Feature

North, South, East and West. Let's multiply views, and converge on values.

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Introduction

The initial suggestion of 'looking at things' from the perspective of the North as it was proposed by the editors of this special issue prompted a number of reflections about the connections that exist - but which are often overlooked - between the nature of Western scientific endeavor, science education as it is normally pursued in schools and Universities, and the ethical issues that are sweeping through our globalized world.

'What if' the current and still typically modern approach of techno-scientific research was being deconstructed, to the extent to which what we commonly refer to as the 'scientific' approach was to become just one voice in amongst a multiplicity of partial views, and opening the way to the variety of cultures, languages and experiences of natural environments that characterize human communities? But then 'what if' the multiplicity of laws, norms and codes governing our societies could converge into a few, simple rules aiming to guarantee democracy and equity for all human communities, within the limited confinements of our increasingly shrinking planet?

In this scenario, the modus operandi of a single, prevailing way of thinking and ruling from the top-down – as represented by the powerful marriage of modern techno-science with the sphere of global finance – would be replaced by a form of democratic dialogue amongst a variety of voices, narratives and ways of being. Meanwhile, the acknowledgment of our inter-being within Gaia, the consciousness of our ignorance and fragility in a limited, dynamic and ever evolving planet would call every society to privilege ethically sustainable choices, which are aimed to fulfil basic human needs for all.

Also education would be deeply transformed; giving voice and value to a multiplicity of narratives and approaches, stemming from a variety of cultures, views, disciplines, that are engaged in finding new ways to creatively realize human talents. A few ethical rules might inspire attitudes and guide behaviours. I am sketching the outline of a view of education deeply rooted in place; disciplinary frameworks are used to draw the profile of such place from the multiplicity of overlapping levels of bio-physical, social, spiritual and ethical dimensions.

Centers and peripheries

What does 'North' mean to me? I imagine the North to be made of people and countries 'up there', in the map of Europe, or may be even in the World map. Northern people may be those who have to endure the cold and the darkness for a few months every year, but people of the North are also those holding wealth, political stability, security… They are at the top of Human Development index.

South for the European Union is Italy, or – at a larger scale – the Mediterranean countries: confusion, poverty, turmoil are the images that come to mind.

Scaling up to a global view, the same pattern of thinking may apply: North is Canada and the US – the rich and the powerful, those who know what are the "right" things to do, and how to do them. South is Latin America, Africa, and India…

So in this view, North can take on the meaning of 'Centre': places from where control is exerted upon the Souths, the 'peripheries'.

North versus South – Centre versus Periphery - Powerful versus Powerless – Up versus Down … spatial relations in a geographical and geo-political perspective may conceal hierarchical relations, with underlying power imbalances. Huge investments and research centres, technological innovations, big science, are up in the North. The top 20 institutions for scientific research from 1999 to 2009 consist of 14 US-based universities, three UK-based universities, and one each in Canada, Japan, and Germany[1].

Scientific innovation and frontier research influence and guide the way we think and we perform: the North (the Centre) leads the way by imposing its own narrative of control over nature; the South (and more in general, the peripheries) is the place were projects are translated into products thanks to the multitudes of ill-paid laborers and the resources that taken away from indigenous, local populations.

Changing geographies

Private capitals and economic interests are fuelling an increasingly unbalanced world, where techno-scientific innovation is addressed to satisfy the greed of a few: according to J. D. Sachs "*the global economy is growing quickly, but too much wealth is siphoned off by well connected billionaires*"[2].

Meanwhile landscapes are changing: new peaks of wealth and power are emerging amongst oceans of poverty, tracing new paths in the global web of energy, matter and information fluxes.

In the ranking of global financial centres, three Eastern cities (Hong Kong, Singapore and Shangai) are just below London and New York.[3]. Arab League, Saudi Arabia and Iran are amongst the top producers of oil [4]. In bio capacity ranking Brazil and China are the leaders, followed by USA, Russia, India[5]. From a relational perspective, the global metabolism of people, places and resources around the world, North and South are no longer so clearly set apart. Such interactions however are not evenly spread; the web is not a flat structure.

