A Collaborative Effort to Build a Modular Course on GeoEthics

Vince Cronin, Baylor University, Geology Department, Vince_Cronin@baylor.edu

Giuseppe Di Capua, Istituto Nazionale di Geofisica e Vulcanologia, Italy, guiseppe.dicapua@ingv.it

Cindy Palinkas, University of Maryland, Center for Environmental Science, cpalinkas@umces.edu

Catherine Pappas-Maenz, Dawson College, Canada, cpappas@dawsoncollege.qc.ca

Silvia Peppoloni, Istituto Nazionale di Geofisica e Vulcanologia, Italy, silvia.peppoloni@ingv.it

Anne Marie Ryan, Dalhousie University, Earth Sciences Department, Environmental Science and Centre for Learning and Teaching, amryan@dal.ca

You are part of this collaborative effort. Today, *right now*, tell us about a problem, an opportunity, a resource, a technique, a case study, a way of viewing the world that we might use in this course. Join us, and let us keep in touch with you as our project develops.

ABSTRACT. The need to promote ethical practice in the geosciences has long been recognized. Governmental boards for licensing professional geoscientists commonly require participation in continuing-education courses or workshops about professional ethics as part of the license-renewal processes. Geoscience-based companies and organizations of professional geoscientists have developed ethical codes for their members or employees. Ethical problems have been reported that involve the practice of science applied to Earth studies, interpersonal relationships within geoscience departments, business practices in geoscience-based companies, field work and the destructive modification of geologic sites, public policy development or implementation related to Earth resources, extractive resource industries, development that modifies landscapes in significant ways, interactions with the press and other media professionals, and even interactions with individuals or groups that have a significantly different worldview.

We are working toward the creation of a modular semester-long course in GeoEthics. The modules will be free-standing, so each could be repurposed for use in a different course; however, the GeoEthics course will provide a useful overall introduction to a variety of topics in ethics applied in the context of geoscience. Such a course might be an excellent capstone course for undergraduate geoscientists, or an introductory course for graduate students. The first module will cover basics intended to provide a common vocabulary of words, ideas and practices that will be used throughout the course. The remaining 5-6 modules will focus on aspects of geoscience in which ethical considerations play an important role. We feel that the geoscience classroom can provide a safe, controlled environment in which students can confront a representative sample of the types of ethical issues they might encounter in their professional or academic careers. Our goal is to help students develop effective strategies for working through these dilemmas. Our modules will utilize formal discussion, role-playing, debate, and reflective writing, among other techniques. We hope that this will lead students to internalize these lessons so that they lead careers in which ethical practice is an essential element.

A functional knowledge of applied ethics is not imparted at birth or awarded along with academic diplomas.

It is something that each generation must help the next generation to develop. It's our generation's turn now.

We try to equip our students with the scientific knowledge and skills necessary to make a positive impact on our understanding of Earth and its processes and products.

We should exert the same effort to prepare them for the ethical challenges they will face during their careers.

"The only ethical principle which has made science possible is that the truth shall be told all the time.

If we do not penalize false statements made in error, we open up the way, don't you see, for false statements by intention.

And of course a false statement of fact, made deliberately, is the most serious crime a scientist can commit."

Physicist and author C.P. Snow,
quoted in *Honor in Science,*
published in 2000 by Sigma Xi,
the Scientific Research Society

Why a modular course?

We want the educational resources we develop for geoethics to be used in a broad range of geoscience courses, only some of which might be devoted wholly or in large part to geoethics. Hence, we envision a strategy that will yield a granular array of resources that can be used in different ways, for different people over different time periods.

Minutes. In some cases, we want to provide small bursts of information that students can use for homework or for a few minutes in class: text, video, slides.

Tens of Minutes. In some cases, we want students to work with a little bit more information, or for a longer time, in a project that might take all or much of a class period, or that might be a homework project.

Class Periods. A topic might over one or more class periods, use a variety of resources, and employ several learning strategies.

2-3 Weeks. A ***module*** would be an integrated set of resources considered over the course of two or three weeks that would provide students with the opportunity to develop a deeper and more multi-dimensional understanding of material with an ethical dimension.

A Semester. A course in geoethics would be compiled from a selection of modules.

An individual teacher would choose to adopt or adapt the resource that fits the situation.

What is the target group of students?

The target audience for these resources includes mid- to upper-level geoscience undergraduates and early-stage geoscience graduate students. The individual modules will likely be useful in other courses as well, in geoscience departments and perhaps in departments of geography, environmental science, and geotechnical engineering. Many of the smaller bits will be useful even in the lowest-level undergraduate geoscience course.

How will course resources be made available?

We anticipate that course resources will be made available in association with the InTeGrate Program, utilizing the online resources maintained by SERC (serc.carleton.edu). We will also make resources available via the IAPG website (www.iapg.geoethics.org).

