MEDICAL GEOLOGY

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Geological Survey of Sweden

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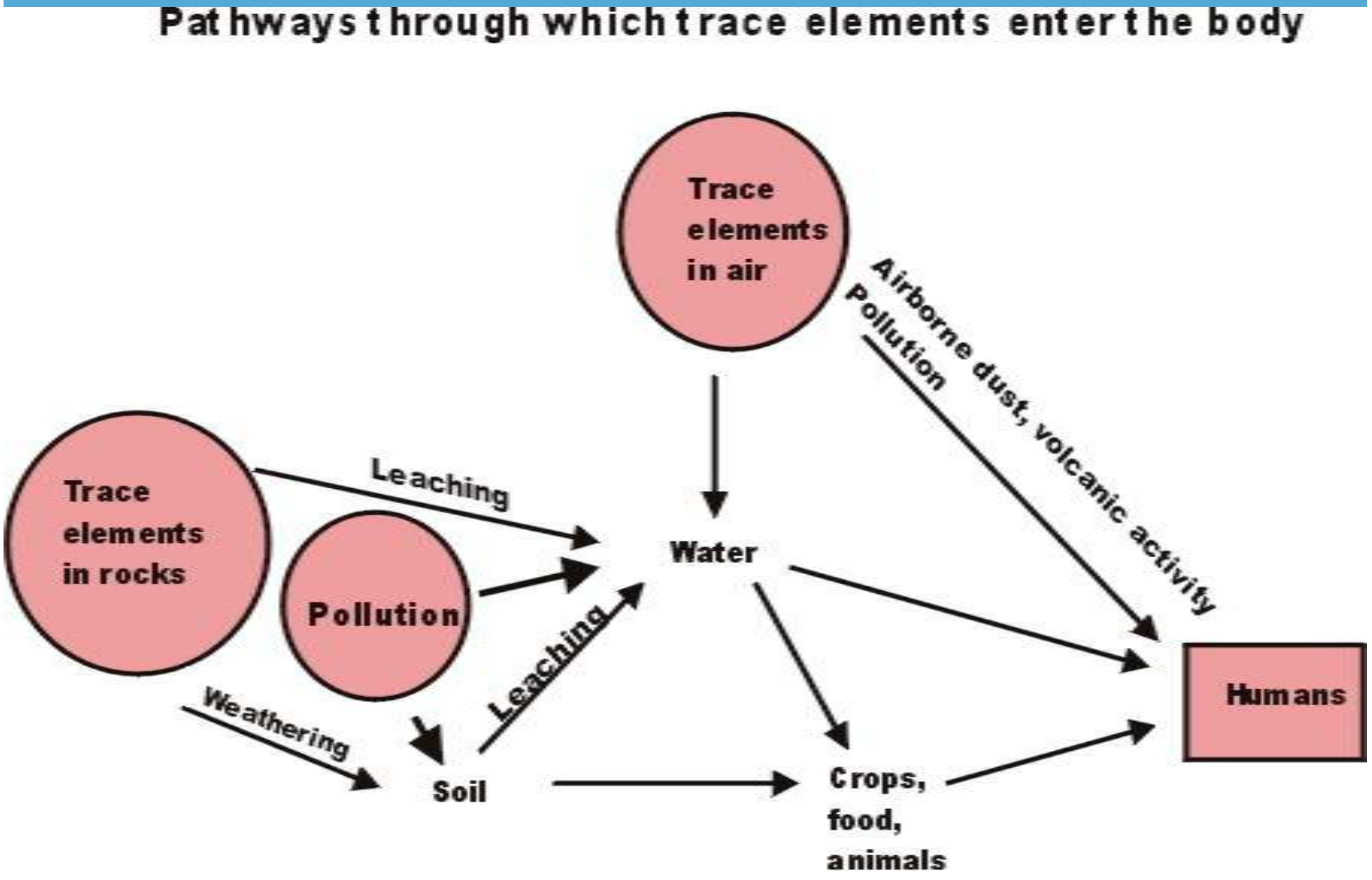
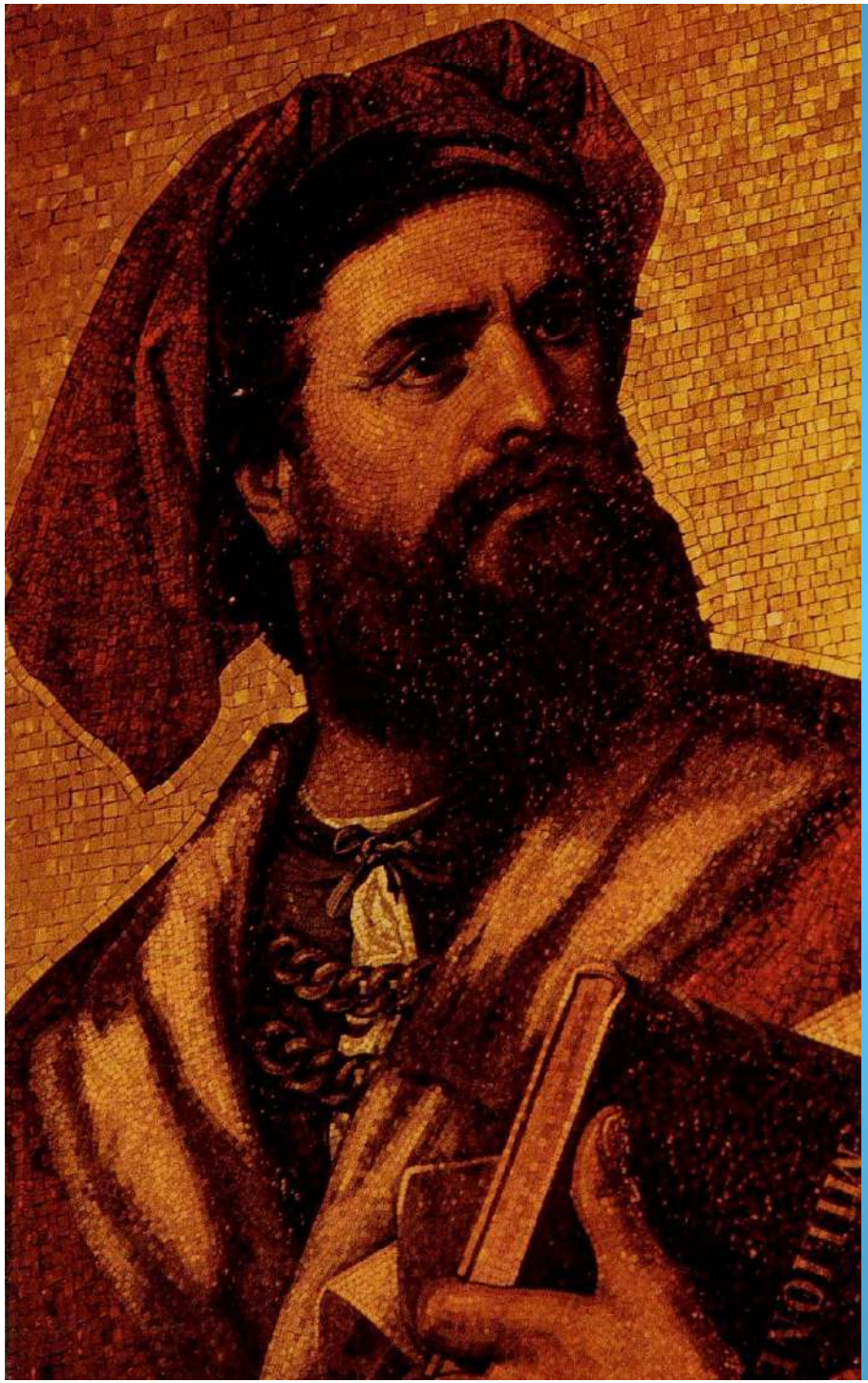
"Medical Geology"