Also information technology networks, even if the word itself (network) reminds us of a spider web distributed over the whole planet, have a limited number of knots: the most powerful computer operating in the world today is the Chinese Tianhe-1A (produced by the National University of Defense Technology); this machine concentrates an extraordinary computational power and it consumes 4.04 megawatts[6]. The trend to concentrate ICT networks in the shape of web farms and cloud computing makes huge energy demands; energy and materials are required partly to cool electronic components: according to the chosen strategy, the future data-processing centers will be concentrated in Iceland (for its low air temperatures), in Egypt or Australia (for the availability of solar and wind power generated on site). So, in the present organization of the world, new peaks of power are soaring over new peripheries: and more and more violent conflicts are arising over the control of the residual resources and goods.

Fragile fortresses

One of the main characteristics of this brief period on humanity's history has been the practice of 'disarranging' the web of natural systems; such web was progressively structured and organized over the course of a long evolutionary process by developing low gradients, high biodiversity, high resilience. The Anthropocene or the 'Age of Man' as described by Steffen et al. (2007) appears today as a 'disrupted place', featuring local concentrations of people, power, materials (e.g. megacities, big dams, ICT centres…) surrounded by large spaces from which increasing fluxes of minerals and resources are drained, and towards which all kinds of waste is being discharged.

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[1] http://sciencewatch.com/inter/ins/09/09Top20Overall/

[2] http://www.aljazeera.com/indepth/opinion/2011/03/20113313330192433.html

[3] http://en.wikipedia.org/wiki/Global_Financial_Centres_Index

[4] http://en.wikipedia.org/wiki/List_of_countries_by_oil_production

[5] http://wwf.panda.org/about_our_earth/all_publications/living_planet_report/demands_on_our_planet/biocapacity/

[6] http://www.slashgear.com/tianhe-1a-supercomputer-breaks-world-record-with-nvidia-gpus-28110848/

While a minority of people moves rapidly and comfortably along the dots of concentrated power, wealth, food and opportunities, the majority is trapped in the peripheries, trying to survive in the face of decreasing resources.

The widening gap between the few who hold power and the increasing number of 'subjugated' peripheries is accompanied by a multiplicity of raising barriers, which are protected with all sorts of means. In such a way the modern fortresses are born – either geographically defined (e.g. the fortress of Europe), or described geo-politically in terms of the sphere of control wielded over energy and mineral resources, food, water, or even in terms of legal protections (through laws that allow/forbid the free circulation of people and goods).

But fortresses are increasingly under siege: not only because of the conflicts that see centres clashing with peripheries, but also because of the conflicting interests between centres, each one engaged in securing supremacy and control over people as well as natural and technological resources.

The "technosphere," the innovative engine that has driven the modern economy is also the same engine that is fuelling conflict: the world of technological transformation is organized in ways that are very different and run contrary to the functioning of the "biosphere": perhaps it should not come as a surprise if this 'world of man' that we have created reveals fragility and proneness to error.

Besides, it is emerging with increasing clarity that the natural systems are not observing of human barriers: every component – from the single atom of carbon released as CO_2, the micro-organism that has recently evolved (either through mutation or manipulation), up to the organisms which are consciously or unintentionally moved from one continent to another – within a more or less long time will get over all kinds of barriers erected by humans and it will spread uncontrolled, following paths which are often unknown. Human fortresses are prone to be conquered and surrendered to nature.

Global unbalances: what consequences?

Globalization processes and the growing power afforded by the new technologies have contributed to increase enormously the fluxes of matter and energy between different parts of the world, creating piling ups on the one side and gaps on the other.   Within a few decades of extensive and intense manipulation we have observed significant changes in the main bio-geochemical cycles: cycles that – gradually shaped over billions of years - had reached a balance that has been kept since human's first traces on Earth.

Man's effects on aerial and oceanic pools of CO_2 are now evident, with unforeseen effects on the average temperature of the planet and on the movements of great masses of air and water. Less known are the changes produced in the pools and fluxes of other important chemical elements, such as phosphorus and nitrogen, altered in parallel with the spread of industrial agricultural practices.