We plan to collaborate with professional organizations to help us promote these resources through presentations, workshops, short courses, newsletter articles, and other appropriate means. These groups will include the SERC community, National Association of Geoscience Teachers (NAGT; www.nagt.org), Geological Society of America (GSA; www.geosociety.org), American Geophysical Union (AGU; sites.agu.org), American Association of Petroleum Geologists (AAPG; www.aapg.org), American Institute of Professional Geologists (AIPG; www.aipg.org), Association of Environmental and Engineering Geologists (AEG; www.aegweb.org). We welcome other suggestions for groups we might collaborate with in developing or promoting educational resources for geoethics.

Is this aligned with other efforts in geoscience ethics?

The coauthors are all members of the International Association for Promoting Geoethics (IAPG; www.iapg.geoethics.org). IAPG is affiliated with the International Union of Geological Sciences, and the American Geosciences Institute. The coauthors met as part of a workshop on *Teaching Geoethics Across the Geoscience Curriculum* that was organized by Dave Mogk and others, with sponsorship from the National Science Foundation and participation from SERC (serc.carleton.edu). The current group that is working on developing a geoethics course are active members of many prominent geosciences organizations, including organizations that have their own codes of ethics. We plan to build upon this community of interest in developing educational resources.

How can I keep in touch with this project?

First, you should consider becoming a member of the International Association for Promoting Geoethics (www.iapg.geoethics.org). IAPG has a blog that we will be using to solicit input. Second, please communicate with any of the coauthors of this poster and let us know about your ideas and potential contributions.

Can I join the group and help build course resources?

It is safe to say that all of the current participants in this project are personally aware of our shortcomings. Nobody appointed us as Grand Poobahs of geoscience ethics. We have simply offered to contribute our experience, reflection, background reading, the fruits of our discussions, and our willingness to put honest, good-faith effort into the development of these resources. We would be delighted to have your help.

What do we hope geoscience students will gain from coursework in GeoEthics?

In addition to being able to understand and use the basic vocabulary employed in discussions of ethics (*e.g.,* terms such as ethics, morals, integrity, virtue, utility, character, justice, *etc.*), we would like students to be able to articulate informed commentaries that expand on the following:

- Why ethical behavior is important to our personal health and that of our community.
- The range of a geoscientist's responsibilities, from personal to global.
- That the health of a geoscience community is based on common understandings of right and wrong in the context of their disciplines.
- That formal frameworks exist within geoscience communities to address ethical issues, based on our community's understanding of moral philosophy. In some cases, this is codified the form of "codes of ethics" or "professional practice manuals."
- How a geoscientist can develop the ability to recognize and anticipate ethical issues, so that they can act appropriately.
- The community, legal, and employer-specified contexts for defining whether an action is appropriate often differ from one another in important ways.
- Resources are available to help a geoscientist navigate ethical issues as they occur.
- Intellectual processes have been developed over many years that can be used to help you discern viable solutions to ethical dilemmas, in which two "goods" are in conflict with one another. We would like to help students develop decision-making skills that will help them make appropriate ethical choices within the geosciences.
- We want to help students learn how to effectively communicate the rationale for ethical decisions.

What other ethical competencies do you believe should be included in this course? What should students know or be able to do after this course?

(Please contribute your thoughts below.)

Geoscience students should begin to see themselves as part of a broader community that shares certain understandings about what we ought to do.

Students should see themselves as developing scientists, not just story tellers who camp a lot.

What do we do with data that are perceived to be inconsistent with the rest of our data? Discard? Ignore?

Please put your ideas on a Post-It Note and contribute to this poster!
If you do, please also give us a legible email address so we can follow-up.

Suggested Modules
(2-3 weeks)

Intro module, covering basics of applied ethics: definitions, goals, moral reasoning, moral theories, dilemmas — 3 weeks

Module about the whistle-blower's dilemma, and other "righteous" acts that can get you fired — 2 weeks

Module about providing geoscience expertise to the general public — 1-2 weeks

Module about your responsibilities as a geoscientist toward stewardship of the planet and its environment — 2 weeks

Module about being an advocate for your client -- when is it appropriate, when not — 2 weeks

Module about geoscience workplace ethics — 1-2 weeks

Module about ethical issues related to ground water — 2 weeks

Module about using ethics as a criterion in deciding on a career path, or on a change in career — 1-2 weeks

Geothical Exercises
(a classroom discussion or homework)

A senior staff member asks you to cover something up. Do you speak up or keep quiet? How bad does it have to be for you to speak up?

You just landed the job you wanted in the town you want to live in. You are asked to do something you consider unethical. What are your options?

Your friend invites you over to see her dream home. You see that it was built low in a flood plain. What do you do?