- the science dealing with the relationship between natural geological factors and health in man and animals


PINATUBO
2 days 1991
10 billion tonnes of magma
20 milj ton SO2
600 000 ton Cu
800 000 ton Zn
1 000 ton Cd
300 000 ton Ni
550 000 ton Cr
10 000 ton As
800 ton Hg
60 volcanoes per day
>3000 vent fields at mid ocean ridges

PATHWAYS


Pathways through which trace elements enter the body
Trace elements in air
Airborne dust, volcanic activity
Pollution
Trace elements in rocks
Leaching
Pollution
Water
Leaching
Weathering
Soil
Crops, food, animals
Humans

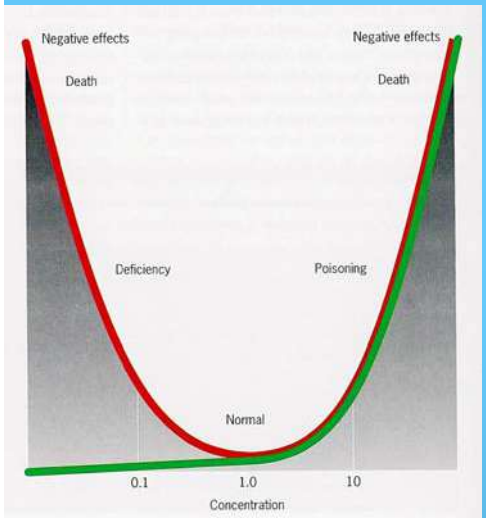


HIPPOCRATES
460-377 BC

MARCO POLO
1270

Diseases at state of deficiency respectively toxicity caused by the same element

Element	Deficiency	Toxicity
Iron	Anaemia	Haemochromatosis
Copper	Anaemia "Sway back"	Chronic copper poisoning Wilson-, Bedlington-disease
Zinc	Dwarf growth Retarded development of gonads Akrodermatitis entero-pathica	Metallic fever Diarrhoea
Cobalt	Anaemia "White liver disease"	Heart failure Polycythaemia
Magnesium	Dysfunction of gonads Convulsions Malformations of the skeleton Urolithiasis	Ataxia
Chromium	Disturbances in the glucose metabolism	Kidney damage (Nephritis)
Selenium	Liver nechrosis Muscular dystrophy ("White muscle disease")	"Alkali disease" "Blind staggers"



United Nations Educational, Scientific and Cultural Organization.

IGCP #454 Medical Geology

IUGS

IUGS SPECIAL INITIATIVE ON MEDICAL GEOLOGY

International Working Group on Medical Geology

IUGS Initiative on Medical Geology

- 1998- International Working Group on Medical Geology
- 1999-2004 UNESCO IGCP#454 Medical Geology
- 2002-2003 ICSU Medical Geology
- 2003-2005 IUGS Special Initiative on Medical Geology
- 2004- 4 Geo Union Initiative
- 2004- ICSU Science for Health and Well being
- 2005- International Medical Geology Association
- 2007-2009 International Year of Planet Earth

SUPPORTING ORGANISATIONS

- International Union of Geological Sciences (IUGS)
- COGEOENVIRONMENT
- UNESCO
- International Council of Scientific Unions (ICSU)
- Geological Survey of Sweden (SGU)
- United States Geological Survey (USGS)
- US Armed Forces Institute of Pathology (AFIP)

70 MEMBER COUNTRIES

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BI-ANNUAL NEWSLETTER

December 2003

MEDICAL GEOLOGY NEWSLETTER

IUGS Special Initiative on Medical Geology

Newsletter No. 7
ISSN 1651-5250

NEW INTERNATIONAL MEDICAL GEOLOGY ASSOCIATION (IMGA)

Participants at the Medical Geology Course, Campinas, Brazil

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http://www.medicalgeology.org

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MEDICAL GEOLOGY

IUGS Special Initiative, IGCP project #454 Medical Geology and International Medical Geology Association

NEWS SPONSORS

Updated September 7, 2004

NEW MEMBER Africa ESAAMEG Norwegian group Malaysian group Brazil

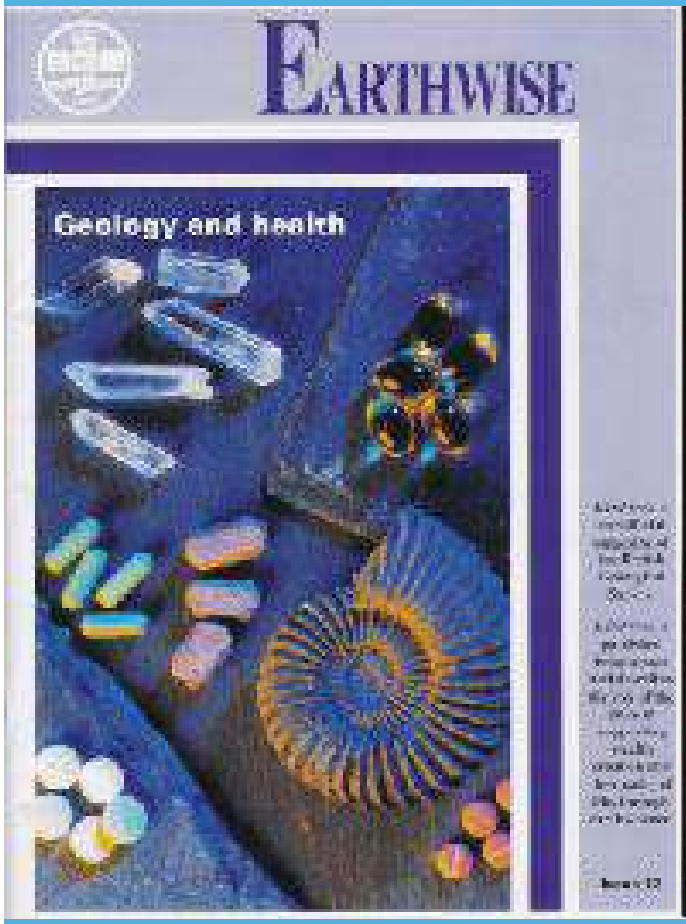
Medical Geology meeting at SGU in Sweden 14 September.

