Remote Sensing for Environmental Monitoring and Change Detection
Edited by Manfred Owe & Christopher Neale. IAHS Publ. 316 (2007) ISBN 978-1-901502-24-4, 288 + viii pp. Price £55.00

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Heavy metals in European soils

New maps are online that show estimated total heavy metal concentrations of eight metals (arsenic, cadmium, chromium, copper, mercury, nickel, lead and zinc) using 1588 geo-referenced topsoil samples from the European geochemical database. The concentrations were interpolated using block regression-kriging. Nice feature: The maps can be viewed in Google earth. See: http://eusoils.jrc.it/foregshmc/

El futuro de la ciencia del suelo

The IUSS book "The Future of Soil Science" has been translated in Spanish by Dr. Miguel Angel Segura Castruita, Professor of Soil Science at the Instituto Tecnológico de Torreón in México. The book contains the views from 55 soil scientists in 28 countries and is a palette of opinions and views reflecting great diversity but also several commonalities. The English and Spanish version can be freely downloaded from the IUSS website – see www.iuss.org

"You are earth, you feed on earth, and you'll return to earth"

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The importance of soil to humankind as producer, carrier, filter, and buffer is currently underlined (Various Authors 2004; Bouma 2006). We feel, however, that soil deserves wider consideration also by virtue of other less obvious functions that fulfill ancestral sanitary, psychological, and social humans' needs. "Terra es, et de terra vivis, et in terram reverteris" ("You are earth, you feed on earth, and you'll return to earth") stated Saint Bernard of Clairvaux (1091-1153) in his work *Meditationes piissimae de cognitione humanae conditionis*. As a matter of fact, our relationship with soil lasts from birth to death, often unconscoiusly.
The first contact with soil can be the regular and intentional consumption of it, *geophagy*, which is still practiced by pregnant women and children worldwide (Wilson 2003). "Edible" earth may supplement poor-diets (Hooda et al. 2004) and is purchased in markets or taken from termite mounds, hut walls, and riverbeds. Adding earthy material to toxic or bitter foods to enable their consumption is a widespread practice (Johns and Duquette

1991). Carbonates have an obvious antacid effect, while some types of clay are even efficient at removing radionuclides from gastric juices (Barth and Bruckner 1969). Furthermore, it must be emphasized that much of the microflora of the gut that builds up resistance to diseases is derived originally from soil. Just from the soil Selman A. Waksman isolated the streptomycin, the first antibiotic active against tuberculosis (Waksman and Woodruff 1941). In recognition for his discovery, Dr Waksman was awarded the Nobel Prize in Medicine in 1952. However, realistically there is a great deal of literature reporting negative effects of geophagy, such as anaemia (Stokes 2006), chronic poisoning by heavy metals (Sheppard 1998), intestinal occlusion (Yé et al. 2004), perforation of the colon (Woywodt and Kiss 1999), and infections with intestinal helminthes (Luoba et al. 2005).

If the internal protective role of soil toward humans is debatable, undeniable is the external role, from both a factual and psychological point of view. Throughout history, most societies have used masks composed of earth materials to disguise or protect the face in battle, theatrical performances, or parties. Nowadays, clay facemasks are used for therapeutic or aesthetic reasons, since they stimulate the circulation of the blood and lymph systems, remove dead skin cells, absorb surface fats, tone and strengthen the connective tissues (Carretero 2002; Poensin et al. 2003). More importantly, soil products are used for protection for humans in the guise of houses. An estimated 1.5 billion people live in houses constructed of unfired earth (Keefe 2005). Plinthite (Gr. *plinthos*, brick) is a iron-rich and humus-poor soil horizon that simply requires to be cut into blocks and left to air-dry to form hard bricks. Soil houses are virtually fireproof and can withstand moderate earthquake shocks thanks to their ductility. Furthermore, the exhalation rate of dangerous radon (Wakefield and Kohler 1991; Law et al. 2000) from adobes is much less than that from concrete or other building materials (Minke 2006). Remarkable are the advantages of using such adobes in terms of energy saving, taking into account that the embedded energy required to produce one cubic metre of building material amounts to 10 kWh m^{-3} for sun-dried soil, 590 kWh m^{-3} for perforated fired bricks, 800 kWh m^{-3} for concrete blocks, 2640 kWh m^{-3} for ordinary Portland concrete (Keefe 2005). As a consequence, soil buildings are in increasing demand in many countries (Minke 2006). Soil contributes to saving energy also when placed untreated over the roofs and turfed, providing efficient thermal insulation (Takakura et al. 2000).

Soil can also fulfil non-primary needs of humans, such as that of expressing creativity. *Nazca Lines* are hundreds of gigantic individual figures, ranging in complexity from simple lines to stylized human and animal figures drawn on the Nazca Desert, Peru, between 200 BC and 700 AD. These features, the longest of which is nearly 270 m, were made by removing the iron oxide coated pebbles that cover the surface of the desert and that contrast with the light-colored earth underneath. Much more recent is *Marree Man*, the largest manmade artwork in the world. This geoglyph depicts a 4.2-km high man holding a boomerang and was made in Australia by anonymous creators using a 2.5-m wide, eight-tine plough attached to a tractor. The use of soil in art has not been surpassed by the development of more sophisticated materials. In contrast, it has experienced a revaluation thanks to contemporary art (Fig. 1). Jean Dubuffet coined the term "art brut" to indicate an art free from intellectual implications, appearing primitive and child-like. Dubuffet himself, Burri, Donati, Fautrier, Mathieu, Soulages, and Tàpies used bulk soil, single size fractions of soil, or tar in their artworks. "Earth art" is a form of art come to prominence in the late 1960s, with personalities such as Heizer, Long, Oppenheim, and Smithson. Earth art uses items from the natural environment, such as soil and rocks, and "earthworks" are prepared in the open air and left weathering there.

