

The department MBT addresses a field of research at the interface of the basic disciplines of chemistry, geology and biology. The basic questions are:

- 1) Which organic compounds of either natural or anthropogenic origin are present in the different compartments (biota, sediment, water) of the marine environment ?
- 2) What are the reaction pathways involved in their biosynthesis, biotransformation and diagenesis?
- 3) What are the reaction kinetics and how are these influenced by environmental conditions ?
- 4) In the case of biogeochemistry: when did the reactions take place (geological component) ?
- 5) In the case of toxicology: what are the biological effects of the observed concentrations of the parent compounds and their reaction products ?

The research is divided into the two departmental themes, i.e. 'Biogeochemistry' and 'Environmental Chemistry & Ecotoxicology'. Both are intimately connected to the NIOZ prioritized research area 'transfer of energy and matter in the coastal, continental shelf and continental slope systems' and supply information that is vital to understand the impact of man's actions on ecosystems. A large part of the biogeochemical research is also closely related to the second NIOZ priority 'marine system variability through time'.

After the move of the marine biogeochemistry laboratory end of 2002, the new lab facilities were extensively used for the first time in 2003. All people working in the new facilities are very enthusiastic: they offer excellent conditions for state-of-the-art molecular biogeochemical analyses. Our advanced analytical equipment is performing much better since the analytical laboratory is characterized by constant environmental conditions. In 2003 our analytical equipment was also substantially expanded by two grants from the NWO-Middelgroot program for the acquisition of an LC-triple-quadrupole MS for the analysis of polar and high-molecular-weight lipids and GC-time-of-flight MS for the ultra rapid analysis of biomarkers for palaeoclimate studies. Both instruments have been installed in the laboratory end of 2003 and are expected to be fully operational in spring 2004.

Three PhD students defended their thesis successfully in 2003, all at the University of Utrecht, Department of Earth Sciences. In January 2003, Enno Schefuß presented his thesis work on the use of biomarkers in the determination of the palaeo-environmental effects of the Mid-Pleistocene Transition in the tropical Atlantic and equatorial Africa, a nice collaboration between the MCG and MBT departments. In February 2003, Bart van Dongen, who was funded by the NEBROC program, defended his work on preservation of carbohydrates through sulfuration in marine sediments. Rienk Smittenberg got his degree in September 2003 on his thesis on the use of compound-specific ^{14}C dating in palaeoenvironmental reconstructions of fjord environments. Other outstanding scientific results of 2003 were the publication of two *Nature* papers with strong MBT involvement. One by a group of German and Dutch biogeochemists and microbial ecologists on the identification of the bacteria responsible for the anaerobic ammonium oxidation in the Black Sea water column and the impact of this process for the oceanic nitrogen cycle (Kuypers et al. 422, 608-611). The other (Schefuß et al., 422, 418-421), authored by NIOZ scientists from MBT and MCG, on the important role of tropical sea-surface temperatures on south African vegetation in the mid-Pleistocene. In 2003 MBT also became actively involved in the LOCO project through the involvement of Kees Booij, who intends to study the role of ocean currents in the worldwide transport of anthropogenic organic components by attaching SPMD sampling devices to moorings available in the LOCO program. Two other important research programs ended in 2003: the STW-funded project on the lipids of marine diatoms and the NAAP-funded project on the combination of lipid biomarker and fossil DNA in the reconstruction of Holocene environmental changes in Antarctic fjords and lakes. A detailed account of the results obtained in these projects is given below.