An influential person in you community dismisses a geologic hazard as not worth wasting time on. You know better, but what do you do?

The last of the reagent is gone, and you have a "drop dead" deadline to finish the analysis by tomorrow. What do you do?

An active fault capable of a damaging earth-quake is found passing under an existing apartment complex. What do you do?

You are a middle-school science teacher. A student in your class says her family does not believe in evolution. What do you do?

Should we conduct sampling programs in a sensitive environment, like a wetland, that might be locally harmed by the act of sampling?

How do geoscience teachers balance the need to inform/teach the public/students with the desire to respect different worldviews.

Project Ideas
(a couple of classes to a week)

Ethical preservation or archiving of geoscience records: field notes, lab notes, photographs, videos — a day to a week

Ethical preservation of key outcrops that are part of our geoscience or educational heritage — a day or two

Codes of ethical behavior for geoscientists, and the idea of an ethical community — a week or so

The ethics of collecting or buying fossils — a day to a week

Other Ethical Problems and Issues

Should geologists assist development (homes, businesses, roads) in or near sensitive or hazardous areas (coastlines, hillslopes, wetlands, et cetera)

Recording map data as if it had been measured, when it was just guessed — discussion, maybe with short video

Pouring bad stuff down the drain pipe — discussion, maybe with short video

burying bad stuff in the back lot — discussion, maybe with short video

Fudging a measurement — discussion, maybe with short video

Using someone else's scientific/interpretive ideas without attribution, as if they were your own original work

Telling officials that you are eligible for an honor or funding when you're not — discussion

The ethical dimensions of decisions to build or remove dams — 2 weeks

Making sloppy or imprecise measurements — discussion, maybe with short video

What sort of care isneeded in working with native communities in remote/sensitive areas like the Arctic. How does this ethic extend to all such interactions.

Eating meat every day given related deforestation and starvation deaths

Should geologists support development in landslide-prone areas, such as the favelas in Brazil or the million-dollar homes in Colorado & Malibu?

Neglecting to (correctly) assess the uncertainty in field measurements

When structures are destroyed by storms/tsunamis along coastlines or by floods in floodplains, should they be rebuilt in the same place?

Geothical Case Studies

Oso Landslide - Why was anyone allowed to live there? Why are people living in similar places today? — a few days to a week

Jim Slosson and the Big Rock Mesa landslide, California — A day or so

Deadly debris flow at Pacifico, California -- avoidable if they had just looked over the fence — A day or so

Rebuilding in the lower 9th Ward of New Orleans, Louisiana

Vaiont Dam Disaster — A day or so

L'Aquila earthquake case — A day or so

Worthwhile Texts

Ariely, Dan, 2012, The (honest) truth about dishonesty -- How we lie to everyone, especially ourselves: New York, Harper Perennial, 312 p., ISBN 978-0-06-218361-3.

Ashmore, Robert B., and William C. Starr [editors], 1991, Ethics across the curriculum -- the Marquette experience: Milwaukee, Wisconsin, Marquette University Press, 259 p., ISBN 0-87462-998-5.

Barger, Robert N., 2008, Computer ethics -- A case-based approach: Cambridge, UK, Cambridge University Press, 245 p., ISBN 978-0-521-70914-9.

Bronowski, Jacob, 1965, Science and human values: New York, Perennial Library, 119 p., 0-06-097281-5.

Boyle, Gregory, 2010, Tattoos on the heart -- The power of boundless compassion: New York, Free Press, 217 p., ISBN 9781439153154.

Carter, Stephen L., 1996, Integrity: New York, Harper Perennial, 277 p., ISBN 978-0-06-092807-0.

Cronin, V.S., Di Capua, G., Palinkas, C.M., Pappas-Maenz, C., Peppoloni, S., and Ryan, A.-M., 2014, A collaborative effort to build a modular course on GeoEthics [abstract]: American Geophysical Union, Fall Meeting.

de Waal, Frans, 2009, The age of empathy -- Nature's lessons for a kinder society: New York, Three Rivers Press, 291 p., ISBN 978-0-307-40777-1.

Florman, Samuel C., 1987, The civilized engineer: New York, St. Martin's Press, 258 p., ISBN 0-312-02559-9.

Gert, Bernard, 1998, Morality -- its nature and justification: Oxford, UK, Oxford University Press, 408 p., ISBN 9780195122565.

Hare, R.M., 1981, Moral thinking -- its levels, method and point: Oxford, UK, Oxford University Press, 242 p., ISBN 0-19-824660-9.

Hoose, Seena, 1993a, Professional practice handbook [3rd edition]: Association of Engineering Geologists, Special Publication No. 5.

