popular at the markets. Artists from HONF together with the researchers from the Microbiology department of UGM university in Yogyakarta conducted a series of workshops to define proper and safe fermentation processes, and create a kit for the general public. They basically democratized a science protocol for making home wine, while at the same time were essentially supporting an old tradition of fermentation that by far is more a part of the indigenous cultures in Indonesia than the official religion. Through a publically available kits and instructional video, the artists and the scientists involved in the project basically connected traditional knowledge about fermenting with modern, Arduino based, open source gadget technologies that make the production of alcohol not only safe but also, and this is critical, visible and open to tips and tricks which keep it so. The acoustic installation based on the fermentation process was a response to the high rates of poisonings and deaths due to alcohol consumption in Indonesia. What makes the project outstanding is how DIYbio and open source approach to science connected contemporary art strategies with local and traditional knowledge and culture, but also to otherwise seemingly remote and arcane science. This created a special science communication project based on an appreciation of the local and the traditional knowledge and culture related to alcohol now supported and reinforced by modern technologies and methods.

The DIYbio in Yogyakarta has a strong interests in flowers and plants, similar to the other emergent initiatives in the Southeast Asia region such as the Biomodd project in the Philippines connecting plants and computers in elaborate ecologies. Nevertheless, there is telling difference. While in the Philippines the plants are used for building future sustainable server farms (Biomodd), in Indonesia fruit and plants are used basically as a political medium for resolving social issues and questioning the global biotech networks. Following Japan, the flowers are even used for supporting the Creative Commons License in the first ever biopiracy flower protest, the "Common Flowers: Flowers Commons" project. The project started in Japan and Germany and was only promoted in Indonesia with a workshop, but provides a fascinating case study of a grassroots biopiracy response by developing nations to a GM patent. The Japanese and the Indonesian biopirates essentially reversed the "jailed" and genetically modified and patented blue carnation gene, and then released the reverse-engineered flowers back into nature. Since these plants are officially considered benign, it is not illegal to release them into the environment. The Japanese company that owns the patent decided to avoid public reactions against GM and then outsourced their "production" to South America. The blue Moondust carnation was developed by a Japanese beer-brewing company, Suntory, as the first commercially available genetically engineered flower. Although the company was granted permission to grow them in Japan, they simply outsourced production to Columbia, from where they ship their "fresh-cut flowers" worldwide.

In the "Common Flowers" project the artist collective (BCL) reversed the plant growing process, cloning new plants from the purchased fresh-cut flowers using Plant Tissue Culture methods. Using DIY biotech methods involving everyday kitchen utensils and materials available at any supermarket and drugstore, in undisclosed locations and moments they "freed" the GM carnations back into nature to support the idea of creative commons and even bio-sharing: "By freeing ('jail-breaking') the flower from its destiny as a cut-flower and establishing a feral and more 'natural' population of blue carnations, the flower will be given a chance to reconnect to the general gene-pool and to join again the evolution through natural selection. Common Flowers hopes to touch is the question of patents on plants and on lifeforms in general. In particular what form of legal protection for their plants was granted and does the act of simply growing plants constitutes a violation of Suntory's copyright. Is this reverse Bio-piracy?" (Fukuhara & Tremmel, 2010).

This more socially and critically involved hacking is typical for the Asia DIYbio scene (except Singapore) due to its close ties with the EU based initiatives. An excellent verbal definition of this vision and style of DIYbio hacking was given in an interview with the BCL collective that created the "Common Flowers": "Hacking has to be effortlessly elegant. A small gesture with a big outcome. With Bio-hacking in particular we mean the attempt to regain the power about our shared biological destiny. We need to get involved, we need to understand, we need to learn. Not only we as artists, but we as a society." (Gfader, 2010) The strategy of "small gestures with a big outcome" uses a non-technological jargon to explain the basic low-tech and high-impact strategy of the DIYbio movement. In the Indonesian context they display their competence and commitment by using scientific protocols as a form of political protest and social empowerment, and not merely a medium for technological progress and scientific advancement.

HONF as a new media art laboratory — running since 1999 — implements such simple, community and open source based technologies to improve the daily lives of the local people that are dependent on agriculture. Also in the Philippines, DIYbio activities that are just starting around the SABAW Media Art Kitchen and their "BedroomLab" workshops and meetings are trying to target agricultural "hacks" in the form of urban farming, bio-fuels and solutions dealing with ecological issues. The interest in plants and digital technologies underlying all these bottom-up local projects is becoming something of a distinctive sign of the Asian Hackerspace scene. Even the very successful Biomodd (LBA2) project in the Philippines that began in 2009 as an art initiative by a Belgian artist Angelo Vermeulen uses the idea of bringing plants and computers together for a socially and ecologically sustainable future. We see how rapidly how an art idea was transformed into a serious, community driven inquiry into issues of symbiosis of biology and electronics as sustainability solution. Through a partnership with the University of the Philippines Open University (UPOU), a whole range of local cultural partners and more than 100 Filipino artists, scientists, engineers, gamers, craftsmen, volunteers and students, the project attained a critical mass that turned it into an international success story supported by the famous TED foundations. Over the course of eight brief months an installation was created that literally fused a living ecosystem of plants with a modified computer network. The monumental sculpture is composed of a system of recycled computers intertwined with an aquaponics system that serves as a cooling device for the computers used for various games etc. The synergy between technology and biology brings together computers, algae and plants along with diverse people that took part in this open source, educational and art project. This involvement of the public in serious ecological debates about the sustainable future is an exemplary case of Hackerspaces-in-action.

