

Foreword

Vision of Integrated Life Sciences at the First Croatian Congress on Molecular Life Sciences (CCOMLIS) Displayed Challenges and Opportunities of the Genetic Age

There is little doubt that life sciences will be of particular importance in the next decades. The impact will be on both, society and business, as advances in knowledge and biotechnology are applied and integrated. It is, therefore, a crucial time for planning the future of life sciences. The new biotechnology industry is growing rapidly in Europe and has a great potential for creating growth and employment. The bioscience sector is of strategic importance for competitiveness all over the world. Particularisation of science into disciplines and the classification of life science disciplines as separate scientific areas and fields, such as medical, technological and natural sciences (split further among biological and chemical fields) generated very different academic backgrounds and affiliations of Croatian life scientists. Following separate roads of development, scattered over various scientific societies, they are attending very different specialised scientific meetings despite of rather similar research interests, shared methodologies, and basic aims. Being aware of the fact that molecular genetics will become a pervasive force in our lives, Croatian life scientists recognised the need for an improved communication that will allow an integrated experience in assessing the underlying potentials for the future development. Molecular life scientists of thirteen learned societies and PLIVA Pharmaceutical Industry formed a Board that has organised the First Croatian Congress on Molecular Life Sciences (CCOMLIS) held in Opatija in June 2002. Croatian biologists, biochemists, immunologists, geneticists, microbiologists, pharmacologists, clinical chemists, biophysicists and biotechnologists from all parts of Croatia, as well as from various foreign laboratories, gathered together for the first time. All participants shared the same molecular approach to various aspects of life using the same molecular language that emerged as unifying force in contemporary natural, biomedical and biotechnological sciences. Beside having presented their recent results, the CCOMLIS participants were also engaged in the organised After Dinner Debates discussing the problems related to the infrastructure, educational and societal aspects of new technologies, promises, and dilemmas produced by the recent achievements of life sciences. The Meeting

encompassed 150 scientific presentations prepared by 439 authors. A useful communication among Croatian life scientists has been established, common problems identified and strategies for the future outlined.

The Congress was held under auspices of the Croatian Parliament and EMBO. EMBO cares for biosciences in Croatia despite of Croatia's serious deficit in the number of scientists who are associated with EMBO. Since EMBO puts great emphasis on the need of excellence, the first Croatian Congress on Molecular Life Sciences was privileged to have an EMBO lecture in the Programme. Though being a local meeting, CCOMLIS enjoyed an international atmosphere, not only because the Croatian scientists affiliated with foreign academic institutions, but because of foreign scientists who have contributed to the development of Croatian life sciences, who were invited to take part in the Meeting and who came from Amsterdam, Budapest, Heidelberg, Ljubljana, Mainz, Oxford, Vienna, Yale, and Zurich. The Congress also attracted representatives of public media creating a rare occasion for communicating relevant issues of molecular life sciences to the general public.

The few CCOMLIS related papers, that are included into this issue of Food Technology and Biotechnology, represent only partly current research interests of molecular life scientists in Croatia. A rough overview of general research interests of the Congress participants is displayed in Table 1. Fig. 1 shows that various sources of biological material were used in the presented investigations. It is encouraging to notice that many fruitful collaborations with well equipped foreign laboratories have been established, but equally encouraging is the fact that one half of the presented research could be performed in Croatia proper (Fig. 2 outlines the respective quantitative relationships).

The first holistic view of our genetic heritage, revealed at the very start of the century, announced the beginning of the Genetic Age. Today all life scientists agree with Dawkins: *Who is really competing for survival are not plants and animals, yeasts and humans, but the gene encoding the very nature and operation of each entity.* No wonder that gene based studies of molecular evolution are the most popular among Croatian life scientists.