Hoose, Seena, 1993b, Symposium on ethical considerations in the environmental practice of engineering geology and hydrogeology: Association of Engineering Geologists, 36th Annual Meeting, San Antonio, Texas, 107 p.

Kerenskiy, Zoniitsa, 2014, Learning about arguments by making arguments: Teaching GeoEthics across the geosciences curriculum, Science Education Resource Center, accessed 15 July 2014 via http://serc.carleton.edu/case/activities/32118.html

Kevles, Daniel J., 1998, The Baltimore case -- A trial of politics, science, and character: New York, W.W. Norton & Company, 509 p., ISBN 0-39331970-9.

Landau, Russ Shafer, 2012, The fundamentals of ethics [2nd edition]: Oxford, UK, Oxford University Press, 338 p., ISBN 978-0-19-977355-8.

Landau, Russ Shafer, 2013, The ethical life -- Fundamental readings in ethics and moral problems [3rd edition]: Oxford, UK, Oxford University Press, 489 p., ISBN 978-0-19-977355-8.

Lollino, G., Arattano, M., Giardino, M., Oliveira, R., and Peppoloni, S., [eds.], 2014, Engineering geology for society and territory - Volume 7 Education, professional ethics and public recognition of engineering geology: Springer, 274 p.

MacIntyre, Alasdair, 1998, A short history of ethics -- A history of moral philosophy from the Homeric Age to the Twentieth Century [2nd edition]: Notre Dame, Indiana, University of Notre Dame Press, 280 p., ISBN 0-268-01759-X.

Martin, Mike W., and Roland Schinzinger, 2010, Introduction to engineering ethics [2nd edition]: Boston, MA, McGraw-Hill Higher Education, 270 p., ISBN 978-0-07-248311-6

Martin, Mike W., and Roland Schinzinger, 1989, Ethics in engineering [2nd edition]: New York, McGraw-Hill Book Company, 404 p., ISBN 0-07-040719-3

Mogk, David, 2014, How to teach GeoEthics: State your case, Science Education Resource Center, accessed 15 July 2014 via http://serc.carleton.edu/geoethics/how_teach_geoet.html

National Academies, 2009, On being a scientist -- A guide to responsible conduct in research [3rd edition]: Washington, D.C., National Academies Press, 63 p., ISBN-13 978-0-309-11970-2

Oreskes, Naomi, and Erik M. Conway, 2010, Merchants of doubt -- How a handful of scientists obscured the truth on issues from tobacco smoke to global warming: New York, Bloomsbury Press, 355 p., ISBN 978-1-60819-394-3.

Peppoloni, S., and Di Capua, G., 2012, Geoethics and geological culture -- Reflections from the Geoitalia Conference 2011: Annals of Geophysics, v. 55, no. 3, accessible via http://www.annalsofgeophysics.eu/index.php/annals/issues/view/482

Quinton, Anthony, 1989, Utilitarian ethics: La Salle, Illinois, Open Court, 116 p., ISBN 0-8126-9052-4.

Sher, George, [editor], 2001, John Stuart Mill, Utilitarianism [2nd edition]: Indianapolis, Indiana, Hackett Publishing Company, 71 p., ISBN 978-0-87220-605-2.

Shuirman, Gerard, and Slosson, James E., 1992, Forensic engineering -- Environmental case histories for civil engineers and geologists: San Diego, California, Academic Press, 296 p., ISBN 0-12-640740-1.

Sigma Xi, 2000, Honor in science: Research Triangle Park, North Carolina, Sigma Xi, 41 p., ISBN 0914446142.

Singer, Peter, 1993, Practical ethics [2nd edition]: Cambridge, UK, Cambridge University Press, 395 p., ISBN 9780521439718.

Stichler, Richard N., and Robert Hauptman [editors], 1998, Ethics, information and technology: Jefferson, North Carolina, McFarland & Company, 323 p., ISBN 0-7864-0392-6.

Wenner, J.M., and Baer, E.M., 2014, The math you need when you need it: Science Education Resource Center, accessed 15 July 2014 via http://serc.carleton.edu/mathyouneed/index.html

Weston, Anthony, 2013, A 21st Century ethical toolbox [3rd edition]: New York, Oxford University Press, 545 p., ISBN 978-0-19-975881-4.

Wyss, M., and Peppoloni, S., [eds], 2015, Geoethics, ethical challenges and case studies in Earth science: Elsevier, 450 p., ISBN 978-0127999357.

Text Suggestions?

Does moral philosophy have anything to offer the geosciences that will help each of us to do what we *ought* to do: to tell the truth, to be a good scientist, to be an informed voice for our planet and its inhabitants, to act with justice?

Teaching GeoEthics Across the Geoscience Curriculum
http://serc.carleton.edu/geoethics/index.html

Join Us!
http://www.iapg.geoethics.org