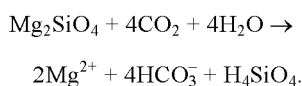


## Let the earth help us to save the earth

The editorial by Balamram<sup>1</sup> on 'Carbon dioxide, climate change and geoengineering' illuminates some of the dilemmas, and mentions some ways to mitigate the climate change problem. I want to draw attention to the most natural method to combat climate change, the process that has kept the CO<sub>2</sub> levels of the atmosphere within reasonable bounds throughout geological history, namely the process of chemical weathering. Chemical weathering is the neutralization of carbonic acid with minerals. For olivine, the most common silicate on earth, with a composition close to Mg<sub>2</sub>SiO<sub>4</sub>, this weathering reaction can be written as follows:



In this way CO<sub>2</sub> will reach the oceans as bicarbonate, where it will be sustainably sequestered as carbonate sediments.

At present this process is not able to cope with the large volumes of CO<sub>2</sub> set free by the combustion of fossil fuels, resulting in a rapid rise of the atmospheric CO<sub>2</sub> levels. We have proposed to enhance the rate of weathering in order to reach a new balance between CO<sub>2</sub> input and output<sup>2</sup>.

Weathering is a process that takes place at the interface between solid rock and air. When we want to enhance weathering, we must increase the reactant surface. This can be done by mining and milling large volumes of olivine rock, and spread the powder over the land surface of the earth or in shallow seas, and then let nature do its work.

The most efficient way of achieving this goal is through large open-pit olivine mines in wet tropical countries, spreading the olivine powder in the wider surroundings of these mines. This has the following advantages:

- Weathering proceeds fastest under wet tropical conditions.
- In most countries under consideration, wages are still low, making mining less expensive than elsewhere.
- By spreading the powder not too far from these mines, transport costs can be kept low.
- By creating large mines, one can use the economy of scale.
- It will bring employment and boost the economies of developing countries.

It is self-evident that the industrialized nations should pay, probably through a system of carbon credits.

Some possible countries with large deposits of olivine rocks are – Asia: New Caledonia, Philippines, Indonesia, China, Thailand, India, Oman; Africa: Guinea, Sierra Leone, Ivory Coast, Madagascar, Congo; America: Cuba, Colombia, Brazil and Guatemala.

We have calculated that using the above advantages, the cost per tonne of CO<sub>2</sub> that is sustainably sequestered by this method will fall below 10 Euro per tonne, as opposed to price levels of 60–100 Euros for CCS, the method in which CO<sub>2</sub> from stack gases of power plants, oil refineries or cement factories is captured, purified, compressed and pumped into abandoned gas fields. These prices do not even include the cost of permanent monitoring of CO<sub>2</sub> storage.

1. Balamram, P., *Curr. Sci.*, 2008, **95**, 291–292.
2. Schuiling, R. D. and Krijgsman, P., *Climatic Change*, 2006, **74**, 349–354.

R. D. SCHUILING

*Institute of Geosciences,  
P. O. Box 80021,  
3508 TA, Utrecht,  
The Netherlands  
e-mail: schuiling@geo.uu.nl*

## More on D. D. Pant

As a historian, one of the main reasons that I subscribe to *Current Science* is for its obituaries. Scientists famous and obscure are honoured, after their death, by tributes that carefully describe and evaluate the deceased person's career and provide rich glimpses of their personality. The recent obituary of D. D. Pant by S. N. Thakur (*Curr. Sci.*, 2008, **95**, 786–787) is typical. It goes over the details of Pant's education, employment and main fields of research, while giving a sense of his deep humanism and commitment to Gandhian values. Still, I may be permitted to add a few details which the obituarist missed, which pertain to the 'humanist' rather than 'scientific' side of the physicist's achievement. For, aside

from his contributions to the universal science of spectroscopy, Pant made major contributions to the cultural life of his native Uttarakhand. He was one of the founders of the Uttarakhand Kranti Dal, which led the movement that, in turn, led to the creation of the state of Uttarakhand. He was a founder-adviser to the remarkable Hindi journal, *Pahar*, which in the twenty-five years of its existence has published many landmark essays on the cultural and ecological history of the Himalaya. Finally, Pant also inspired the 'Askot-Arakot Abhiyan', a march conducted every ten years across the breadth of the Uttarakhand Himalaya by young men and women dedicated to his own ideals of a just and humane society.

These details, intended to supplement rather than contest Thakur's appreciation, perhaps go to confirm the argument made recently in these pages that the best scientists often have an interest in matters well outside their own domain of specialization. Long before the slogan 'think globally, act locally', became popular, its essence was captured by D. D. Pant, through his own rare combination of scientific excellence and social concern.

RAMACHANDRA GUHA

*22A, Brunton Road,  
Bangalore 560 025, India  
e-mail: ramguha@gmail.com*