While the analyses of scientists aim at measuring changes of isolated parameters (e.g. nitrogen compounds), the effects of such changes are also affecting other parameters, often with feedback effects. Most of the consequences of these interactions are unknown. In order to build a reliable frame of the unfolding processes we should always include in the picture the 'unknown unknowns' (European Environmental Agency, 2001).

Two examples of global changes, described by measuring single parameters and interaction effects, are illustrated here below.

    a) Rockstrom et al. (2009) identified and quantified nine planetary boundaries that - if transgressed – could cause unacceptable environmental change with disastrous consequences for humanity. According to these authors, three of the nine interlinked planetary boundaries have already been overstepped: biodiversity loss, nitrogen cycle disruption, climate change.

    b) Gruber and Galloway (2008) showed the main anthropogenic pressures on the interactions among biogeochemical cycles during the 21st Century, and they underlined the fact that perturbations of the global nitrogen and carbon cycles caused by human activity are partly linked to each other. Some interactions increase the amount of the factors shown; some others cause a decrease, but there are also many question marks, which indicate an unknown impact.

While specialized big-science research - thanks to an ever growing financial support from private companies and risky (even hazardous) technological innovations - ventures out towards unknown fields, pushed by the presumption of being able to predict and control the outcomes, alarms are multiplying from other research sectors: scientists engaged in interdisciplinary studies try to trace an overall frame of the global Earth system functions and of the new evolutionary trends triggered by the growing anthropic pressure.

Warnings are more frequent and urgent: Westley et al. (2011) claim that "*Humanity has entered the Anthropocene era; human activity has become a major driving force in the history of the planet. The future of human wellbeing may be seriously compromised if we should pass a critical threshold that tips the earth system out of this stability domain*" (p.762).

And even more recently: "*Human societies must now change course and steer away from critical tipping points in the Earth system that might lead to rapid and irreversible change. This requires a fundamental reorientation and restructuring of national and international institutions toward more effective Earth system governance and planetary stewardship*" (Biermann et al., 2012, p.1306).

How to promote societal changes: top-down or bottom-up?

Mainstream academic research groups focus on institutional restructuring as the key action to promote change; suggestions have been made for the creation of a high-level United Nations Sustainable Development Council managed directly under the UN General, and mostly relying *"on the Group of 20—as primary members that hold at least 50% of the votes in the council"* (Biermann et al., 2012, p.1306).

But an increasing number of people – academic researchers as well as stakeholders, members of the civil society, NGOs, citizens' associations – are envisaging new ways for developing knowledge, transforming social webs, testing different ways of relating with the local landscapes. Such trend reflects the emerging diversity of conceiving the relationships between science and policy decision-making processes; it realizes in practice the 'model of extended participation' (working deliberately with imperfection) in which science is included as one part of the 'relevant knowledge' that is (or may be) brought in as evidence to a decision-making or policy process.

The ideal of a rigorous scientific demonstration is replaced by that of open public dialogue, and citizens (as well as scientists) become both critics and creators, providers and recipients in the

Knowledge production process (Funtowicz and Ravetz, 1993; Spangenberg and O'Connor, 2010).

Such an approach aims to bring back the focus of the debate to some epistemological and ethical aspects upon which Jerry Ravetz drew the attention many years ago (Ravetz, 1997). He observed that the questions that usually science asks refer to 'how' and 'why': *"We ask, 'how does this work?', expecting an explanation of the interactions of its constituent parts; or 'why does this have its particular shape (or structure or constitution)?' expecting an answer in terms of how those properties enable it to exist or to perform well"* (p.11).

However – he noticed – there is another question one can ask, "'what-if?" that is quite different in kind from the other two. *"In the context of the new challenges for science, 'what-if?' becomes the leading question, with a new urgency"* (p.11). *"With 'what-if?' as the leading question, our whole conception of the scientific enterprise could begin to evolve in a fruitful way"* (p.12).

