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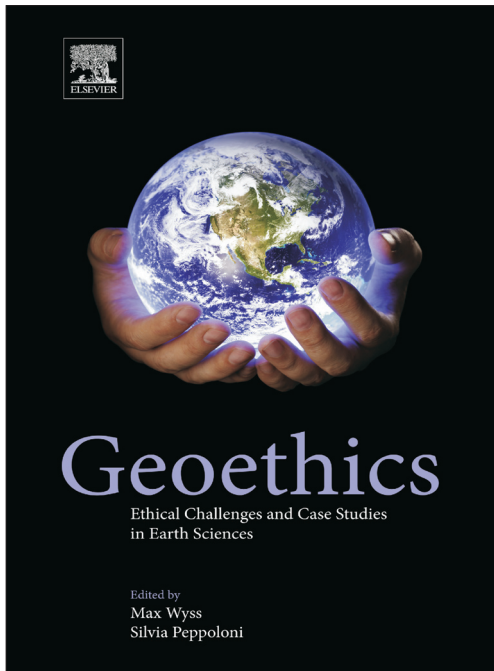
The book provides a unique insight into the emerging field of geoethics and current ethical challenges facing geoscientists. According to a definition in Chapter 1 'geoethics consists of research and reflection on those values upon which to base appropriate behaviour and practice where human activities intersect the geosphere' (p. 4). Like bioethics, geoethics is a form of applied ethics, a new branch of ethics dealing with moral problems, practices and policies especially connected to geosciences, the need for which was first addressed on geological and geoscience conferences in the last two decades. The book is edited by two scholarly geologists devoted to the international enhancement of ethical consciousness in geosciences. Max Wyss (International Centre for Earth Simulation, Geneva, Switzerland) is a worldwide acknowledged geophysicist on earthquake risk reduction, while Silvia PEPPOLONI (National Institute of Geophysics and Volcanology, Rome, Italy) serves as Secretary General of the International Association for Promoting Geoethics.

The 33 chapters of the book written by 47 different authors shed light on geoethical practice and inquiry from multiple angles. The authors are mainly geophysicists, geologists and also scientists and technical professionals experienced in different areas of risk re-

ductions and disaster mitigation, while some authors are coming from philosophical and ethical institutions. The volume is thematically divided into six sections. 'Philosophical Reflections' (chapters 1–6) is placing geoethics in the context of geosciences and applied ethics. 'Geoscience Community' (chapters 7–9) gives an overview about the ethical endeavours of geoscientists, 'Ethics of Practice' (chapters 10–16) discusses several interesting issues about the ethical dilemmas of those practicing geosciences, while 'Communication with The Public, Officials and The Media' (chapters 17–23) deals with possible ways to communicate environmental uncertainty and risk with a broader public. The section on 'Natural and Anthropogenic Hazards' (chapters 24–29) is followed by writings on the especially vulnerable position of 'Low Income and Indigenous Communities' (chapters 30–33).

'Philosophical Reflections' introduces the case studies presented in the book, provides definitions of geoethics and outlines the broader academic and social context. The opening chapter entitled 'The Meaning of Geoethics' employs a practical notion, focusing on geoscientists' responsibility while practicing research, and sharing strategies for a more ethically conscious future. The second chapter connects geoethics more to the domain of philosophy. Using hermeneutic and phenomenological approaches, this chapter argues for an applied ethics based on a reciprocal communication not just between theory and practice in general, but also between ethicists/philosophers and geoscientists in particular. The following chapters of this part of the book are also reflecting the integrative notion of geoethics. We can read about how geoethics can serve to meet goals of sustainability (Chapter 3), about the flagship position of disaster research in the field of geoethics (Chapter 4), and about the need for an inclusive, interdisciplinary and application oriented field of geoethics (Chapter 5) in line with that 'Science and Technology can no longer be seen as value-neutral providers of knowledge and certain means, leaving only the user and society to think about the moral dimension of their "application"' (p. 51). Chapter 6 offers an interesting insight from the perspective of evolutionary biology into the constraints of human mind when dealing with deep time and historical contingency, which are worth considering when probabilities and uncertainties of geoscientific results are communicated to a broader public. The ideas concerned in the first six chapters lead up effectively to the more special cases analysed in the later chapters of the book.

The second section ('Geoscience Community'), concentrates on the professional ethics of geoscientists, and



their challenges in conducting research responsibly. The section starts with an overview (Chapter 7) of research integrity, and cases of misconduct like data fabrication, falsification or plagiarism. (Chapter 9 discusses plagiarism in more detail.) The role of statements resulting from international conferences on research integrity is emphasised, just like the Singapore statement and the subsequent Montreal statement on cooperative research projects. Chapter 8 scrutinises the development and challenges of the Scientific Integrity and Professional Ethics Policy of the American Geophysical Union, offering useful insights for other institutes considering the ratification of such a policy.

