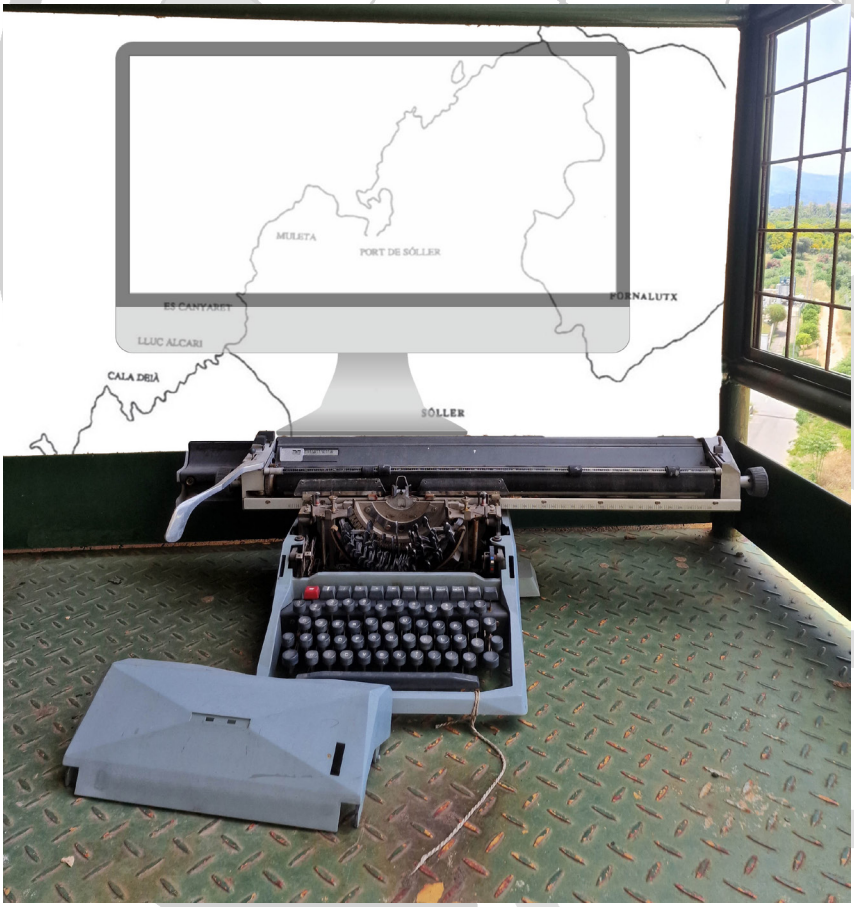
INFORMATION TECHNOLOGIES AND SOCIAL MEDIA: NEW SCIENTIFIC METHODS FOR THE ANTHROPOCENE

Gaetano Sabato, Joan Rosselló (Editors)



Preface by Javier Martín-Vide

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Geographies of the Anthropocene

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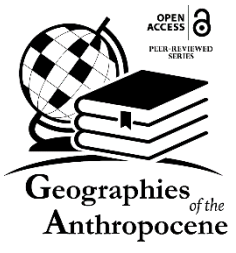

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Geographies of the Anthropocene

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Geographies of the Anthropocene

Open Access and Peer-Reviewed series

The book series "Geographies of the Anthropocene" edited by the International Scientific Publisher "Il Sileno" (Il Sileno Edizioni) will discuss the new processes of the Anthropocene epoch through the various worldviews

of geoscientists and humanists, intersecting disciplines of Geosciences, Geography, Geoethics, Philosophy, Socio-Anthropology, Sociology of Environment and Territory, Psychology, Economics, Environmental Humanities and cognate disciplines.

Geoethics focuses on how scientists (natural and social), arts and humanities scholars working in tandem can become more aware of their ethical responsibilities to guide society on matters related to public safety in the face of natural hazards, sustainable use of resources, climate change and protection of the environment. Furthermore, the integrated and multiple perspectives of the Environmental Humanities, can help to more fully understand the cultures of, and the cultures which frame the Anthropocene. Indeed, the focus of Geoethics and Environmental Humanities research, that is, the analysis of the way humans think and act for the purpose of advising and suggesting appropriate behaviors where human activities interact with the geosphere, is dialectically linked to the complex concept of Anthropocene.

The book series "Geographies of the Anthropocene" publishes online volumes, both collective volumes and monographs, which are set in the perspective of providing reflections, work materials and experimentation in the fields of research and education about the new geographies of the Anthropocene.

"Geographies of the Anthropocene" encourages proposals that address one or more themes, including case studies, but welcome all volumes related to the interdisciplinary context of the Anthropocene.
Published volumes are subject to a review process (**double blind peer review**) to ensure their scientific rigor.