After affecting several aspects of life, our final contact with soil in most cases is burial. Soil plays a crucial role in preventing spread of germs from corpse decomposition and, thus, risk of infections for living beings. The decay of our remains within soil implies formation of a discrete, ephemeral 'hot spot' of biological activity directed towards the slow release of elements to the wider ecosystem (Carter et al. 2007). Part of "our" carbon is transformed into adipocere, a mix of waxy grave substances that reside in soil for several centuries (Berstan et al. 2004) and that could be viewed as our last, small, personal contribution to counteract global climate change, the present-age bogeyman.

Fig. 1 *In 1998, soil rose to the dignity of the masterpiece per se thanks to Maurizio Cattelan: 8x5x5-m soil cube sustaining an olive tree at permanent collection of Castello di Rivoli, Turin, Italy (photo courtesy of Museo d'Arte Contemporanea)*

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Soils on the web: Te Ara

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Te Ara or "the pathway" is the new online *Encyclopaedia of New Zealand*, the world's first purpose-written online encyclopaedia. The general site address is www.teara.govt.nz. Te Ara is published by the Ministry for Culture and Heritage with the general editor being eminent social historian Jock Phillips, appointed in May 2002. Work began on the project in July 2002 and so far three of nine broad themes have been published: "New Zealanders" (launched 8 February 2005), "Earth Sea and Sky" (12 June 2006), and "The Bush" (24 September 2007). Photographs, sounds, moving images, documents, graphs and maps are

combined with text. Links provide pathways to the digital collections of libraries, archives and museums around the country. Te Ara allows for the inclusion of community contributions such as photographs, oral histories, or updates of information.

Te Ara is first New Zealand government-sponsored encyclopaedia since the three-volume *An Encyclopedia of New Zealand* (edited by A.H. McLintock) was published in 1966. At the planning stage it was decided to design it specifically for the internet because that is where many people now seek information. Although other encyclopaedias are available on the internet, they are almost all printed versions that have been digitized. That Te Ara has been designed for the internet offers many advantages:

- Information can be corrected or updated
- Electronic files such as video clips can be included
- It is freely available anywhere in the world
- Many more illustrations can be used than in a print version
- Links to other websites can be incorporated

Te Ara is a unique, authoritative source of information on New Zealand topics. Articles are prepared by or in conjunction with subject specialists and then reviewed and edited. All the entries with substantial Maori content have been translated into Maori. Te Ara is immediately accessible at school, in the work place, in public libraries, or at home. Although it works best with broadband, it is designed to be used with slower dial-up connections. Abundant illustrations and video clips make it an attractive site to view. Currently the site receives over 6,000 visitors a day.

Information in Te Ara is layered to help make it accessible to a wide range of people. Language in the text is aimed at the average newspaper reader, avoiding technical jargon as far as possible. Every article has a "Short Story" – a one-page summary written in simple English for younger children or those whose first language is not English. Browsers can read the text and open up accompanying illustrations as they go, or work through all the illustrations in a separate gallery. Every page, or an entire article, is easily downloaded in a printable format. For those who want more information, each article has a "Further Sources" section, with links to up to half-a-dozen relevant websites, as well as books. Parts of Te Ara are being published in book form, for example "Maori Peoples of New Zealand" was published in 2006 and "Living on the Edge: Natural Hazards in New Zealand" is being published in November this year by David Bateman Ltd in association with the Ministry for Culture and Heritage.

The latest theme includes articles on soil science by Allan Hewitt and Phil Tonkin. Allan provides an overview entitled "Soils" under the broad heading "Landscapes" (Hewitt 2007). Phil's history of soil science in New Zealand (a longer version appeared in two earlier issues of *NZ Soil News* this year) is summarised in "Soil Investigations" under the heading "Understanding the Natural World" (Tonkin 2007) (e.g. see Fig. 1). A fascinating personal account of Charles Wright's early days as a pedologist/ecologist in New Zealand 1936-1958 is documented on a PDF link with the latter article.

Many other profusely illustrated and wide-ranging articles relevant to geosciences are available in "The Bush" such as wetlands, lakes, geomorphology, and perceptions of landscapes. Similarly, the theme "Earth, Sea and Sky" includes aspects of the marine realm, natural resources, and the shaping forces such as geology and climate and associated natural hazards and disasters. The theme "New Zealanders" comprises articles on Maori tribes and later immigrant groups who settled in New Zealand. It also includes articles such as Pacific migration, canoe navigation, and the timing of initial Polynesian settlement. There are also sections in Te Ara entitled "New Zealand in Brief", "New Zealand Peoples", and "Places", the last being a series of articles on 22 regions in New Zealand (such as Bay of Plenty or Canterbury), of which seven are now available.

Those who have prepared articles for Te Ara will attest to the fact that they are deceptively difficult to write and illustrate within strict word limits and appropriate levels of understanding. For example, in writing the entry on "Volcanoes" under "Natural Hazards and Disasters", Smith et al. (2006), commissioned to write 3000 words, submitted an article of about 14,500 words together with more than 120 illustrations. The entry was subsequently edited down to about 4,500 words and 55 illustrations.