Afterword

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Long ago, physicists with some interest in biology spent a lot of time worrying about the compatibility of living systems and the laws of quantum mechanics. We knew that their problem was that they knew no chemistry and found it hard to think in terms of only a few electron volts. Biology is really a branch of chemistry; it is, in fact, chemistry coupled with natural selection, and although we do not pretend to explain everything in chemical terms, there is no doubt that we have gone far in doing this for many elementary biological processes. Chemistry entered the biological sciences a long time ago; classical biochemistry elucidated the flows of matter and energy in living cells, revealing the biosynthetic pathways of small molecules and how energy was unpacked from chemical bonds into ATP and related molecules and used again to make new compounds. In the modern period of molecular biology we sought explanations of more complex processes in cells in terms of proteins and nucleic acid. This is the chemistry of information, how it is stored in DNA sequences and how these are used to specify amino acid sequences and thereby the folding patterns of proteins. This will flow seamlessly into the next stage — the chemistry of organization — as we come to analyse how cells recognize each other, how signals are transmitted and received, and how the processes of the cell are regulated.

In all of this work, not only are the fundamental concepts chemical but chemistry has provided us with powerful tools of analysis. Where would biochemistry be without radioactive isotopes, and where would genetics be without DNA sequencing? Indeed, it could be argued that all the significant advances (*pace* the Double Helix) have been based on new technology rather than new ideas, and certainly today it is not too much of an exaggeration to say that the most fundamental work in modern biology is done by inventors who provide the means for others to probe Nature and make discoveries.

There is a growing interest of chemists in biological problems. This is also an old interest, stemming from the ceaseless search for molecules with biological activity. Vast resources in the pharmaceutical and agrochemical industries are devoted to this work of chemical discovery and the development of compounds for use in medicine and agriculture. We can foresee large developments in this field — in methods for discovering new entities and in generating diversity, and most particularly in knowing better how to link the chemical structure of an entity with its biological effect. The richest interface between biology and chemistry is precisely here, in the field of molecular recognition. Whether or not we will ever understand the chemistry of interactions well enough to design a drug from the structure of an enzyme, or predict the nature of a receptor from the chemical structure of an effector is moot; what is certain is that increasing knowledge will allow us to load the dice increasingly in our favour.

Chemical research has revealed an endless plethora of natural chemical entities made by microorganisms, plants and animals. Many have interesting biological effects and have been selected in nature because they favour the fitness of the organisms that make them. There is a virtual treasure house here awaiting discovery. The powerful tools of molecular genetics can be used in conjunction with chemistry to reveal the biosynthetic pathways of these compounds and the structure of the enzymes that are involved. We need to understand how all of these have evolved, and there will be great insights into their connections, beginning with the recent work on polyketide biosynthesis in streptomycetes.

As a chemist manqué, who began an indifferent career in chemistry more than fifty years ago synthesizing dyes in a garage, I am pleased that there is now a journal where I can indulge both of my interests.