All of these real-life and real-time examples of experimental forms of research, investment and even artistic creativity show clearly how the

“low-tech but high-impact” logic of Hackerspaces operates in various contexts and how it can connect science, culture and society in ways, which we could not even have imagined before. The artistic and scientific solutions and protocols impact and involve groups of citizens and stakeholders in the process of the research, creation and production, but as well in emergent critical and almost always edifying discourse driven by the hacker’s motto that not only code but also bacteria and plants want to be free.

## 6. JAPAN: FETISH DIY HARDWARE AS MEANS OF POLICY

The last case study in our thumbnail survey will focus on Tokyo Hackerspace, and emphasize how a vast range of citizen involvement in science, technology, and policy are subtly related to alternative R&D spaces. Their Safecats project initiated shortly after the Fukushima meltdown and ghostownification of an entire region. The goal was to create “open source humanitarian hardware” for participatory sensing of radiation, shows clearly the limits and possibilities of connecting community, science and technology. The open source DIY tools were both a design response to the challenges of gathering independent data and understanding the spread and effects of radiation, but also political gadgets of social action and even personal fetish objects for dealing with uncertainty and trauma. The DIY and open hardware aspects of building low tech tools added to the personal, social, and public sensing activities an aspect of healing and catharsis related to the extraordinary challenges of this collective trauma, but also to a situation of extreme uncertainty. It is now frankly acknowledged that participatory monitoring over DIY Geiger counters and similar low tech solutions generated rather than tamed the uncertainties surrounding radiation, because they showed how difficult and maybe impossible it is to get accurate data about the unfolding situation and decide on the right course of action. In this sense, participatory monitoring is not only about crowdsourcing data, but as well involves dispersing individual and collective anxiety, hopes and fears. It is in the wild, which Fukushima has been in spades, a therapeutic mobile device rather than policy mechanism, a form of post-apocalyptic ritual of everyday and every night catharsis and healing, with occasional elements of protest and reflection.

DIY open hardware tools for radiation monitoring in Japan are more like technological fetishes and power objects, with ability to connect anxiety and hope, symbolic and real power over the circumstances, scientific (objective) data with primal human emotions. These radiation monitoring devices support a very distributed and multi-faceted response to the catastrophe, in the early days with utopian calls for a return to nature and in the end staging carnivalesque attitudes embracing an almost post-humanist and ironic relation to radiation (“Tokyo Radiation Levels” project by Steven Danieleto or “Tokyo Kids& Radiation community” on Facebook). The DIY tools, such as iGeigie, a functional assemblage of iPhone with Geiger counter, retain a deeply symbolic function related to the idea of “nuclear society” (uncannyterrain.org) and issues with survival on a human scale. Another Safecast apparatus involves binding together a Global Positioning System receiver with a Geiger counter, managed through a Arduino controller mounted to the outside of an automobile with a data card (memory stick or SD card) uploading data in real time. Within the DIY context, this is a contemporary version of the nuclear shelter, prototyped and calibrated not in the ‘closed,’ sealed zero risk environment of the bunker stocked with canned foods, but in the open, managing fear and uncertainty through abstraction, knowledge, mobility and portability (Whittington & Kera, 2011).

The Uncannyterrain.org documentary film project shows how Safecast data are used for exploration of food contamination and organic farming. Strikingly, an ethic of openness extends even to contamination, at least in some cases, what one baker refers to in terms of “coexistence.” As the filmmakers write (Koziarski, 2011): “Ohashi may need to look outside Fukushima now for organic suppliers for his bread. He says we need to learn to coexist with radiation. Suzuki and Fukumoto are leaving the idyllic farming community of Kaidomari to live in balance with nature elsewhere. Hongo won’t sell his potentially contaminated rice this year, but he’s eating it himself. Yoshizawa wants to save his 300 irradiated dairy cows from a death sentence.” All of these decisions imply a commitment not to nuclear technologies but to living in the light of their consequences within a vision of nature that combines coexistence and compassion with the patently not-natural and pervasive radiation. In this sense, DIY monitoring tools are not media for assessing our situation and creating a public pressure on some policy makers or even protesting against the circumstances.

