

Synthesis at the Interface of Chemistry and Biology

simply co-opt the immune system to generate a highly selective natural host in the form of an antibody combining site. To generate a selective catalyst rather than a selective receptor, stable transition-state analogues (rather than substrates) were used as antigens on the basis of the Pauling notion that enzymes evolve maximum binding affinity to the transition state of a reaction. The early experiments by Lerner and co-workers and in our own laboratory involved the generation of esterolytic antibodies using phosphonate/phosphate transition-state analogues. Other approaches have since been developed to generate catalytic antibodies, including covalent catalysis, proximity effects, and general acid-base catalysis (thereby allowing us to dissect the contribution of each of these factors to biological catalysis). Using these approaches, antibod-

ies have been generated that catalyze a wide array of chemical reactions, from acyl transfer and redox reactions to pericyclic and photochemical reactions with specificities and, in some cases, rates rivaling those of enzymes.

The detailed characterization of the immunological evolution, three-dimensional structures, and mechanisms of catalytic antibodies has also helped to dissect and quantify the relationship between binding energy and catalysis in the evolution of catalytic function. Indeed the use of transition-state analogues to elicit catalytic antibodies provided “proof by synthesis” of the Pauling notion of enzymatic catalysis. In another example, a “ferrochelatase” antibody, which catalyzes the efficient insertion of metal ions into porphyrin (the last step in heme biosynthesis), was generated

Chemistry for the Future Solvay Prize

On 4 December 2013, the presentation of the first “Chemistry for the Future Solvay Prize” took place in Brussels at the prestigious Palace of the Academy of Sciences and Arts in Belgium. This prize created by Solvay in 2013 is to reward every two years a major scientific discovery that could shape tomorrow’s chemistry and help human progress.

After the welcome address by Nicolas Boël (Chair of the Board of Solvay), the laureate Peter G. Schultz was invited on stage to receive the superb crystal trophy and the 300000 € prize from the hands of Jean-Pierre Clamadieu (Solvay CEO).

The large audience from scientific, academic, and political circles in Belgium had responded to the invitation of Solvay to congratulate Peter Schultz in the presence of US ambassador Mrs. Denise Campbell Bauer and to enjoy a Science and Innovation event.

Prof. Hakan Wennerstrom (University of Lund, Sweden), Chair of the Prize Jury, reminded us of the scope and goals of this new international award. After a short recap of Peter Schultz’s career, he highlighted the scientific work and his great originality particularly in the field of stem cell differentiation techniques and modification of biochemical processes of life to incorporate unnatural amino acids into proteins.

To complete this “Science and Innovation” afternoon, Peter Schultz discussed the scope of his research. As a wonderful scientist and teacher, he managed to attract the public’s attention and showed

many potential applications of his work in medicine and chemistry.

Then, as a chemist himself, the Belgian Prime Minister Elio di Rupo stressed the initiative of Solvay and emphasized the role of science and research in our modern society and industry to respond to the changes and needs of our world.

And finally, to illustrate the “Spirit of Innovation” Bertrand Piccard, a third generation explorer of our planet, invited us virtually into the cockpit of “Solar Impulse” (around the world solar airplane) stimulating the public by its dynamism and inspiring messages.

A high level meeting, a great laureate.... See you in 2015!

 www.solvay.com/en/innovation/solvay-prize/ceremony



Price-giving of the award to the Laureate Professor Peter G. Schultz, by Solvay CEO Jean-Pierre Clamadieu (left)