

Editorial

FOCUS ON HOTTEST RESEARCH IN BIOSCIENCES

It has been demonstrated by S.C. Bradford in the mid-1930's that a relatively small number of journals publish the bulk of significant results for any given scientific discipline. Thomson ISI is committed to providing comprehensive coverage of the world's most important and influential journals. The ancient principle "publish or perish" may be now reformulated as "publish in ISI journals or perish", because the most important papers are published in relatively few journals. But, the core of 3000 of journals which accounts now for about 75 % of published articles and over 90% of cited articles, it is not static. Its basic composition changes constantly, reflecting evolution of scholarly topics. In the process of journals evaluation and selection Thomson ISI uses very well established criteria concerning: publishing standards, editorial content, international diversity and citation analysis.

*At this time in the ISI chemistry journals is obvious the fast developing of interdisciplinary topics as **chemical biology, immuno-chemistry, and bioinformatics**, all related with life sciences. This editorial illustrates some of the hottest science topics, reflected in ISI journals as these appear relevant.*

Thus, in J. Am. Chem. Soc. 127, 15071-15082 (2005) S. Jager et al. from University of Bonn published the well cited paper A versatile toolbox for variable DNA functionalization at high density. This paper is specially resumed by Michael Eisenstein in the rubric Research highlights in Nature vol. 2, 895 (2005) under the suggestive title Decking out your DNA. In essence, certain DNA polymerases show surprising tolerance for chemically modified nucleotides, opening up exciting new possibilities for the efficient production of highly functionalized nucleic acid molecules. The research team from Bonn University systematically measured incorporation of a variety of nucleotides with different types of functional group into oligonucleotide chain, using seven different bacterial DNA polymerases. Two polymerases Pwo and Went (exo) efficient incorporated every nucleotide variant tested. The flexible character of these polymerases could have interesting implications for perspective bioengineering projects, such as aptamers development or for building modified DNA molecules with altered charge distribution (i.e. functionalized DNA) that can self assemble.

In Angew. Chem. Int. Ed. 44, 6863-6866 (2005) P. Vincenati et al. from French Atomic Energy Commission (FAEC) published the paper entitled: Sandwich immunoassays a high throughput screening method for cross-coupling reactions. Sandwich immunoassay, known as enzyme linked immunosorbent assay (ELISA's) use two monoclonal antibodies that recognize distinct binding epitopes on a single antigen. In fact, one antibody is immobilized on a solid support and the other is conjugated with an enzyme that converts a substrate to

an easily decelable product, or products of bond forming organic coupling reactions. The team of researchers from FAEC demonstrates that biological assays can have a valuable analytical potential, allowing direct measurement of a specific product in complex mixtures. They are fast, precise and sensitive. This research team analyzed the crude reaction mixture by ELISA and detected bond formation by monitoring the conversion of the enzyme substrate to a colored product. This procedure aids in the discovery of the synthetic catalysts that trigger bond formation between reactive species.

*In Natur. Biotechnol. 23, 1424-1433 (2005) **R. Penchovski** and **R.R. Breaker** published an article entitled: Computational design and experimental validation of oligonucleotide-sensing allosteric ribozymes. This article is also reviewed by **M. Eisenstein** in Nature 2, 12, (2005). Researcher Ron Breaker from Yale University is a pioneer in engineering of catalytic RNA. His early work involved the development of riboswitches, studies that typically used multiple round of in vitro evolution to generate specialized molecules that are optimized to perform a function of interest. Now Breaker and postdoc Robert Penchovski have developed a fast and efficient computer based system capable of rapidly screening millions of RNA sequence and structure variants to identify allosterically regulated ribozymes capable of responding sensitively to the presence of specific DNA sequences. They adapted existing algorithms for calculating the energy profile of RNA molecules. These provide enough information to nicely predict sequences that will adopt two different states –one in presence of the target and one in its absence. They identified sites into which nucleotide sequence recognition sites could be engineered and used their algorithm to identify ribozyme variants in which target binding would change the ribozyme's energy profile in a determined predicted manner. Their computational work offers a general tool for virtually any RNA design project.*

