Swiss Microbial Ecology: dynamism and challenges

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From 23–24 September 2004 the First Meeting of Swiss Microbial Ecology took place in Neuchâtel (Switzerland) with the support of the Swiss Society of Microbiology, The National Centre of Competence in Research (NCCR) Plant Survival, and the Swiss Academy of Sciences. Over 70 microbial ecologists from 13 Swiss institutes, and some 10 researchers from five French, German and Italian institutes, attended the meeting. The main objectives were to offer Swiss microbial ecologists an opportunity to meet and exchange news of scientific advances in microbial ecology and their views on the future of this discipline. The meeting also allowed young researchers (61% of those present) to highlight their work, develop networking with senior scientists and meet future employers in a convivial environment.

The outstanding success of this first meeting well illustrates the growing Swiss research interest in microbial ecology. This discipline has largely developed as a response to growing social and economic demand. The meeting was in fact supported by major Swiss corporations (Nestlé, Catalys-Promega, Sarstedt and Novartis), thus reflecting the industrial relevance of Swiss research in microbial ecology. Swiss microbial ecologists are working on topical issues such as the response of eco- and agrosystems to global changes (land use conversion, climatic changes etc), functioning of lake ecosystems and biological control of pathogens, as illustrated by the topics of the oral and poster sessions: 1– Soil and Plant Microbial Ecology 2– Interactions 3– Biodegradations and Polluted Environments 4– Aquatic Microbial Ecology and Geomicrobiology 5– Methods. This spread of themes is also reflected in the published work of Swiss microbial ecologists (data retrieved from the Web of Science database 2000–2004, n = 125 journals and 260 papers). Most microbial ecology research in Switzerland is published in journals specialising in microbiology (45.2%), environmental science and biotechnology (13.4%), and aquatic science (11.1%, figure 1).

It is worth noting two important issues in relation to the topics addressed at the meeting. First, most of the studies target microbial environments which undergo anthropogenic disturbance and pollutions, while a few are carried out in pristine environments. Second, research dealing with microbial interactions has become an issue of growing importance, as microorganisms are constantly interacting with their environment and with other organisms. In this context, several talks and posters at the meeting stressed the need to take into account other organisms present in microbial environments (plants, animals, protozoa, fungi, viruses) and not to consider bacteria as an independent entity evolving in a biologically inert environment. Research dealing with biotic interactions therefore allows microbial ecologists to publish their work in journals dedicated to plant or animal biology or ecology (Figure 1).

During the meeting, a round table entitled "Perspectives in Swiss Microbial Ecology" raised interesting questions regarding microbial ecologists' identity. As well shown by the communications during the meeting and by publications in the period 2000–2004, microbial ecology is not only a matter for microbiologists but is at the crossroads of several disciplines including plant ecology and physiology, animal and gut ecology, soil science, geology and pathology. There is a demand from other disciplines for expertise in microbial ecology, as ecologists, clinical microbiologists and geologists realise that microbial ecology may constitute a key approach in dealing with concepts involved in general ecology, epidemiology or biogeochemical cycles. Cross-disciplinary papers (medicine, geology, chemistry) account for 13.4% of Swiss microbial ecology literature (Figure 1). Additionally, we acknowledged an urgent need for bioinformatic, computational and statistical tools to interpret the huge flood of data