The perspective of post-normal science, to which Ravetz explicitly refers to in that article, allows us to bring a new perspective on the geography of a world ruled by a few fortresses, rich and powerful but fragile, and towering upon an ocean of degraded peripheries: the synergy of a few, powerful decision-makers with a few leading, techno-scientific research groups has led to an increasing asymmetry between those who create the problems and those who are called upon to solve them: and between the few that enjoy the benefits and the multitude who bears the burden of unforeseen, negative consequences.

By acknowledging the relevance of the question 'what if' and extending the circle of subjects who are asking such question before starting a new research project, it becomes possible to throw light on the contradictions between needs and wants of different social groups, and to put into evidence approaches based on precaution (EEA, 2001) and humility (Jasanoff, 2007). These approaches should be the main drivers for choice in all circumstances in which the stakes are high with high systems uncertainties (Funtowicz and Ravetz, 1993).

The democratization of science that derives from the recognition of the need for extended facts and extended peer communities is strictly connected to the recognition – at a global level – of what are the primary needs of all human communities; scientific research in this view has the prime aim of looking to the satisfaction of such needs.

Around the concepts of 'human needs' there is a rich literature. For example, Alkire (2002) analyses a plurality of contributions within the context of human development. Drawing on Max-Neef et al. (1989) fundamental human needs are: subsistence, protection, affection, understanding, participation, leisure, creation, identity and freedom. An interesting contribution however comes from Narayan et al. (2000), who are drawing on a pioneering, cross-cultural study which included primarily the voices of the poor, illiterate, and in some cases remote, respondents. According to this research, the primary human needs can be identified as the following:

- **Material Well-being**: having enough – food, assets, work;
- **Bodily well-being:** being and appearing well – health, appearances, physical environment;
- **Social well-being** - being able to care for, bring up, marry and settle children, self-respect and dignity, peace, harmony, good relations in the family/ community;
- **Security** - civil peace, a physically safe and secure environment, personal, physical security, lawfulness and access to justice, security in old age, confidence in the future, freedom of choice and action;
- **Psychological well-being** - Peace of mind, happiness, harmony (including a spiritual life and religious observance)

The analysis of human development needs is thus gradually shifting from the idea of individual satisfaction to the requirement of for collective needs to be progressively satisfied at a global level, in the effort "*to transform our system out of a destructive pathway and into one that leads to long-term social and ecological resilience*" (Wrestley et al., 2012, p.763).

Local conflicts and global issues

I live in Italy, a few kilometres from the Susa Valley: for more than twenty years a fierce and nonviolent resistance has been sustained against the construction of a high speed railway, which according to the National Government was supposed to boost economic growth, thanks to the newly established connections between the North of Italy and Northern Europe. 'Progress' was identified with the possibility for people and goods to move more rapidly across national borders.

Actions of organized protest started in 2002 with the constitution of the NO TAV movement, including members of the local communities - park rangers, local councillors, voluntary associations, academics (http://www.notavtorino.org). Informed by a nonviolent spirit, the movement sought to hinder the realization of such 'major infrastructure', to sensitize people across the country to provide support and join in the marches and the events organized in the city of Turin and other sites in Italy. Upon the construction of the building site and the start of the works, the government put military forces in place to defend the site; as a response to the Government's measures, within the NO TAV movement a wing of direct action also started to emerge. Episodes of violent clashes happened in the past year and brought the situation to a stalling position. Currently the controversy has taken the shape of a polarized conflict: on the one side there are the representatives of political and economic power, supported by leading 'techno-experts'; on the other side there are the local communities increasingly connected with other communities all over Europe, and becoming ever more 'expert' thanks to the dialogic exchanges with representatives of civil society, NGOs, university members, communities of the South, etc.

This phase of the conflict has taken the character of a nonviolent opposition carried on by well-known figures as well as people of the Valley and members of the civil society; public hunger strikes have also taken place in Turin and in a number of other towns in Italy.

This local controversy describes well the antagonistic relationship between the organization of the 'technosphere' (as implicitly advocated by leading politicians), and the organization of the 'biosphere', gradually but strongly argued by the local communities, some NGOs and a minority of academics. Conflicts are taking place with identical dynamics in many parts of the world, where local communities are expressing their dissent by nonviolent means such as marches, demonstrations, symbolic public acts, public speeches, drama and music, silence, non-cooperation, fasting (Sharp, 1973), in order to put stoppers into the forward-moving ventures of big science and big finance, carrying out huge transformations of the landscapes, dispossessing local communities from their soil water, food, air.

