JMMB: The Journal for Interdisciplinary Integrative Microbiology

Examination of the recent citation index reveals that the impact factor for *JMMB* over the past few years has been steadily increasing. Its papers are now cited by scientists everywhere who recognize the need for the fusion of Molecular Microbiology with Biotechnology. Considering that *JMMB* is only a few years old, this achievement can be considered to be something of a milestone. It might be worth analyzing the basis for this development.

As over 90% of the biological diversity on Earth is prokaryotic, Microbiology encompasses most of life as we know it, and its study is certainly relevant to the remaining few percent as well. These facts emphasize the tremendous potential of the smallest forms of life for solving our planets' greatest problems. These problems include not only human health and welfare issues but also the health and welfare of the entire biosphere. Environmental issues potentially could and may well lead to the demise of human culture. We need to face up to and solve the problems caused by our excessive human population: global climate change, pollution, ozone depletion, destruction of our oceans and forests, species extinction, etc. Both basic scientists and industrial concerns must be cognizant of our perilous circumstances and devise means to obviate the nearly inevitable outcome. We must act swiftly and effectively. Microbiology may hold the key to solutions to some of the problems arising from overpopulation.

The genomics era, ushered in by biotechnological advances of the late 20th century, now allows analysis of biological systems in an integrative fashion. Thus, traditional reductionist inquiry is being complemented by and

may eventually be superseded by 'global systems' biological approaches. Automated DNA sequencing enables us to view the entire genetic potential of an organism; microarray data permit examination of transcriptional expression profiles of all encoded genes; mass spectrometric advances are now paving the way for whole organismal proteomic analyses, and metabolic analyses will be promoted by the development of novel spectroscopic approaches and ultramicromethods for small molecule quantitation. These high-throughput platforms in turn depend upon the development of elaborate bioinformatic systems for integrative information flow.

The tasks of bioinformaticists are arguably the most complex and difficult, precisely because these projects must integrate and create hierarchical relationships for global sets of input data from all relevant disciplines. These include the genome, transcriptome, proteome and metabolome data cited above, but they also include molecular interactional data that describe protein:protein, protein:ligand, protein:nucleic acid, and nucleic acid:nucleic acid (e.g., RNA:DNA) interactions. These in turn lead to intracellular and intercellular signalling and communication. They also allow coordination of the diverse metabolic capabilities of the cell and its compartments. Finally, these molecular interactions are responsible for cellular and organismal interactions in multicellular organisms and entire ecosystems. When data analysis proves excessively complex, modeling and hypothesis-driven, interactive systems approaches must be considered. The end result will be unprecedented predictive power for biological systems at all levels, from mo-

lecular phenomena explained in atomic detail right on up to behavioral considerations of organisms in ecosystems.

Returning to the crucial point, the advances anticipated for Microbiology that may provide solutions to some of our greatest problems will rely upon an ever-increasing interdependency between the academic laboratory and relevant industrial concerns. The academician will provide innovation and long-term perspective while the industrialist will develop large-scale technologies and micromethods for the purpose of product delivery. The latter products will then be used by the academician (and others) to amplify and extend innovative approaches. Thus, interdisciplinary teams spanning all facets of an

economy are likely to be the norm rather than the exception for future advances, and as noted above, any such advances will depend on a strong computational infrastructure.

Recognizing these emerging features of integrative microbiology, *JMMB* is committed to facilitating the union of basic microbial science with technological advance. We hope that the industrial sector will join the basic scientific community in using *JMMB* as a platform for expression. We aspire to promote and accelerate the fusion of the basic and applied sectors of the scientific community.

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