These tools do not serve only rational goals and needs, but are also means of that carnivalesque, ironic and semi-magical interaction which Brenda Laurel calls “designed animism”; this theatricality reminds us data are never passive representations, but triggers for action: ‘Sensors that gather information about wind, or solar flares, or neutrino showers, or bird migrations, or tides, or processes inside a living being, or dynamics of an ecosystem are means by which designers can invite nature into collaboration, and the invisible patterns they capture can be brought into the realm of the senses in myriad new ways.’ (Laurel, 2009 p.262) These DIY fetishes are tools of negotiation with non-human forces in ways which are not only scientific (calibration) or political (protest), but as well deeply personal and even for some people manifestly spiritual (therapy, reflection, irony).

The anthropological fascination with fetish objects struggled with a primal problem of many epistemologies, namely the association of symbolic and material realms. Some of these traditional practices and associations, expressed in ritual and myth, appear as powerful spiritual technologies operating through elemental materials bound together in figurative form (Mauss, 2001; Pietz, 1991). Currencies such as cowry and glass, technologically powerful objects for binding, piercing and reflecting, powerful figures forged or carved as rulers under public gaze or in secrecy, are all examples of such fetishes similar to DIY open source hardware. They also use powerful technological objects and transform them into alternative, low tech and imaginative uses that open new possibilities of interaction. These DIY tools embody the critical design attitude behind “what if...?” approaches, functioning to awaken users to possibilities of various futures. They incorporate even “design noir” attitudes (Dunne & Raby, 2001) that insist our tools are often the expression of our unconsciousness, being symbolically powerful instruments with which we actively explore the aberrations, transgressions and obsessions in our society and nature. Carnavalesque and therapeutic design behind the Hackerspace projects in Japan is an affirmative celebration of the “Unpredictable potential of human beings to establish new situations despite the constraints on everyday life imposed through electronic objects”. (Dunne & Raby, 2001 p.7)

DIY Geiger counters and similar participatory devices are typical “noir” and fetish tools. Pace Dunne and Raby, they are media “that fuse complex narratives with everyday life... a fusion of psychological and external ‘realities’” in which “the user would become a protagonist and

coproducer of narrative experience rather than a passive consumer of a product's meaning.... objects that generate 'existential moments' – a dilemma, for instance -which they would stage or dramatise." We need, however, to resist Dunne and Raby's judgmental definition of these tools as basically wicked and means of self-reflection: "These objects would not help people to adapt to existing social, cultural and political values. Instead, they force a decision onto the user, revealing how limited choices are usually hard-wired into products for us. On another level, we could simply enjoy the wickedness of the values embedded in these products and services. Their very existence is enough to create pleasure." (Dune & Raby, 2001 p.46) To be sure, the carnivalesque and therapeutic dimensions of a ritualized practice of moving through contaminated spaces, as an active technological reflection on environmental uncertainty, raises a range of performative and experiential practices associated with these tools. But what is overlooked here is that the participatory DIY monitoring of radiation with open source hardware tools becomes a form of modern technological ritual, bringing together a community facing a dangerous and uncertain situation and trying to cope with it as best they can. In the case of Japan it has also triggered a natural geopolitical experiment of lowering the energy demands of the whole country and pushing production and industry to China in order to shut down the nuclear facilities.

## 7. CONCLUSION

The Asian Hackerspaces that have emerged in recent years demonstrate a fruitful synergy between technology development and community building closely resemble various forms of indigenous and even pre-modern forms of knowledge creation and practice (technocratic rituals in Singapore, fetish DIY Geiger counters in Japan, and protest science protocols in Indonesia). The alternative R&D underground is not simply a matter of rebellion or utopian wish-fulfillment, but rather offers various practical models of how science and technology can be integrated with everyday education, entrepreneurship and culture. The Hackerspace culture gained a momentum in the recent Fukushima disaster, proving its ability to mobilize and serve the needs of the public by building low tech solutions used for participatory monitoring of radiation. These tools in Japan enabled citizens to deal directly with the disaster by measuring, sharing and interpreting data, and to better cope with the crisis situation on a psychological and social level. In a similar manner in Yogyakarta the organization of artist and designers (HONF) support local village communities by linking them with academic institutions to provide creative and open source solutions for local problems. In Singapore the hacker community supports the building of cheap *sous-vide* cookers and molecular gastronomy tools for slow cooking of meats at a low temperature, reorienting people away from modern stirfry and fastfood. This is considered a return to an older, even paleolithic, healthy diet our forefathers thrived on and thereby built-up what we now call civilization. These concise examples helped us elaborate our main thesis that the Hackerspaces integrate community building with prototype testing in a way that appears to work well and is growing. The attentive reader of our survey must decide if they provide a more resilient model for society facing emerging technologies and various profound environmental and social challenges, often inspired by some form of indigenous knowledge and traditional (if not paleolithic) culture.

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## PROJECTS AND WEBSITES MENTIONED

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 Biocurious Kickstarter page <http://www.kickstarter.com/projects/1040581998/>  
 Biomodd (LBA2) Philippines project <http://www.biomodd.net/lba2>  
 BioWeatherMap <http://www.bioweathermap.org>  
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