**Technology in Society: an International Journal**

**Special issue on: “Biotechnology, Controversy, and Policy: Challenges of the Bioeconomy in Latin America”**

Guest editors: Pierre Delvenne (FNRS / Université de Liège, Belgium) and Kim Hendrickx (Université de Liège, Belgium).

**The multifaceted struggle for power in the bioeconomy: introduction to the special issue**

**By Pierre Delvenne and Kim Hendrickx**

Within and beyond the “charmed circle” of the Organization for Economic Cooperation and Development (OECD) countries [1], there are continuous attempts to meet a range of environmental, economic and social challenges of the 21st century. Promises and expectations with regards to technological solutions to these problems play a major role in shaping political-economic policies, institutional practices and wider societal transformations. Changes are promoted through competing master narratives [2, 3], such as the “knowledge-based economy”, conflating technological advance with societal progress. In this respect, one clear example (central to this special issue) is biotechnology, and its enlarged international regime of intellectual property rights [4]. In this case, various programmatic policy documents play a role in framing challenges to world economies and societies with regards to food safety, healthcare, and water and energy supply. Such policy documents are often produced by the European Commission, discussing a “knowledge-based bioeconomy” [5] or the OECD, designing a “policy agenda for bioeconomy” [6]. Relying on the potential economic and environmental benefits of biotechnology, these policy documents create a strategic interest in commercial outcomes, which leads to the development of a global “bioeconomy”, where a substantial share of economic output is dependent on the development and use of biological materials [6].

Exploring the bioeconomy is one objective of this special issue. It requires looking both at opportunities, such as the achievement of a sustainable and inclusive growth, and a wide range of challenges such as building broad societal support to avoid “locking-in inferior technological solutions” [6], p. 6]. However, most studies tend to limit themselves to on-going developments in OECD countries. Today’s multi-polar world strategically requires avoiding this narrow perspective by opening the focus beyond the classical occidental “Triad” (US, EU, Japan). Actual developments indicate that India, China, Argentina and Brazil are key players within the global bioeconomy. This is why the other main objective of this special issue is to particularly focus on some of the key players in Latin American countries, which are already main actors in the agro-food sector, as well as relevant and rising powers in the biomass/bioenergy or health care/biomedicine sectors.

In Latin America, biotechnology has been surrounded by controversy even when the terms of the controversies have differed from those taking place in European countries. Transgenic plants, in particular, but also, more recently, transgenic insects (see Reis-Castro and Hendrickx, this issue), have been extremely contentious in scientific, public or policy realms. While this is a global phenomenon, there have been significant regional differences and local enactments of the bioeconomy master narrative in Latin American contexts. Asking the question: “how has biotechnology interacted with distinct national and subnational contexts in Latin America?”, this special issue explores how genetically modified organisms (especially GM crops and insects) become the subject of different framings and controversy across the sub-continent. It also investigates why Latin American countries and Northern countries build on different emerging narratives even though they share a strategic interest in the bioeconomy. Broaching this question enables policy-makers to develop a more fine-grained approach that accounts for the dynamic and reconfigured relationships between the “global North” and the “global South”.

This special issue explores cases from Latin American countries, studied in comparison to global trends in the arenas of public participation, scientific knowledge production, regulation and governance. The authors demonstrate the complexity of these cases, both in terms of regional differences and the different spaces of public, policy, and scientific knowledge production into which such innovations are inserted. The articles are based on rich empirical data collected in Argentina, Brazil, Chile and Paraguay. Authors show that the top-down circulation of policy narratives on biotechnology is challenged, complemented and even partly undermined by local bottom-up dynamics. Conversely, articles also focus on those grassroots dynamics and the ways they are influenced and conditioned by macro-sociological and political economic factors. Lastly, a great deal of attention is paid to the ways states and national actors actively contribute to their own insertion in globalized markets where bioengineered living resources are increasingly tasked with solving the most pressing economic and social issues. We believe that this collection of works challenges scholars, intellectuals, policy-makers and relevant stakeholders to open up their views of biotechnology as a dynamic construct that interacts with local situations in a variety of ways. From a more distanced perspective, the aggregated findings of the contributors to this special issue suggest that the important tasks for scholarly work on bioeconomy today become (1) to observe and critically assess the de-localization and re-localization of the concept of bioeconomy in Latin America where biological resources have become increasingly strategic over the last decades; (2) to analyze the bioeconomy as a site of struggles among countries and/or social groups who articulate strategic visions as part of narrating activities. Recent publications on the notion of bioeconomy (e.g. [4]) assert that it was “motivated by the need of maintaining OECD countries’ competitiveness in relation to emerging economies”. So, clearly, bioeconomy is part of a narrative originating from core countries and there is something important at stake for others actors involved and concerned by it. This touches on an incipient question: how do other actors, e.g. from peripheral countries and emerging economies, shape this narrative in return?

