

Mine waste pollutes Mediterranean

Sir — Garcia-Guinea and Huascar¹ discuss the catastrophic environmental impact of huge quantities of waste materials from polymetallic ore mining in South America. A similar situation — fortunately without such dramatic consequences so far — affects the southwest Mediterranean coastline.

Spain, Morocco, Algeria and Tunisia have a variety of volcanic-related mineral deposits (especially oxides, sulphides and sulphosalts of base and precious metals). Southeast Spain has been mined since 3000 BC, and has more than 120 abandoned mines — the highest number in Europe — concentrated along approximately 300 km of the Mediterranean coastline. Immense quantities of metal sulphides (lead, zinc and silver in Cartagena, Sierra Almagrera), precious metals (gold and silver in Rodalquilar, Las Herrerías) and mercury-antimony (Valle del Azogue) have been extracted; some mines are still active (for example, the Las Herrerías open pit).

Over the past six years, I have led several mineralogical, geochemical and metallogenetic research projects in this region, in cooperation with the Spanish Comisión Interministerial de Ciencia y Tecnología and IUGS/Unesco^{2,3}. There are no regional environmental studies of the intense mining activity of the area. (There are more than 2,000 mining pits and 230 tailing dams and dumps in the province of Almería alone⁴.) There are also industrial and ore-dressing plants close to the coast.

Despite this huge volume of mining

waste, no geochemical mapping of the toxic element anomalies has been carried out — unlike in other major mining districts (for example the Iberian ‘Pyrite Belt’⁵, the Tees River basin⁶) — and no data exist about the geographical distribution patterns of the mining-related chemical elements.

Monitoring studies of metal distribution are only local and are restricted to areas where the pollution has reached extremely high levels. The most critical case is Portman Bay (Spain): this is the most contaminated bay in the entire Mediterranean, and a perfect example of ecotoxic pollution of a coastal environment by mine tailings. The waste from mining operations was discharged directly into the inner part of the bay for more than 30 years, polluting the sea for a radius of several kilometres⁷.

On a larger scale, the southwest Mediterranean area is sadly contaminated, as has been shown by the high concentration of arsenic found in water, soils and sludges⁸, lead in bivalve shells (up to 100 parts per million, more than 30 times the average mean)⁹, methylmercury, selenium, cadmium, zinc and lead in dolphins¹⁰, lead and zinc in fish and other marine organisms¹¹ and so on. This pollution is also conditioned by the interaction of cyclone and anticyclone streams through the Straits of Gibraltar and from the north of Corsica. These streams converge in the Algerian–Provençal marine basin, meeting in the Alboran sea (where high quantities of cadmium and manganese

have been detected¹²), and cause an accumulation of mining tailings and industrial waste.

The most recent Unesco Science World Report stresses that environmental preservation and solving problems created by human activity is one of the most important challenges now facing mankind, and the World Conservation Union considers the Mediterranean a protected area. It is therefore of the utmost importance that the European Union and North African countries affected should monitor this environmental threat which is progressively poisoning rivers, aquifers, soils, beaches and the sea.

Jesús Martínez-Frias

Consejo Superior de Investigaciones Científicas, Museo Nacional de Ciencias Naturales, Departamento de Geología, c/ José Gutiérrez Abascal 2, 28006 Madrid, Spain
e-mail: mcnmf53@fresno.csic.es

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French research needs

Sir — Declan Butler describes the possible impact on French research of the change of government (*Nature* **387**, 645; 1997). He emphasizes that the Socialists have a more favourable attitude towards academic research than the previous government, but also that mandatory reforms would face “widespread resistance”, particularly if the system of life tenure were to be threatened.

This is probably a realistic view of the reaction of most civil servants. Budgets have been under pressure for a long time, and there have been no resources to enable postdoc researchers to build dynamic research teams. Foreigners are welcome in the Centre National de la Recherche Scientifique (CNRS) and other national organizations, which proves that it is not a chauvinistic system. It is, however, a rigid system, and there is no real alternative between getting a permanent position and

having to rely on one-year research and teaching posts in universities. Most new French PhDs have to leave French laboratories when they have completed their three years.

This rigidity reflects a general problem in the French economy, where there is no real tradition of short-term employment contracts (perhaps renewed several times), the most efficient way to manage projects in a fast-changing world. A worker must by law be offered a full-time post after two short-term contracts lasting a maximum of 18 months. Only a few semi-private institutions such as the Institut Pasteur are free to hire contract researchers of any nationality at will. Academic laboratories of the CNRS and others that would like to recruit postdoctoral students have to rely on a few 18-month positions offered by the Direction de la Recherche et des Etudes Techniques of the defence ministry, or on specifically designed short-term contracts reserved for foreigners (*postes rouges* or

roses). Most postdocs are foreigners with grants from foreign or supranational organizations.

This situation has its origins in the French *grandes écoles* system, which leaves French industry in the hands of well trained engineers who usually lack contact with fundamental research (except in large companies), and the academic system in the hands of scientists with no incentives or financial means to transform their research results into new products and jobs.

It is to be hoped that a consensus on these basic facts, which imply the need for a different type of funding for academic research, will be accepted by both sides of the political spectrum.

Xavier Michalet

Laboratoire de Biophysique de l'ADN, Institut Pasteur, 25 Rue du Dr Roux, 75724 Paris cedex 15, France
e-mail: michalet@pasteur.fr