APPLIED ORGANOMETALLIC CHEMISTRY
Appl. Organometal. Chem. 2006; **20**: 812
Published online in Wiley InterScience
(www.interscience.wiley.com)

Book Review

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Chemical biology: a practical course

Wiley-VCH; 2004,
207 pp; price 37.90 euro
ISBN 3-527-30778-8 (softcover)

Chemical biology is a flourishing new discipline broadly defined as the development and use of chemistry techniques for the study of biological phenomena. The chemical biology approach typically involves deducing structural information on biomacromolecules (or small biologically relevant molecules) in order to develop new methods for the synthesis of such compounds, leading to their application in experiments designed to gain better understanding of biological problems. The purpose of the practical course described in this book is to provide a basis for training for graduate chemists and biologists in selected techniques and methods, within this interfacial area. This reviewer is not aware of an equivalent text and, given that chemical biology is among the fastest growing areas of investigation in molecular sciences, the present text seems to satisfy a current need within molecular based graduate education.

The introductory chapter describes the interplay between organic synthesis and biology in chemical biology research, and outlines the major fields of interest in the new science at the interface of chemistry and biology. Seven well-illustrated case studies are presented: the Ras superfamily and its Rab sub-family of lipidated proteins; identifying the natural biological target for the immunosuppressant FK506; covalent trapping of protein-DNA complexes (i.e. mechanism-based trapping); fluorescent probes; modulating cell surface architecture using chemical tools; and allele-specific inhibition of kinases. Although each case study is only a brief outline, together they clearly illustrate the scope and power of the chemical biology approach.

The practical course comprises 12 experiments, nearly all involving chemical synthesis, with products including: oligonucleotides; doubly labelled peptide nucleic acids; an oligonucleotide–streptavidin conjugate; peptides; phenyl- and alkylpyrophosphates; vesicles containing lipidated peptides; biotin–galactose conjugate; α-amino amides; and a biphenyl antibiotic. Those experiments not based on chemical synthesis concern enzymatic synthesis of amylose, identification of proteins from yeast, and *in silico* protein ligand design. The experiments are presented in a more or less common format, with an abstract, list of 'learning targets' and the theoretical background preceding the main experimental procedures section, and references/special literature closing each chapter. These experiments are not for the faint hearted and almost all are beyond the usual provision with undergraduate laboratories; isolation of potato phosphorylase and enzymatic synthesis of amylose is the most evident exception. Knowledge and experience of instrumentation is largely assumed and, disappointingly, there is little guidance on data interpretation. A wide array of instrumentation is required to carry out the 12 experiments, including NMR, HPLC-MS, MALDI-MS, a DNA synthesizer, a fluorescence spectrometer and two-dimensional gel electrophoresis. Many of these instruments are required for two or more of the experiments.

All experiments have been 'field tested' with groups of two or three students. Each experiment was run over a week and took around 5 h per day. The proteomics experiment was an exception, with two-dimensional electrophoresis during the first week and tryptic digest and mass spectrometry in the second week. Up to two experienced graduate students were assigned supervision and examination responsibility for the individual student groups; the editors comment that the practical course requires substantial input and manpower. Unfortunately, no comments are included on the mechanism of student examination.

This book offers a wide variety of stimulating experiments for those involved in training graduate students operating at the interface of chemistry and biology. Although the laboratory protocols are demanding with regards to equipment and manpower, those institutions able to manage effective deliver of the practical course would provide a top-end educational experience. Given the expertise and experience that this book captures, it is keenly priced. Indeed, it would represent good value to an academic adopting but one of the experiments described.

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DOI:10.1002/aoc.1152