New brochure on medical geology for downloading (Earth and Health theme under "Planet Earth")

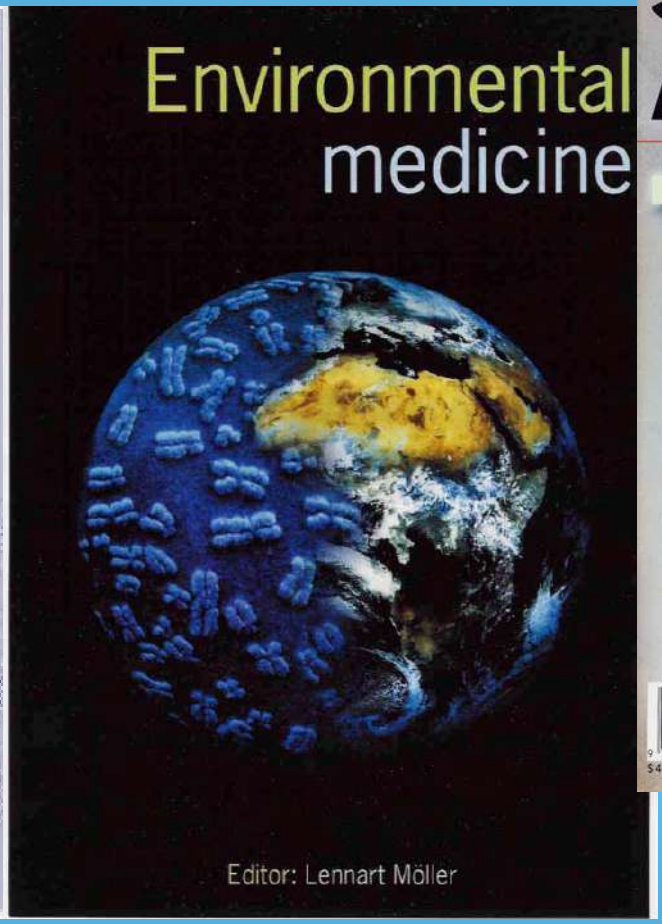
AN EXTENSIVE REPORT ON Medical Geology 2000-2004