Table 1. General interests of Croatian life scientists based on 150 CCOMLIS presentations

General subject	% of presentations
Evolution, morphogenesis and gene expression including bioinformatics	16.5
Protein structure and function	13.5
Biomedicine, biologically active molecules	13.5
Physiology and diseases	12.0
Medical and veterinary diagnostics, genotyping	10.5
Methods including bioinformatics	9.0
Marine ecology	6.6
Genetics	6.0
Biology of lipids	4.5
Signalling, targeting	4.5
Immunology	3.0
Citotoxicity, mutagenesis	3.0
Microbial physiology	3.0
Bacterial resistance	1.5
Virology	1.5

Yet gene expression is a highly complex and tightly regulated process that allows a cell to respond dynamically both to environmental stimuli and to its own changing needs. I. Ivančić-Baće *et al.* (p. 261) report on how the cell survival and the repair of double strand breaks after γ -irradiation depends on the presence of GAM protein. Many factors act as an »on/off« switch that controls which genes are expressed in a cell, as well as a »volume control« that increases or decreases the level of expression of particular genes. Indeed, life sciences are dominated by the functional genomics.

Aminoacyl-tRNA synthetases (AARSs) are essential for faithful translation of the genetic code, and the basic principles of how amino acids are paired to their cognate tRNAs to ensure high fidelity of translation are known. *E.g.* the reported studies of I. Weygand *et al.* (p. 247) revealed that accurate seryl-tRNA synthesis in yeast and plants is accomplished *via* tRNA-assisted optimisation of amino acid binding to the enzyme active site. However, advances in genomics instigated identification of novel enzymes and pathways to aminoacyl-tRNA synthesis. In that respect methanogenic Archaea represent an exciting group of organisms attesting to high degree of evolutionary diversity, as reported by D. Korenčić *et al.* (p. 255)

Molecular genetics begins to elucidate the underpinnings of human health and disease. Such advances promise to deliver substantial benefits to humanity, by improving the prevention, diagnosis and treatment of a wide variety of diseases. The paper of G. Rusak *et al.* (p. 267), who have investigated the effects of several structurally related flavonoids on the hsp gene expression in human promyeloid leukaemia cells, exemplifies a preliminary pharmacological study.

Genetic mutations are increasingly identified as interactive elements in the individual vulnerability or resistance to a variety of widespread, often complex, dis-

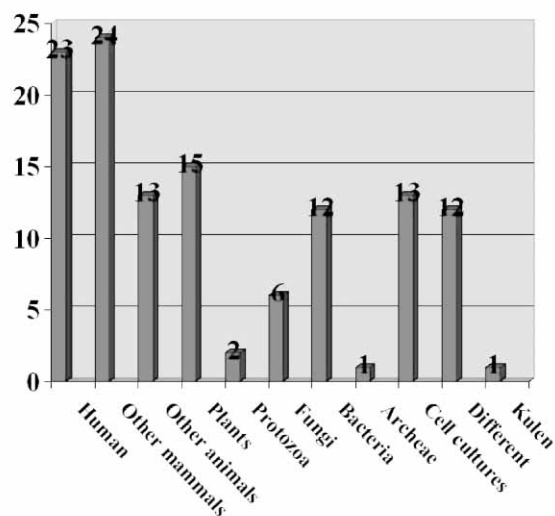


Fig. 1. The analysis of the CCOMLIS presentations with respect to the origin of biological samples studied

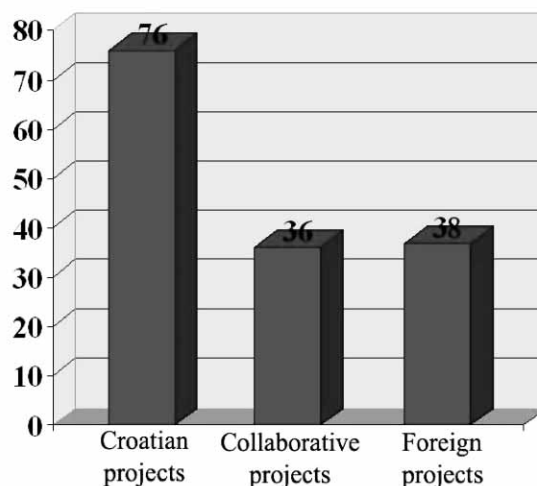


Fig. 2. The analysis of the CCOMLIS research presentations with respect to the collaboration with foreign laboratories and programmes

eases and disease processes. Human disease phenotypes are controlled not only by genes but also by lawful self-organising networks that display system-wide dynamics. These networks range from metabolic pathways to signalling pathways regulated by hormone action. When perturbed, networks alter their output of matter and energy which, depending on the environmental context, can produce either a pathological or a normal phenotype. It is the study of the dynamics of these networks that provides more and more new insights into the pathogenesis and treatment of complex diseases. About 60 % of the Congress communications were focused on various aspects of molecular medicine.

