Plenary lectures

PL-1 Crystallography & Ribosomes, Antibiotics Resistance, Parasites, the Microbiome, Environmental issues, Origin of Life and More

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The current global escalation in resistance to antibiotics is a serious threat. Thus, it seems that the world is headed for a post-antibiotic era, in which common infections and minor injuries that have been treatable for decades could become fatal again. Ribosomes, the universal cellular machines that translate the genetic code into proteins, are paralyzed by many clinically useful antibiotics. Structures of ribosomes from genuine multi resistant pathogens, alongside those from eukaryotic parasites illuminated the antibiotics modes of action and highlighted issues associated with species specificity in susceptibility to antibiotics.These structures also showed that the ribosome's catalytic site is located at its core within a universally conserved semi-symmetrical region. The high conservation of this region implies its existence irrespective of environmental conditions and indicates that it might represent a prebiotic RNA entity with catalytic capabilities. Hence, it could be the kernel around which life originated and evolved.

Keywords: Ribosomes, biochemistry, biology

PL-2 Self-Organization-driven Supramolecular Chemistry and Adaptive Chemistry

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Supramolecular chemistry is actively exploring systems undergoing self-organization, i.e. systems capable of spontaneously generating well-defined functional supramolecular architectures by self-assembly from their components, on the basis of the molecular information stored in the covalent framework of the components.

Supramolecular chemistry is intrinsically a dynamic chemistry in view of the lability of the interactions connecting the molecular components of a supramolecular entity and the resulting ability of supramolecular species to exchange their components. The same holds for molecular chemistry when the molecular entity contains covalent bonds that may form and break reversibility, so as to allow a continuous change in constitution by reorganization and exchange of building blocks. These features define a Constitutional Dynamic Chemistry (CDC) covering both the molecular and supramolecular levels.

CDC takes advantage of dynamic diversity to allow variation and selection and operates on dynamic constitutional diversity in response to either internal or external factors to achieve adaptation.

In particular, component selection on both the dynamic molecular and the supramolecular levels may be driven by the formation of an organized phase: - in 2D on a surface, - in soft matter (gel, liquid crystal), - as well as in 3D in a solid/crystal. Systems will be described and discussed that undergo such processes of self-organization-driven constitutional adaptation. They point to the emergence of an adaptive chemistry.

References

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