Notes on the medical geology meeting in Florence,August 2004

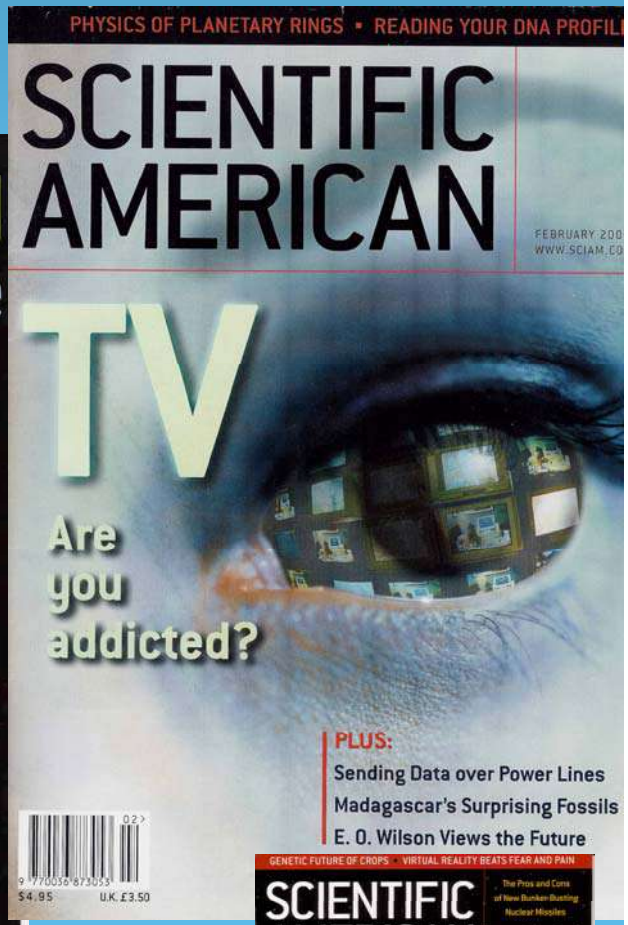
Internationellt genomslag



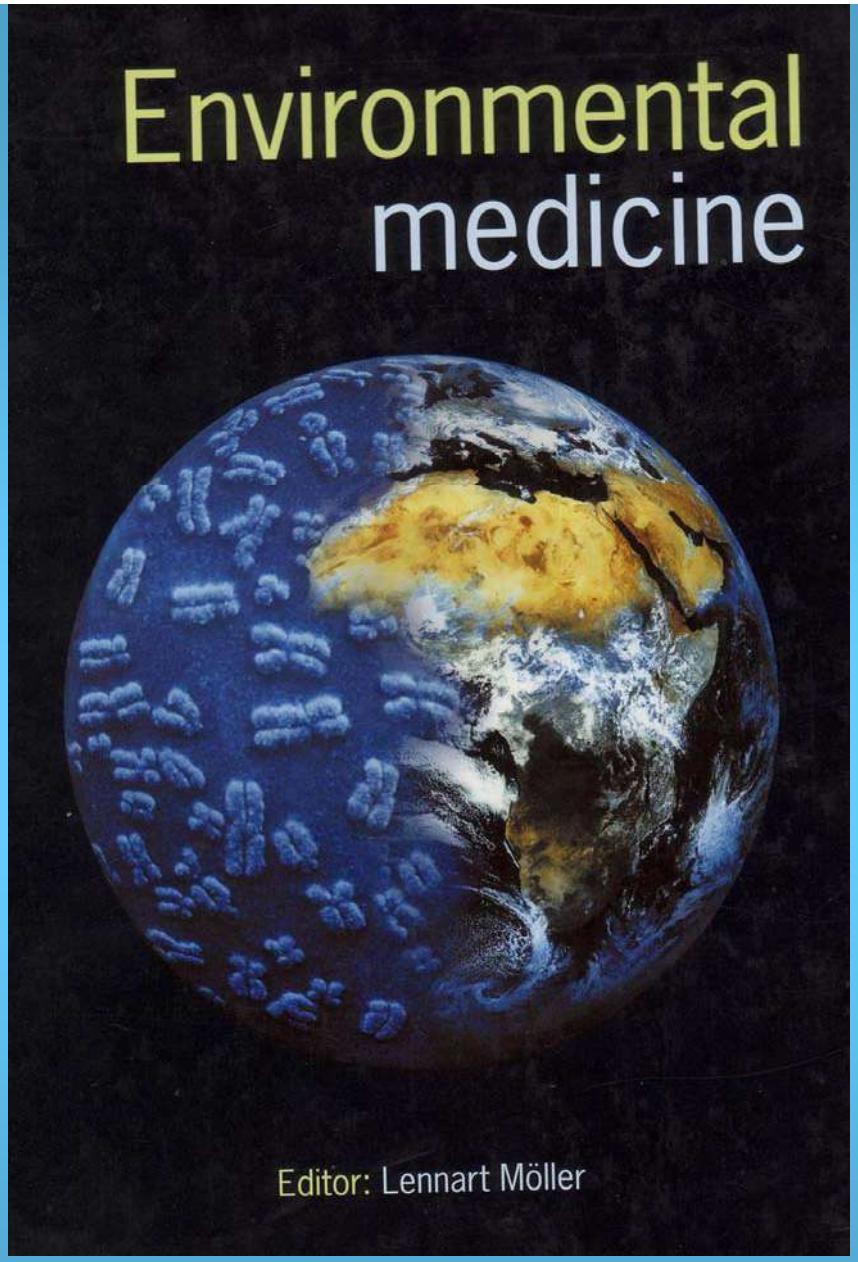
England



Sverige



USA



CHAPTER 10

Medical geology

OLLE SELINUS AND ADRIAN FRANK

Mother nature is a polluter

In June 1991 the volcano Pinatubo had an eruption. Over just two days the volcano ejected about 10 billion tons of magma and 20 million tons of sulphur dioxide, and the resulting aerosols influenced the global climate for at least three years. This event alone introduced 2 million tons of zinc, 1 million tons of copper and 5,500 tons of cadmium into the surface environment. The millions of tons of ash pumped into the atmosphere spread over thousands of square kilometres, probably containing all the elements in the Periodic System. In addition to the elements known to be essential to life, such as hydrogen, carbon, nitrogen, oxygen, sodium, potassium, calcium, magnesium, iron, copper, zinc, phosphorus, sulphur and iodine, volcanoes also redistribute those elements which under certain conditions are regarded as harmful, such as arsenic, beryllium, cadmium, mercury, lead, radon and uranium plus the remaining elements, some of which have still undetermined biological effects. Similar volcanic events have occurred every few years throughout geological history (Figure 1). From the standpoint of natural releases of metals to the environment, it is important to realize that there are on an average 60 volcanoes erupting on the surface of the earth at any given time. The total flux of metals from these eruptions is significant. Submarine volcanism is even more significant than that at continental margins. It has been conservatively estimated that there are at least 3,000 vent fields on the mid-ocean ridges.