Meanwhile, the majority of the people are embedded within the dominant worldview and, encouraged by newspapers and media, are led to support the mainstream narrative that identifies technology, power, speed, economic growth, control over nature as the privileged ways towards progress; this same narrative is orientated to silencing and eradicating from the global narrative the voices and realities of billions of people who are reclaiming equity and justice.

What about the role of education?

Educational systems, in Italy as well as abroad, have explicitly privileged not only the teaching of scientific knowledge at the expense of humanistic and artistic training, but – as it is evident from many official documents of the European Union – teaching addressed to acquire technological competence for competing in the global market has become increasingly popularised.

"MODERN contributes to raising awareness in European higher education institutions of the strong need to invest in people, to support potential leaders, and to encourage management training at all levels (junior and senior, academic and administrative staff), with as background the aim to ensure their competitiveness to respond to external challenges"[7].

More specifically, science education has a crucial role in shaping students' views; conventional approaches to science teaching are still emphasizing the idea of science as a special way of knowing – free from values and directed towards the 'progress' of humanity.   Moreover, by fragmenting information in different disciplines, space and time scales, and by presenting themselves as experts whose duty is to give the right instructions, teachers fail to help students to build a personal, critical, reflexive view of ecosystems' services and the role and position of humans within the natural world.

> *"Master narratives of technoscience and the policy practices that make them durable seem to disconnect our knowledge, experience and imaginations from history. In particular, the urgent societal narrative of "no time to lose" and its associated notions of a global race to lead in technoscientific innovation detach the search for progress from any live sense of a larger historical trajectory which gives us perspective. This also inhibits our institutional capacity or willingness to experiment with possible alternatives. We therefore risk subordinating ourselves as citizens to the imagined force of that grand narrative. This disempowering effect seems to grow relentlessly, and so does public awareness of it."* (Felt and Wynne, 2007, p.79).

Another science education is possible, stemming from post-normal science (e.g. Liberatore and Funtowicz, 2003), indigenous knowledge (Berkes and Berkes, 2009), and rooted into a learning and teaching methodology based on mutual respect and dialogue amongst a plurality of views (Colucci-Gray et al., 2012): from North and South, East and West, and from the peripheries of the global as well as the local context of a classroom. This kind of science education – characterized by reflexivity and mutual learning – not only aims to promote critical thinking in students, but has deeply political implications: "*It is only through explicit official recognition of the ambiguous and open-ended*

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[7] The MODERN project, European Platform Higher Education Modernisation:
www.highereducationmanagement.eu,

character of supposedly 'scientifically-revealed' public policy meanings that civic engagement becomes meaningful" (Felt and Wynne, 2007).

Towards multiple views and few shared values in Education

In tune with an idea of science as a human activity, producing fluid, dynamic and sometimes controversial knowledge and being the result of dialogue and reflection amongst different people and cultures, science education might effectively contribute to promote the encounter between personal and local experiences and global situations. This educational approach might help students to make personal choices and to participate in collective decisional processes with a greater awareness of the complexity and interdependence of the socio-environmental contexts in which we all are embedded.

In other words, education might aim to prepare students to relinquish the idea of acquiring knowledge in order to come to a higher *understanding* of reality.   Understanding implies becoming aware that the human community – as well as all other living beings – is included within a planet with moderate resilience, and it is totally dependent upon a limited supply of resources and services (Folke et al., 2011). Understanding also implies the recognition that human rights are deeply rooted in the interconnected nature of the web of life, and they can only be actualized through the balance between ecology and equity (Gadgil and Guha, 1997; Sachs, 2002).

While many different views of science co-exist and may be offered to students in science education classrooms, I select one particular educational narrative that could become appealing to all; this narrative is based on the reciprocal appreciation of different linguistic, cultural, spiritual worldviews, on the voluntary restriction of greed, on the cultivation of nonviolent and creative approaches to conflicts (Galtung, 1996).