*The fluorescence imaging is the core subject of journal Nature 2, 12, 901-903, 2005 with principal support of Karl Zeiss Jena Mikroskopy Section. This dedicated volume of Nature has intended to present basic information in fluorescence imaging domain which presents many challenges to users. In this volume are analyzed by eminent specialists the following subjects: Fluorescence microscopy (**Rafael Juste, Jeff Lichtmann** and **Jase Angel Canchello**) Optical sectioning and two photon microscopy (**Fritjof Helmchen** and **Winfried Denk**.) Fiber –optic fluorescence imaging (**Benjamin Flusberg, Eric Cocker, Wibool Piyawattanumetha**), A guide to choosing fluorescent proteins (**Nathan Shaner, Paul Steinbach** and **Roger Tsien**). Thus, understanding how the different imaging systems work, biologists can fully exploit technical revolution in fluorescence imaging.*

*One may observe that some of the above mentioned actual directions in the chemical research are also our faculty scientific interests. As can be seen from the list of PhD thesis (Anal. Univ. Buc. Chimie, 2007, XXVI, 93) presented in 2006 at the Faculty of Chemistry from Bucharest University, biochemist **Daniela Botus** under the scientific supervising of Prof Dr Docent **Tatiana Oncescu** sustained the thesis entitled: Biochemical and physical chemical aspects of interaction between anticorps and antigens obtained from DNA and RNA viruses.*

*Also, at the Department of Physical Chemistry exits a long tradition in the study of biomolecular interactions initiated by the Acad. Prof. **Victor Em. Sahini**. At the beginning of the 90's Prof. **Cezar Bendic** started the development of the program SHB interactions*

based on the calculation of the overlap population as a quantum chemical criterion for the hydrogen bond analysis in nucleic acids structures (C. Bendic, Advances in Quantum Chemical Bonding Structures, Ed. Research Signpost, ISBN : 978-81-7895-306-9, 251-270, 2008; C. Bendic, Internet Electronic Journal of Molecular Design (BioChem Press), 2005, 4, 579–590; C. Bendic, Anal. Univ. Buc. Chimie, 2005, XIV, 233-240). Differing from the previous HBplus and HBexplore programs, based on arbitrary geometrical criteria, which outlines only the potential hydrogen bonds, this program allows an estimate of the contribution of every atom-atom intermolecular interaction to the stabilization of both DNA and RNA as well as the drug-nucleic acid complex (http://gw-chimie.math.unibuc.ro/staff/cbendic/shb/shb_interactions.html).

*To illustrate the interest for the above mentioned topics at national level the recently (April 5, 2009) informal workshop organized in the Hall Heliade Radulescu of Romanian Academy entitled: “Chemical Kinetics, Biomathematics and Functional genomics. Integration of Biological, Chemical and Physical Information” may be a good example. Special guest of this workshop was **Federico Moran**, professor of Bioinformatics at University Complutense of Madrid. He presented the conference: Reconstruction of metabolic network from genomic data. Open questions and problems for genome scale. At this workshop actively participated: **Dr. Vlad Popa**, Institute I.G. Murgulescu of Physical Chemistry of the Romanian Academy, **Dr. Marcel O. Vlad**, Institute of Statistical and Applied Mathematics Stanford University and **Dr. Alexandru Corlan**, Cardiology Research Unit, University Emergency Hospital from Bucharest.*

*More recently (June 1, 2009) the second Cristofor I. Simionescu Symposium “Frontiers in macromolecular and Supramolecular Science”, featuring prominent international specialists **Dr. Takuzo Aida**, University of Tokyo, **Dr. Daniel Funeriu**, Technical University, Munchen, **Dr. Ionel Haiduc**, President of the Romanian Academy, Bucharest, **Dr. Valeria Harabagiu**, ICM Petru Poni, Iassy, **Mike Klein** and **Virgil Percec**, University of Pennsylvania, **Jos Put**, DSM Research Geleen, **Mitsuo Sawamoto**, Kyoto University, **Dieter A. Schluter**, ETH, Zurich and **Eiji Yashima**, Nagoya University, was held at the Romanian Academy and ICM Petru Poni, Iassy.*

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