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THE 4 DIMENSIONS OF PLANT SECONDARY METABOLISM. THE ROLE OF METABOLOMICS

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Life Sciences are going through a rapid change. Since molecular biology started its advance some 30 years ago, it had a major landmark in obtaining the full sequence of the human genome, followed by that of various other organisms. We are now reaching the phase that the 1000 $ full sequencing of an organism becomes reality. It is almost cheaper to sequence again than to save the full sequence of an organism. At the same time it becomes clear that having a sequence does not help much to really understand a living organism. The high expectations for drug development, for example, have shown to be over optimistic, as so far no novel drugs have resulted from this knowledge. In fact a genome is like a blueprint, and a blueprint has only two dimensions, and not the four of life: 3 of space and 1 of time. Using these blueprints the research is now going to a more holistic approach: systems biology. That means in an integrated approach study organisms at all levels of phenotype, metabolome, proteome, transcriptome and genome. The importance of a systemic approach can be illustrated by the fact that plants can be considered to be super organisms in the sense that they are dependent on the collaboration of the plant with all kind of microorganisms, e.g. in the rhizosphere, but also endophytes in the plant itself. That means many new opportunities for natural products research. Plant interactions with their environment, health effects of our food, traditional medicine, biosynthesis, metabolic engineering are examples of areas where society expects us to translate basic research into novel products and concepts to the benefit of all of us. We all have many new opportunities but also many challenges. We have tools like metabolomics, genetic engineering, and phytochemistry to better understand plants but we need to closely collaborate with other disciplines to have an as complete view as possible of the systems we are studying.