The volume proposals can be presented in English, Italian, French or Spanish.

The choice of digital Open Access format is coherent with the flexible structure of the series, in order to facilitate the direct accessibility and usability by both authors and readers.

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Preface

Javier Martín-Vide[1]

Science is, with very few exceptions, the result of the systematic work and selfless dedication of those who pursue – both individually and as a team - the search for truth, by means of answering questions based on hypotheses or conjectures, contrasting, confirming or falsifying propositions, reproducing experiences, deducing laws or making predictions, thus following the scientific method, in a general process of advancing knowledge. It consists of a chain of links of progress in knowledge, forged by scientists in solidarity with their fellow men and women, because their work is for the benefit of all. Trained in the scientific method and in the use of precise terminology, they once relied on the specific field of earth sciences, on direct observation and the support of maps and hand-held instruments. Today they benefit from the so-called new technologies, such as remote sensing and geographic information systems, as well as from new methodological approaches, including collaborative approaches. In general, new technologies greatly facilitate observation and data acquisition, spatial and temporal resolution of the processes under study at very detailed scales, advanced statistical analysis, speed in the execution of calculation programmes and non-invasive intervention in medical operations, among many other examples. Such is the benefit provided by new technologies that it is sometimes forgotten that in order to use them to obtain a scientific progress or true advances in knowledge, it is necessary to follow the stages of the scientific method. If this is not the case, even though surprising results are achieved and often expressed through spectacular images, no new link in scientific knowledge will be produced. Indeed, it must be emphasised that the scientific method remains at the heart of the research process. If it is not followed, the results achieved will not be scientific, but mere elucubrations, guesswork or, at best, unverified or untested knowledge, or only apparent advances.

Apart from the aforementioned, technological evolution has undoubtedly changed the way of "doing" science. To give a few examples, a meteorologist - and even the common citizen - knows at any given moment where the cloudiness associated with a cold front is, where it is raining or where

[1] Professor of Physical Geography, University of Barcelona (Spain), e-mail: jmartinvide@ub.edu.

The translation from Spanish to English language of the preface was done by Joan Rosselló and Marina Palou.

lightning has struck, thanks to satellite remote sensing, radar or the lightning network. An astronomer does not need to stay up all night to make observations of the sky, but can automatically track the stars of his or her choice, as well as carry out the calculations involved. The most advanced medical technologies, such as nuclear medicine, make it possible to detect any dysfunction or even the tiniest anomaly in the body's tissues without the need of expensive surgery or invasive scans in the first place. Space exploration, which requires cutting-edge technology, has brought with it many technological advances that are already commonplace. Nanotechnology, which achieves the control and manipulation of matter at tiny dimensions, typically between 1 and 100 nanometres (nm) (1 nm is one billionth of a metre), allows the creation of new materials and systems with enormous potential applications. It is also interesting to note that its advances result from the disciplinary approach of chemistry, physics, molecular biology, medicine and computer science to mention a few.

New technologies could also be included among the defining elements of the Anthropocene, that leap in the history of humanity characterised by the fact that its footprint derived from the consumption of resources and the generation of waste has a planetary effect. The footprint is now visible in practically every corner of the Earth. The more than 7.8 billion humans, which will approach 10 billion by the middle of the current century, have already exceeded the physical limits of the planet, to a large extent due to the use of new technologies, especially those which allow massive exploitation of mineral, agricultural and ecological resources. The so-called Overshoot Day, which every year calculates the date by which humans will have already consumed all the resources and ecosystem services the Earth has to offer, is every time appearing earlier and earlier in the calendar. It is with the exception of 2020, due to the reduction of economic activity as a result of the COVID pandemic. In 2021 it was the 29th July, which means that we already need 1.7 planets to satisfy our consumption. By 30th June, we will need two planets. We are therefore producing an ecological debt, which our descendants will have to face.

This forces us to reflect from an ethical perspective. New technologies must also help us to manage a complex world that is constantly changing, and that is much more unpredictable than in past decades. They have facilitated knowledge of the world, and its exploitation, and should now be used to channel and resolve the problems of global change, including climate change, very probably the most important challenge we face in the 21st century. In doing so, new technologies must respect the three pillars of sustainable development, that is economic efficiency, social inclusion and environmental

friendliness. If new technologies have served massively for economic progress, they must also help to achieve equality between people, to eradicate poverty, hunger and injustice, and to achieve a more equitable world. In the same way, they must be applied to improving our relationship with nature, to preserving wildlife and the landscape, and to develop a sustainable use of resources.