To grasp the full texture of these struggles, a more Foucaldian conception of power as a relation is necessary, one which does not treat power as intrinsically bad or oppressive but ontologically necessary to human interactions. Under this conception, “the exercise of power consists in guiding the possibility of conduct and putting in order the possible outcome. To govern, in this sense, is to structure the possible field of action of others” [7], p. 790]. Citton [8] translates this definition in narrative terms and he considers that any relation of power can be boiled down to a capacity to ‘scenarize’ someone’s action. Citton calls this asymmetrical but reciprocal form of power ‘power of scenarization’. This turns narratives into mediating instances constitutive of politics and power relations. Cognitive approaches to public policy had already stressed the circular relationship between meaning and power [9]. But as Claisse [10] reminds us, Citton’s ‘power of scenarization’ goes one step further with the claim that power functions as a narrative, reduced to the same elementary components. This deep homology between narrative and power means that narratives are not only objects of knowledge, cognitive instruments or strategic resources, but are located at the heart of power and of its distribution (see also [11]). The outcome of situated science and technology struggles is open-ended, because no actor can anticipate the exact results of their action. However, the “scope of possibilities” to make meaning through narrative — thus to exert power — differs much among the actors, and strategic articulations occur as an important part of narration activities [12], p. 33]. The recent enactments of bioeconomy narratives recast power relations between OECD and Latin American countries. Thus they also recast dependency relations if power is taken in Foucaldian terms as stated above. Amid this site of struggle for power, involved political and social groups often explain their work in scientific terms in order to produce counter-evidence and, by doing so, they turn science and regulation into the grammar of power over biotechnology developments.

**Contributions to this Special Issue**

The first paper immediately opens the debate with a troubling issue: the intensive use of herbicides due to the spread of glyphosate-tolerant soy crops in Argentina. **Florencia** **Arancibia**'s study starts from the smallest possible scale in our Issue: a number of individuals in Ituzaingó, a village in the immediate vicinity of large areas fields of soy cultivation. GM technology becomes tangible through the phenomenology of worried individuals, immediately exposed to soy fields, planted with bioengineered glyphosate-resistant crops, and the airplanes that spray them with herbicides. What worries these people is that the increased spraying activities seem to go on a par with increasing morbidity rates in the village. The paper develops a rich account of how a local observation is turned into a public health issue. Firstly, it becomes clear that an enormous amount of work and allies are required to push the problem into the public arena, with uninterrupted effort during 10 years. A movement emerges named after the first village mothers that started to worry about their children’s health and future: the *Madres de Ituzaingó.* The study shows that ethical, social or environmental claims are not enough to convince the authorities that there is indeed a problem. This brings us to the paper’s second contribution to our Issue. As the title suggests, we have an interesting case study on the dynamics of collective action in challenging the bioeconomy. Throughout the years, the *Madres*, helped by local scientists and by human rights lawyers, developed their science-claims in terms of a popular epidemiology. The language of statistics is required to gradually gain credibility and support from within academic and public institutions. Challenging biotechnology requires the *Madres* enlarge the repertoire of contestation, such as demonstrations and road blockages, to the production of counter-evidence.

The first paper identifies the language and actions through which bioeconomy can be challenged and the second paper continues to question the language and epistemology related to the bioeconomy. **Manuel Tironi, Maite Salazar and Daniel Valenzuela** look at how Chile’s most important farmers’ organizations picture GMOs as objects and how the economic market of GMO crops should be regulated. From the first pages, the study challenges the stereotype of the radical activist Latin American farmers ­— an unwarranted generalization of the Brazilian *Movimento Sem Terra*. Applying Jasanoff’s concept of civic epistemology to subnational public, he demonstrates through rich empirical material that Chilean farmer representatives have conflicting frames and notions about what GMOs are and how they should by managed. Tironi et al. show that GMOs are framed as an economic, political and scientific object respectively, and that each framing is underpinned by a different epistemology that either contests or fosters bioeconomy and neoliberalism. This leads the authors to consider that civic epistemologies can be described as hybrid, rather than in terms of a national ‘style’.