The third section ('Ethics of Practice') focuses on the particular perspective of the involved researcher, who is identifying seismically active faults, estimating the maximum magnitude or peak acceleration of a maximum credible earthquake (chapters 11–14), or the maximum height of a tsunami (Chapter 15), and who unavoidably enters public debates, often fuelled by contradicting interests of public, business and government sectors, which might be interested in building dams or nuclear plants, for example. The subjective reconciliation of William GAWTHROP (Chapter 13) sheds light on the ethical dilemmas of geoscientist from a very personal perspective. Right at the beginning of his career, the seismologist GAWTHROP dedicated himself to estimating the maximum credible earthquake in a Northern Californian region, a project gaining special relevance due to the construction of a nuclear plant. Because of this he faced a massive intervention of 'corporate money' to science, leading to his falling out from seismological research. His case and personal involvement, which are expressed in other chapters (Chapters 10, 11 and 14), illuminate the perceived ethical challenges and obstacles of researchers who try to give credit to scientific evidence. Chapter 10 demonstrates that while arguing for the acknowledgement of scientific claims, such as the acceptance of proper seismological methods in the late Cold War period in estimating the explosive yield of an underground nuclear weapon, how easily can be accused of 'playing politics'. Chapter 16 reflects on how scientific evidence and goodwill may not always be enough in practice for efficient risk reduction. For example recommendations from Muslim countries exemplify in this chapter that international rescue teams involved in hazard assessment should pay special attention to religious beliefs and cultural practices of the locals in order to foster cooperativeness, a highly necessary factor in disaster mitigation.

The next two parts on 'Communication with The Public, Officials and The Media' and 'Natural and Anthropogenic Hazards' continue to examine, now in more detail, the roles and responsibilities of researchers in communicating uncertain risks to the public. These parts begin with comments on the 'L'Aquila Trial' (Chapter 17), where seismologists, engineers,

and civil defence officers were sentenced for 'misinformation' of the public before the 2009 earthquake. (This incident is a kind of reference point, returning several times in the book, and might well be considered as a benchmark in geoethics.) This case also underlines the necessity to clearly identify roles and responsibilities in the decision making process, which are the topic of the next Chapter 18. Pitfalls of communicating earthquake predictions in Greece (Chapter 19) and earthquake and tsunami predictions in Japan are discussed (Chapters 22 and 26), such as the lack of cooperativeness between institutions, providing biased, contradictory and confusing information for the public. In Chapter 20 standard probabilistic earthquake hazard maps, derived from geophysical data only, are assessed as an inadequate tool to calculate expected risks and fatalities, therefore they cannot serve the need of the population efficiently. Chapter 21 reflects on the social constructedness of maps, tools and products of disaster research, arguing that these are selective representations, and so their interpretation is unable to represent the manifold aspects of risk, vulnerability and resilience. These limitations of maps are necessary to be considered in disaster mitigation.

Two chapters are pronouncedly dealing with educating the public. Chapter 23 addresses the gap between the public and scientists and presents how straightforward, short and easy-to-understand communication can be efficient in risk communication. The chapter employs the example of risks connected to the changes of the seaside due to climate change. In Chapter 27 the duties of the Vesuvius Museum Observatory to educate people living close to the dormant volcano are presented. Yet, not just one-way communication from the well-informed scientist to the information-seeking public is considered but participatory approaches as well, aiming to establish mutual engagement with locals. The two participatory examples from the book are an interactive and participatory multimedia map of avalanches (Chapter 21, p. 259), and the adaptation of participatory decision processes in radioactive waste management in the UK (Chapter 28). Experiences from participatory processes reveal that transparency and openness in scientific and technical debates, and partnership among participants are needed in every phase of risk mitigation.

In the next part on 'Low Income and Indigenous Communities' special attention is paid to marginalised groups. As Chapter 30 shows, the specific rights of indigenous peoples to decide about their own way of life and development, declared by the human rights framework of the United Nations, are rarely or inadequately considered in environmental assessments. Similarly, low income communities (chapters 31–33.) have limited possibilities of participation in the decision making process, and they often live in regions with lower infrastructure. Both of these inequalities are affecting the exposure of these marginalised groups to environ-

mental risks and the effectiveness of risk mitigation. Two case studies are presented about the side-effects of and inequalities in decision-making with regard to mining. These are about indigenous communities in the Tampakan region of the Philippines (Chapter 30) and low-income workers from Keonjhar District, India (Chapter 32), where shortcomings of ethics in mining are discussed. Solutions like free, prior, and informed consent are suggested, which were also defined by the United Nations Permanent Forum on Indigenous Issues in order to establish participation and consultation with indigenous people prior to a development project (Chapter 30).