New technologies can provide solutions of enormous importance in the area of energy transition. They can help along with the development, and also the reduction in the cost of energy production coming from solar energy of different types (solar thermal, photovoltaic), wind, tidal, geothermal, etc., as well as hydroelectric and, to a lesser extent, biomass. We will have to add, in the near future, that energy which is obtained from hydrogen and other possible innovations. Even so, it must be remembered that it is essential to reduce our energy consumption. The well-known three 'r's - reduce, reuse and recycle - still apply. And one more step, three 'i's: getting involved, innovating and imagining. Regarding the first, all actors, from public administrations and companies, especially the large multinationals in the energy sector, to groups and associations of different types and sizes, NGOs and ordinary citizens, do not get involved in solving the environmental and energy problem, we will be left with nothing more than well-intentioned words. Together with this, innovation is also vital in order to achieve technological advances that facilitate, if not solve, the various partial challenges. And finally, the third 'i', imagination, a uniquely human capacity. If we do not imagine a better world, we will not achieve it.

Another substantial change in the way science is done is the arrival of collaborative processes and, in particular, those of the so-called Citizen Science. Ordinary citizens can collaborate with "professional" science by providing information and data that, due to their nature or number, are difficult to obtain; they can participate in the methodological process by formulating questions, providing calculation memory with their personal computers, verifying on the ground what the technological platforms detect, etc. The term citizen scientist can therefore be used to describe someone who provides this assistance and knowledge voluntarily, without being a scientist specialised in the subject of study. A fundamental requirement for Citizen Science to be considered as such is that the results of the research return to the citizen, in many cases to improve their living conditions. Science has thus gone out from universities and research centres to become, in a way, "democratised".

Getting back to our origins. The Earth, a planet of unremarkable size among those in the solar system, with an equatorial circumference of just over

40,000 km, has three unique elements: the abundance of water, visible from outer space; the richness of oxygen in its atmosphere, which accounts for 21% of the air we breathe; and the existence of a wide variety of life forms. And in the course of its approximately 4.5 billion years it has reached a crucial stage in its geological history, that of the domination of the planet by the current human species, equipped with a technology capable of modifying it in its entirety and even of destroying it. A technology that will allow them to establish permanent settlements on other stars in the solar system within a few decades. The use of the most advanced technologies must always be governed by the ethical principles of respect for life, for the benefit of all humans and other living beings, in an egalitarian and supportive manner, guided by the concept of one health, which harmoniously combines human health, animal health and environmental health. In this endeavour, education, culture and scientific knowledge are the key.

I am pleased that the contributions of this volume are aligned with that spirit of rigorous progress of knowledge, the results of which can benefit our fellow citizens, life as a whole and our own terrestrial cradle.

The development of technology during the Anthropocene has affected science and the ways of "doing science". Nowadays, new technologies help scientists of several disciplines by facilitating knowledge and how to manage it, but also allow for collaborative science, the so-called "Social Science", where everyone can be a scientist and be involved in providing data and knowledge by using a computer or a smartphone without being a specialist. But is it really that simple? Actually, the daily and integrated use of different digital technologies and sharing platforms, such as social media, requires important reflections. Such reflections can lead to a rethinking of epistemologies and scientific paradigms, both in human geography and social sciences. This volume titled "Information Technologies and Social Media: New Scientific Methods for the Anthropocene" includes 10 chapters exploring some changes related to the way to do science with a multidisciplinary approach. From classroom experiences to the use of Citizen Science, from Artificial Intelligence use to how Social Media can help researchers, the book reflects on the ICT influence during the last few decades, exploring different cases, complementary perspectives and point of views.

***Gaetano Sabato**, PhD in Tourism Sciences, is currently Researcher of Geography at the Department of Psychological, Pedagogical, Exercise and Training Sciences of the University of Palermo (Italy), where he teaches "Geography for Primary Education" at the Sciences of Primary Education master degree. He has published several scientific articles and a monograph: "Crociere e crocieristi. Itinerari, immaginari e narrazioni", published by Giappichelli, Turin 2018. Moreover, he is guest editor, with Leonardo Mercatanti, of two Special Issues of "AIMS Geosciences". His research focuses are on cultural geography and digital representations of the space, didactics, tourism, and perception of risk.*

***Joan Rosselló** is an associate lecturer at the Open University of Catalonia. He holds a Physical Geography PhD, has published more than 20 papers in national and international journals and his research focuses are natural hazards, flash floods and precipitation, studying historical and contemporary events. He sits on the editorial board of the Geographies of Anthropocene book series, Physio-Géo Journal and the Journal of Flood Risk Management.*

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