**Patrick van Zwanenberg and Valeria Arza** take us to Argentina again, and move us from the previous article, questioning how farmers *frame* GMOs, to an analysis of the different faces of GM technology itself. Comparing large and small cotton production farms, the authors observe that GM technology doesn’t ‘work’ and deliver its promises to small farmers. The key to understanding this asymmetry is to consider GM technology as a variable *configuration*, rather than a stable object or a technique that can be applied in the same manner everywhere. Considering a specific technology — in this case GM cotton plants *—* as a *configuration* makes the relationship between technology and its conditions of use and implementation visible. In other words, technological configurations work out very differently in the distinct production systems of small versus large farmers. Even the nature of the GM artifact itself ­— the cottonseed — changes through different contexts. Drawing on the tradition of science and technology studies and in-depth field work, the authors make the strong and important claim that the characteristics of farmer’s production systems, such as access to capital, agricultural machinery and local seed input markets, are not ‘external factors’ to an otherwise stable technology, but an inherent part of a technological configuration as it comes into being in concrete situations. Recognizing the intimate entanglement of the social and the technological has the merit of opening the way for more articulate diagnoses of occurring problems, and the design of policies to support small farmers.

We continue along the STS track, but switch to an entirely different technology with **Luisa Reis-Castro and Kim Hendrickx**. This pioneering case study looks at the release of genetically modified mosquitoes in the environment to fight dengue — a disease transmitted by *Aedes aegypti* mosquitoes. Indeed, transgenic mosquitoes are released to mate with wild mosquitoes and gradually suppress the wild disease-carrying population. The authors ask how this particular approach is framed and legitimized, despite remaining uncertainties about the transgenic mosquitoes’ performance, and the odds of releasing more disease vectors if a proportion of their offspring survives in the wild. Focusing on recent releases in Brazil, the paper shows how specific legitimizing rhetoric downplays technical uncertainties while emphasizing the societal benefits and national prestige of adopting this innovative technology. In addition to using discourse analysis, the authors highlight the ambiguous nature of the transgenic mosquito and the spaces it occupies, such as the laboratory and the environment. The laboratory is at once a production unit, an experimental design transposed to the environment, and a transfer zone of a prestigious technology in a new socio-political context. The paper offers some thought-provoking examples and further questions about the international and political dimensions of technology, public health, and the notion of ‘progress’ in the Brazilian bioeconomy.

**Pablo Pellegrini**’spaper brings in the international dimension of GMOs even more explicitly, by focusing on Argentina’s regulation of GMOs in relation to that of the European Union. The paper explains that both regions have a different approach to the potential risks of GMOs: a precautionary approach in Europe, and a cost-benefit framework in Argentina. After explaining the principles of these regulatory frameworks, and differences between them, Pellegrini argues that the choice for each regulation is intimately related to each player’s economic position and export or import profile on the international market. This allows the author to speculate upon the commercial interests involved in GMO regulation, and to introduce the issue of regulatory power and its implications. With a precautionary approach and high skepticism towards GMOs in the EU, what are the choices for Argentina’s own regulatory designs as an important exporter to Europe? And what can the EU gain from its GMO skepticism?

**Felipe Filomeno** further elaborates on the issue of regulatory power through a challenging systematic and comparative analysis of three neighboring countries: Paraguay, Argentina and Brazil. The author asks how their very different intellectual property (IP) regimes can be explained. Usually, a state’s IP regime is explained in terms of national economic parameters such as income per capita. This approach, however, does not help to explain why Argentina has developed a permissive IP regime, while Brazil and Paraguay have differing restrictive IP regimes. The originality of this paper lies in the fact that IP regimes are explored through variables related to the biotech industry and a state’s capacity to intervene in that industry. In addition, Filomeno’s analysis brings in a rich historical dimension, articulating for each country how its regulatory and research institutions have changed, disappeared or adapted to international neoliberal reforms. These historical and contemporary connections between specific institutions, neoliberalism, and a state’s capacity to intervene in the bio-industry provide interesting material to think about power as structuring other’s field of action through rule-making in the global bioeconomy.