The volume is a well-structured collection of inspiring writings, which raise several thoughts and questions about the aims and future perspectives of geoethics. From the point of view of a geographer who is interested in landscapes, environmental history, and local and traditional ecological knowledge, there is a lot of opportunity for geoethical enquiry and to find connections to a diverse field of study. Almost all case studies are restricted to a narrowly defined domain of geoscience, mainly consisting of different subfields of geology (although no case studies are addressed to ethical challenges in agro-geology or hydrogeology). Geography, soil science, climatology and Earth system science are underrepresented in this volume, however. Extreme hazards, such as earthquakes, tsunamis, volcanic eruptions dominate the case studies, while long-term and gradual risks are rarely considered. (This problem is issued in Chapter 23 and 33). Another interesting point only superficially mentioned is the cooperation of geosciences in risk mitigation, and division of labour between different disciplines. Remarkable examples are climate-change-induced hazards (mentioned only in Chapter 23), or models where climate factors only appear on the input side (see Chapter 24 on the dispersion of volcanic clouds). These kinds of issues are more complex, and the responsibilities of scientists are even less clear. This sort of selectivity might simply result from the academic background of geoethics, which is suggested to have gained impetus due to works of geophysicists on fatal hazards (history and predecessors of the field are only briefly addressed in the last chapter on p. 411). Yet, the circle of scholars involved in geoethics might become more diverse and, consequently, the scope of geoethical research will hopefully expand to a much wider domain in the future.

Another question is whether geoethics will become a kind of a well-defined professional ethic practiced by geoscientists, or whether it will develop to a much wider field and movement, practiced by scholars coming from outside of geosciences as well, namely from social sciences and humanities, or by multi-disciplinary research groups. This volume is dominated by the perspectives of geoscientists, while theories from

and central issues in social sciences and humanities are rarely addressed. (Some exceptions are Chapters 2, 5 and 21, the latter two of which were written by authors from a special institution for applied ethics, the International Centre for Ethics in the Sciences and Humanities at the University of Tübingen, in Germany). Methodologies of actor-network theory (briefly mentioned in Chapter 21), science and technology studies, or historical analysis practiced in political ecology would also be easily applicable to geoethics, and could bring new approaches to the field.

The connection of geoethics to the field of environmental ethics (addressed in Chapters 2 and 5, and mentioned in Chapter 6), and the difference between both remain unclear issues in most case studies. It is noted several times, however, that geoethics might be parallel to bioethics. This is the central notion in Chapter 28 with a very interesting joint discussion of public debates on Creutzfeldt–Jakob disease and nuclear waste management. It remains unanswered whether geoethics can move towards the relational ethics of hybrid nature/culture (WHATMORE, S. 2002), and how traditional resource management practices, environmental knowledge of locals and indigenous groups, and their perceptions on environmental risks can be addressed. (Traditional ecological knowledge is mentioned only in Chapter 21. For further reference see BERKES, F. 2012). To incorporate such different perceptions and values, a more plural vision of ethics should be introduced (cf. the introductory Chapters 2 and 5), and more attention should be paid to approaches in postmodern ethics, which challenge normative and Kantian ethical approaches, also applied in Chapters 12 and 29.

Although East Central European authors and case studies are not included in this volume, geoethics might attract more attention from these countries than what the volume seems to suggest. For example, since 1992 a series of international meetings on geoethics has been organised in the Czech Republic as part of the Mining Příbram Symposia. Ethical concerns of earthquake research might be less striking geoethical topics in this region, but other topics can definitely be, such as the impact of socialist and post-socialist mining or agro-geological and geographical enquiries connected to the locally adapted and developed versions of the Great Stalin Plan for the Transformation of Nature in the 1950s.

To conclude, the book is an excellent enterprise to encourage discussions about ethical issues in the geoscience community and beyond. Its findings could be useful not just to raise the ethical consciousness of the geoscience community by highlighting its role in coping with environmental risks and uncertain hazards within society, but it could also be a relevant starting point for further interdisciplinary and social science studies in the field. Interesting and urgent topics are discussed, ranging from the predictability of earth-

quakes and nuclear waste management to mining and indigenous rights as well as ethics of research and communication. Altogether, the volume with the diverse range of presented case studies promotes open discussion on moral dilemmas facing geoscientists, and argues for more reflective and transparent ways of practicing science with enhanced responsibility and solidarity.

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