FIGURE 1 **Volcanic eruption at Krafla, Iceland 1980.**

The planet earth is thus the ultimate source of all metals. Metals are ubiquitous in the lithosphere, where they are inhomogenously distributed and occur in different chemical forms. Ore deposits are merely natural concentrations which are commercially exploitable. While such anomalous accumulations are the focus of mineral exploration the background concentrations of metals which occur in common rocks, sediments and soils are of greater significance to the total

METALS, HEALTH AND THE ENVIRONMENT
- MEDICAL GEOLOGY-

INTERNATIONAL SHORT COURSES

June 28 – June 29, 2001
School of Mines - University of Zambia
Lusaka, Zambia

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COGEOENVIRONMENT

- **Zambia June 2001**
- **Chile March 2002**
- **Russia May 2002**
- **Japan November 2002**
- **New Zealand Feb. 2003**
- **Lithuania 2003**
- **Puerto Rico May 2003**
- **China June 2003**
- **Scotland Sept. 2003**
- **Brazil November 2003**
- **Australia, Malaysia Dec 2003**
- **Romania Febr. 2004**
- **Hungary May 2004**
- **Italy August 2004**
- **Canada Oct 2004**
- **Australia, Nov 2004**
- **India, Dec 2004**
- **Romania May 2005**
- **USA June 2005**
- **Brazil, Argentina, Uruguay**
- **USA, June 2005**
- **Egypt, Turkey Sept 2005**
- **Ireland. Sweden, Oct 2005**
- **Puerto Rico Nov 2005**