Our final contribution, by **Pierre Delvenne, Federico Vasen and Ana Maria Vara**, is a theoretically provoking paper that relates three conceptsthat are central to this Special Issue: bioeconomy, regulation and neoliberalism. The authors explore the expansion of genetically modified soy in Argentina and they aim to understand how the neoliberal “globalized privatization regime” [13] unfolded in a peripheral location. Their case points at the Argentinean peculiarities of the GM soy complex (compared to neighboring countries like Brazil), with a technological package “free of patents”, embedded in a permissive IP regime as well as in a relatively open, non-monopolistic market dominated by private companies and not limited to multinationals. While they confirm the progression of the neoliberal “capture” of biotechnology in the country, their findings suggest that, combined with the commercialization of science, “peripherality” creates protest, activism and local regulation. They devote particular attention to the participation of two groups of local actors in the regime: the first group is aligned with the globalized privatization regime agendas, while the second is involved in protest and regulatory actions focusing on the health, environmental and safety issues of the GM soy complex. To a different extent, both groups share a local agenda of resistance and an anti-imperialist imaginary (on the notion of imaginary, see e.g. [14]). Both have national development objectives for Argentina in their ideological roots, although their conceptions of “development” are very different, pitting industrial development against the protection of peasants’ livelihoods and the environment. They conclude that it is not accurate to postulate that the neoliberal globalized privatization regime is simply expanding to, or ‘taking over’ Southern countries, but that it is activated and enacted in different and contradictory ways.

A number of common themes appear through our contributors’ very diverse empirical material, methodologies and approaches. Clearly, our collective effort to dislocate, articulate, and open up the “Northern” policy concept and narrative of the ‘bioeconomy’ through case-specific analyses shows that biotechnology *makes a difference* in Latin America, by shaping new social relations and political configurations. But what the papers show as well is that this Special Issue is not about Latin America alone. International and cross-continental developments and regulation are as important to our understanding of the bioeconomy as local specificities, national histories, subnational populations, and distinct sociotechnical production systems. The challenge is to combine and think through these dimensions together, without reiterating the master narrative itself. As the guest editors of this Special issue, we have had the privilege of collaborating with Latin American authors to offer a first attempt at doing this.

**References**

[1] Delvenne P, Thoreau F. Beyond the “charmed circle” of OECD: new directions for studies of national innovation systems. Minerva 2012; 50 (2).

[2] Latour B. Is Re-modernization Occurring - And If So, How to Prove It?: A Commentary on Ulrich Beck. Theory, Culture & Society 2003;20: 35-48.

[3] Jones MD, McBeth MK A narrative Policy Framework: Clear Enough to Be Wrong?. Policy Studies Journal 2010 ; 38(2): 329-353.

[4] Pavone V, Goven J, Guarino R. From risk assessment to in-context trajectory evaluation - GMOs and their social implications. Environmental Sciences Europe 2011; 23 (3): 1-13

[5] European Commission. The Knowledge Based Bio-Economy (KBBE) in Europe: Achievements and Challenges. Clever Consult BVBA; 2010.

[6] OECD. The Bioeconomy to 2030: Designing a Policy Agenda. Paris: OECD International Futures Project; 2009.

[7] Foucault M. The Subject of Power. Critical Enquiry 1982 ; 8(4): 777-795.

[8] Citton Y. Mythocratie: Storytelling et imaginaire de gauche. Paris: Amsterdam ; 2010.

[9] Muller P, Surel Y. L'analyse des politiques publiques. Paris: Montchestien ; 1998.

[10] Claisse F. Simulacres et Futurs antérieurs: Contributions à une approche narrative du politique. Unpublished PhD thesis. Liège : Université de Liège ; 2012.

[11] Claisse F, Delvenne P. As above so below : narrative salience and side effects of national innovation systems. European Political Science. Forthcoming.

[12] Wullweber J. Nanotechnology — an empty signifier *à venir*? A delineation of a techno-social-economical innovation strategy. Science, Technology and Innovation Studies 2008 ; 4 (1) : 27-45.

[13] Mirowski P, Sent E. The commercialization of science and the response of STS. In: Hackett E, Amsterdamska O, Lynch M, Wajcman J, editors. Handbook of Science and Technology Studies. 3rd edition. Cambridge: The MIT Press; 2008.

[14] Jasanoff S, Kim SH. Containing the atom: sociotechnical imaginaries and nuclear power in the United States and South Korea. Minerva 2009; 47: 119-146.