

INTRODUCTION

It has taken a lot of time to receive the green light from COST* to organize a Chemistry Action on the origin of life and early evolution. What is new in the field that has made this argument 'politically correct' in chemistry? Looking at previous meetings in the same field a few years ago, there are today indeed some new interesting components, that perhaps have helped in shaping, more or less consciously, a new 'Zeitgeist'. One is the development of bioastronomy. I remember that this discipline, up to five or ten years ago, was not given much thought by chemists. Now, we all accept that hundreds of chemical reactions take place in space, producing chemicals that eventually may fall on Earth – in prebiotic times even more intensely than today – thus enriching considerably the arsenal of prebiotic products. In general, there is nowadays a strong cultural component in the field of origin of life and life science that has to do with space science. The excitement about the suspected life fossils on Mars, the extraordinary interest around SETI (Search for ExtraTerrestrial Intelligence), and the revival of the anthropic principle – are in my opinion all culturally connected movements that have given a new dimension to the general field of the origin of life – and one that has anchored us to the lay people.

Another new wind in our field comes, in my opinion, from the development of system biology – biology seen in terms of system theory, namely the whole biological system studied in its entire complexity: proteomics, genomics, networks and non linear systems, and so on. This has brought about a revival of theoretical and experimental studies on chemical complexity, like self-organization, emergent properties, autocatalysis – concepts that were already with us, that however have acquired nowadays a new importance. As a consequence of this systemic thinking, there is in the field a larger sense for a holistic approach with respect to the classic reductionistic approach- there is for example more interest in the theory of autopoiesis, in autocatalytic networks, in cellular models. It is perhaps because of this new thinking that the two main 'parties' on the origin of life – the compartmentalistic approach on the one hand, and the RNA world on the other, are coming more and more close in contact: there are now interesting papers in which the interaction of RNA with vesicles, or mechanisms of RNA within vesicles, are

* Founded in 1971, COST is an intergovernmental framework for European Co-operation in the field of Scientific and Technical Research, allowing the co-ordination of nationally funded research on a European level, see: <http://cost.cordis.lu>.



seen as important steps in early evolution. All this, I believe, brings our field to a novel and more advanced cultural level.

This does not mean that the problems and obscurities in our field are solved, or have become much easier. The RNA world in the origin of life suffers still from the ancient vice, that nobody can tell how a first stereoregular RNA family with specific and intelligent sequences can be formed under prebiotic conditions; and on the other hand the advocates of the compartmentalistic approach cannot yet tell us how the first metabolic pathways have originated. The old question of the onset of specific macromolecular sequences – be polypeptides or nucleic acids – is still very obscure, actually not explored much. Some colleagues believe instead that one of our ancient problems, the origin of chirality, is nowadays more understandable in chemical terms.

The main and more general question in our field is still, by definition, to elucidate the pathway that brings from the inanimate matter to cellular life. The possibility of one such transition has not yet been proven in the laboratory and therefore should still be considered as a working hypothesis. Have we done major discoveries to fill the gap, to transform a work hypothesis into a scientific documentation? It is difficult to give a positive answer, the only certainty is, that there is still very much to do. This meeting, and the corresponding Proceedings, represents an important documentation of the situation at the beginning of the new century.

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