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International Geological Cooperation Program, IGCP#454, Medical Geology
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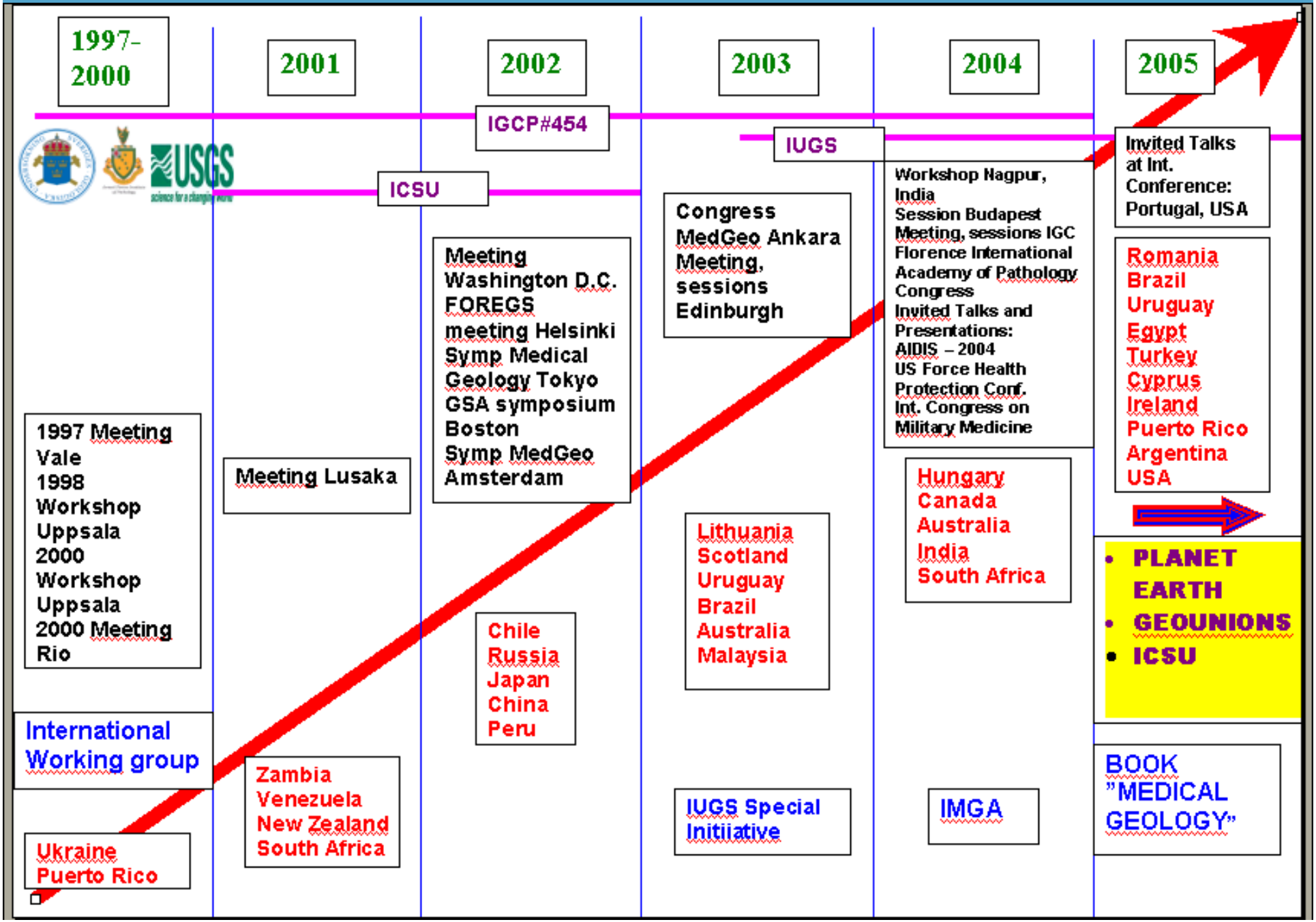
CRC for Landscape Environments and Mineral Exploration (CRC LEME), Australia
Geoscience Australia (GA)
Institute of Geology and Geography, Lithuania (GGI)
Vilnius University (VU)

ACCOMPLISHMENTS

- **Courses, Syllabus, CDs**
- **Sponsoring of scientists from developing countries**
- **Local working groups established all over the world**
- **Special sessions , key note lectures at conferences (medical and geological)**
- **Registry on Medical Geology which will serve as a central facility for the study of pathological materials and exchange of medico/clinical information on medical geology.**
- **US Museum of Medicine, Washington DC**
- **Conferences in US and other countries**
- **Newsletter**
- **Web site (domain medicalgeology.org)**
- **Proposals for journals by Elsevier and Geol Soc London.**
- **Publications in journals and books**
- **Geology and Health - book**
- **Essentials on Medical Geology**
- **Centers for medical geology.**
- **Close collaboration between geoscientists, medics, epidemiologists, toxicologists, pathologists etc**
- **Medical Geology included in curricula at universities**
- **IMGA**