How do we live off this single narrative? While different scientific approaches can lead to different and often contradictory views of the world, by listening to the multiplicity of voices of local communities and indigenous people one can strive to an extraordinary consistency of ideas and action aimed at bringing together ecology and equity and in so doing, lead human societies towards sustainability (Aikenhead and Mitchell, 2011).

This is not a 'new' position; on the contrary: it is rooted in the teachings of many ancient cultures and societies, and it has been expressed by several people with different voices and within a variety of contexts in the last 50 years. Let's recall only a couple of such voices:

The **Cocoyoc Declaration** (1974) was signed – among others – by Johan Galtung, Wolfgang Sachs and Ivan Illich, three personalities who have dedicated their whole life to the promotion of peaceful, sustainable and equitable ways of life within human communities:

"Thirty years have passed since the signing of the United Nations Charter launched the effort to establish a new international order. Today, that order has reached a critical turning point. Its hopes of creating a better life for the whole human family have been largely frustrated. It has proved impossible to meet the "inner limit" of satisfying fundamental human needs. On the contrary, more people are hungry, sick, shelterless and illiterate today than when the United Nations was first set up. At the same time, new and unforeseen concerns have begun to darken the international prospects. Environmental degradation and the rising pressure on resources raise the question whether the "outer limits" of the planet's physical integrity may not be at risk. […] Development should not be limited to the satisfaction of basic needs. There are other needs, other goals, and other values. Development includes freedom of expression and impression, the right to give and to receive ideas and stimulus. There is a deep social need to participate in shaping the basis of one's own existence, and to make some contribution to the fashioning of the world's future. Above all, development includes the right to work, by which we mean not simply having a job but finding self-realization in work, the right not to be alienated through production processes that use human beings simply as tools. […] We have faith in the future of mankind on this planet. We believe that ways of life and social systems can be evolved that are more just, less arrogant in their material demands, more respectful of the whole planetary environment. The road forward does not lie through the despair of doom-watching or through the easy optimism of successive technological fixes. It lies through a careful and dispassionate assessment of the "outer limits", through co-operative search for ways to achieve the "inner limit" of fundamental

human rights, through the building of social structures to express those rights, and through all the patient work of devising techniques and styles of development which enhance and preserve our planetary inheritance". (p.893-901)

At the end of the World People's Conference on Climate Change and the Rights of Mother Earth (April 22nd, 2010) in Cochabamba, Bolivia, a 'People's Agreement' was published, in which it is declared:

"To guarantee human rights and to restore harmony with nature, it is necessary to effectively recognize and apply the rights of Mother Earth.   For this purpose, we propose the attached project for the Universal Declaration on the Rights of Mother Earth, in which it's recorded that:

- *The right to live and to exist;*
- *The right to be respected;*
- *The right to regenerate its bio-capacity and to continue it's vital cycles and processes free of human alteration;*
- *The right to maintain their identity and integrity as differentiated beings, self-regulated and interrelated;*
- *The right to water as the source of life;*
- *The right to clean air;*
- *The right to comprehensive health;*
- *The right to be free of contamination and pollution, free of toxic and radioactive waste;*
- *The right to be free of alterations or modifications of its genetic structure in a manner that threatens it's integrity or vital and healthy functioning;*
- *The right to prompt and full restoration for violations to the rights acknowledged in this Declaration caused by human activities."*

The process of democratization of science will contribute to multiply the descriptions and interpretations of nature, allowing to compare and integrate a variety of views and to gain cues about the complexity of the geo-systems in which humans are hosted. Meanwhile the growing awareness of interdependences amongst human communities living on the same, small planet may lead to sharing a grasp of ethical rules based on the recognition of equal rights and equal destiny for all Earthlings (Latour, 2007). Yet, such conceptual transformation needs to be nourished by an educational system that is respectful of the variety of cultures and talents brought by the students, and aiming to promote cooperation, empathy, reflexivity, sufficiency and nonviolence as the pillars of relations amongst people and with Gaia.

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