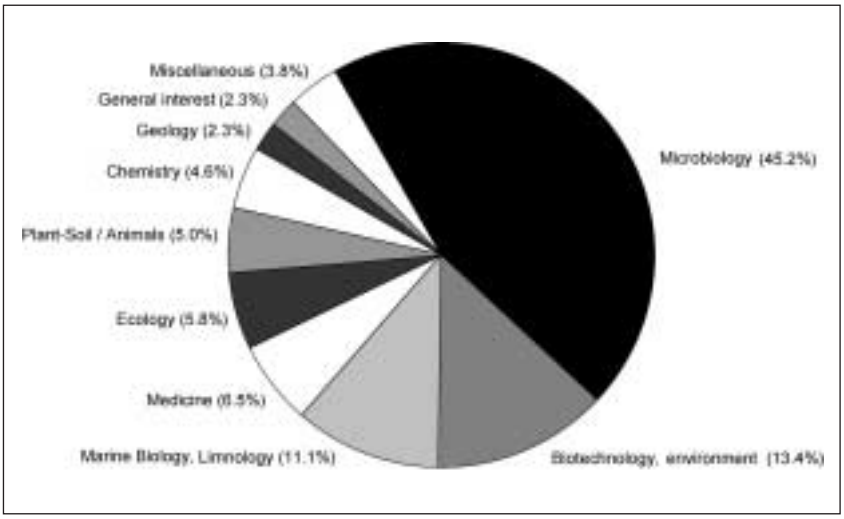

Figure 1. Publications from Swiss microbial ecologists by type of journal. Survey during the years 2000–2004, authors present during the first SME meeting (n = 125 journals and 260 papers).

generated by the new analytical (especially molecular-based) approaches.

Microbial ecology is driven by improvements in technology, since microorganisms cannot be examined by the naked eye and few can be studied by the 'traditional' culture-based microbiological approach. In the past decade new approaches based on metagenomics have been developed on the international level. Such techniques have brought significant progress in our understanding of the diversity, distribution and dynamics of microorganisms, but they require expensive equipment. Although the Swiss scientific community is highly dynamic, it cannot always compete with other countries for 'heavy' equipment (sequencing facilities or microarrays, for instance). However, it can take advantage of Switzerland's trump cards in other technologies such as proteomics or bioinformatics.

New technologies should be regarded as tools for use in responding to key hypotheses and paradigms such as the definition of bacterial species, evolutionary ecology in bacteria, the interactions between higher organisms and bacteria and the role of bacteria in ecosystem functioning. Moreover, an organism cannot be reduced to its nucleic acid or protein sequences. And, in consequence, some microbial ecologists have heralded the rebirth of microbial physiology and organism-based research, approaches that are needed in studying the functions performed by bacteria.

Microbial ecology in Switzerland maintains itself at a high scientific level, since from 2000–2004 the median impact factors of journals increased from 2.116 to 3.205 (with no significant difference between the 4 years, Wilcoxon $\chi^2_{256,4} = 10.1$, $p = 0.04$). However, one may regret the shortage of contributions by Swiss microbial ecologists to journals of general ecology (6%) or of general interest (2%), as shown in Figure 1. Our research is largely confined to microbiology journals such as Applied and Environmental Microbiology (10.3%), Environmental Microbiology (6.1%) and the Journal of Bacteriology (5.3%). This fact underscores a lack of research on theoretical and fundamental questions. The essential advances and improvements in new technologies should serve for more in-depth the study of ecological concepts. In that sense, there is an increasing need to engage in broad-scale multidisciplinary projects and to integrate molecular biology (which is a driving force in microbial ecology) into community and even ecosystem ecology.

Swiss microbial ecologists have raised the question whether the mode of funding research is responsible for the lack of pristine environment research and the lack of fundamental studies on ecological concepts. We would do well to consider how we can influence this mode of funding, for instance by promoting long-term research. The need to develop broad-scale and multidisciplinary projects raises the question of the financing of microbial ecology research: what can we do to give microbial ecology the benefit of the international programmes and networks that are a major component of research funding? Analysis of the past four years' literature shows that international collaborations represent a major proportion of Swiss research in microbial ecology (31%), mainly with EU (65%) and American (18%) colleagues. Through such cooperation Swiss microbial ecologists can gain access to international programmes and funding opportunities.

Microbial ecologists should become more "visible" to other disciplines, in order to foster the emergence of interdisciplinary research in fields such as clinical research, geology, chemistry, general ecology and exobiology. With the same object in view they should also develop partnerships with industry. The creation of a Swiss Meeting of Microbial Ecology under the aegis of the Swiss Society of Microbiology was intended as a step towards such increased visibility for microbial ecologists.

In conclusion, we would like to invite all microbial ecologists to wonder the question of their identity within the scientific community. We would also like to encourage any scientist who is interested in environmental microbiology to join the second meeting of Swiss Microbial Ecology in 2006, which will be organized in Bellinzona the 28th and 29th of September by the Cantonal Institute of Microbiology of Ticino.

Information:
Swiss Society of Microbiology
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