MEDICAL GEOLOGY Development



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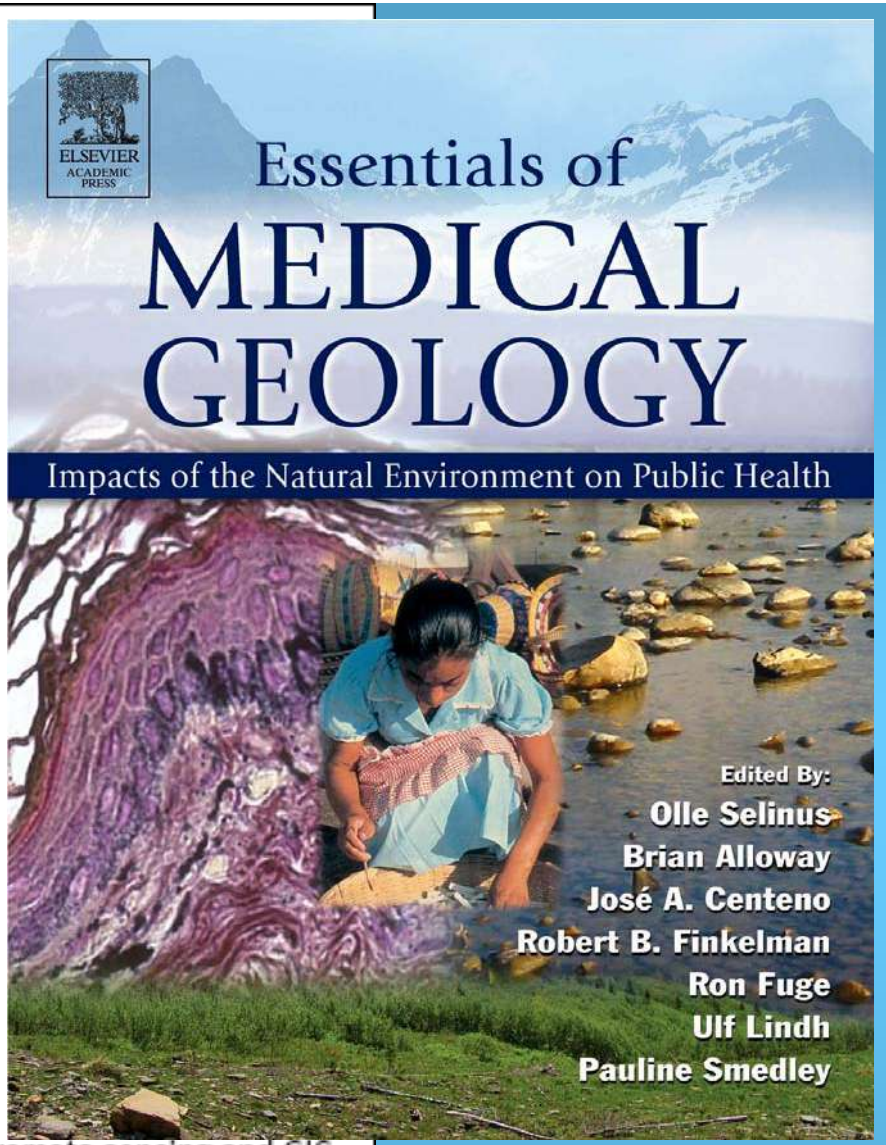

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New big initiatives

- **ICSU - Health and Well being**
- **GeoUnion Initiative**
- **Planet Earth**

• GeoUnion Initiative

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Hazards	David Alexander	***Tom Beer***	Peter Bobrowsky	Rob Fitzpatrick Marcello Pagliai	Piero Boccardo
Health	Mark Rosenberg	Claire Horwell	***Olle Selinus***	Eiliv Steines	Amy Budge

PLANET EARTH

2007-2008-2009

Declared by UN 2005

- **Groundwater - reservoir for a thirsty planet**
- **Hazards - minimising risk, maximising awareness**
- **Earth &Health - building a safer environment**
- **Climate - the 'stone tape'**
- **Resources - sustainable power for sustainable development**
- **Megacities - going deeper, building safer**
- **Deep Earth - from crust to core**
- **Ocean - Abyss of time**

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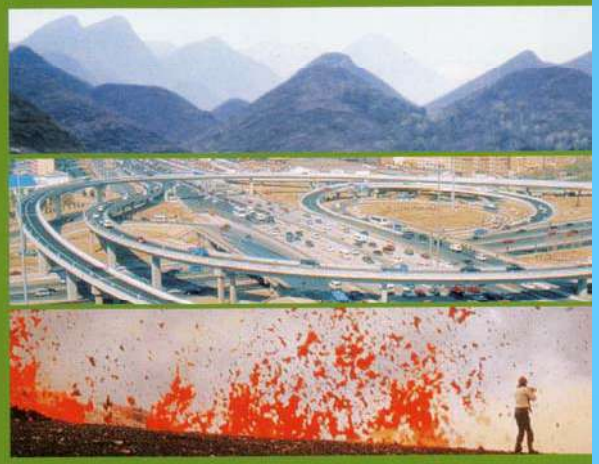

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Thank you! Any questions?