Recent years made it clear that numerous vital physiological functions in higher organisms strongly depend on glycan structures of glycoconjugates. *E.g.* B. Balen *et al.* (p. 275) have monitored the changing glycoprotein patterns related to morphogenesis in *Mammillaria*

gracilis Pfeiff. tissue culture. Information carried by carbohydrate structures are recognised by their receptors, lectins, that are also glycosylated and inducible as well. Dumić *et al.* (p. 281) report on stress related factors influencing ubiquitous galectin-3 expression. However, identifying the complex and versatile carbohydrate structures is not an easy task, and novel analytical techniques are necessary to support the process of understanding of the function and intricate nature of glycosylation. Lauc *et al.* (p. 289) inform about digoxin labelled lectins as a useful addition to the repertoire of glycobiological tools.

Biology is being transformed by an explosive growth of data emerging from laboratories worldwide. The biggest challenge is to transform data into knowledge of understanding universal laws of life and survival, knowledge that will lead to a better understanding of the biological processes underlying both health and disease. Bioinformatics stepped in as a new science primer. By merging biology, computing science and information technology into a single discipline, bioinformatics provides unprecedented biological insights and attracts especially young scientists. We are all aware that computers will play an ever increasing role in biology. No wonder that several CCOMLIS presentations revealed the tendency of young Croatian scientists to turn from bench biochemistry to bioinformatics.

Since current GM products provide widely needed medicines and vaccines, foods and food ingredients, feeds, and fibres, CCOMLIS participants engaged in After Dinner Debates eager to direct their skills to the economic growth and competitiveness of Croatia. The lack of development-friendly policies and investment capital have been recognised as basic obstacles in starting new companies and engaging young scientists into local and collateral projects, thus stopping the qualified brain drain.

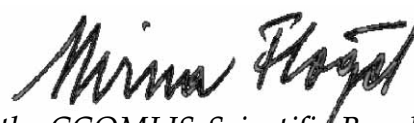
New-age technologies, informatics, miniaturised analytical tools and genetic engineering methods have syn-

ergistically spurred a revolutionary progress that moved experiments from *in vivo* and *in vitro* to *in silico*. However, not all Croatian life scientists are fortunate enough to be able to use new technologies in their laboratories. The costs of new technologies and unequal opportunities in organising research as well as in improving health care were thoroughly discussed. Biotech industry generates tremendous opportunities for the society: in all fields of medicine, agriculture and environmental management, yet related benefits are unequally shared over the Globe. Looking forward to what will be realistic in the future, we have to face the fact that molecular genetics will become a pervasive force in our lives. Genetic information is relevant to every living human being and every organism. Croatian scientists have proved to have the necessary command of microarray techniques but the costs involved in massively parallel analysis of gene expression do not allow genetic screening.

With public support the situation could change, but the public has to become aware of great promises that life sciences could offer in the future. CCOMLIS participants emphasised the importance of educating the general public on key issues surrounding genomic advances. There has never been a time when the scientific issues were more exciting, or the opportunities more apparent, and on the other hand, public understanding so low. The interplay of science, technology, natural systems and human factors may be directed to personal and societal benefits only with joint efforts of the public, politicians, and scientists. A declaration has been forwarded to scientific societies, Croatian media and to Croatian government asking for the support of educational programmes on relevant issues of life sciences at all levels.

In summary, the Meeting proved to be a big success, both scientifically and socially. The majority of the participants were young scientists. The optimism and synergy of all CCOMLIS participants spread a bright vision for the future of life sciences in Croatia.

Guest Editor:



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