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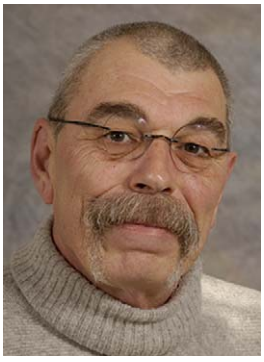
Editorial

Rod Croteau: 35 years of terrific terpene biochemistry



For much of the last half century, the amount of biochemical research being conducted on plant terpenes was in no way commensurate with the enormous size of this class of metabolites and their physiological and ecological importance. However, the situation has changed dramatically in recent years thanks largely to one person, Rod Croteau, whose pivotal discoveries on monoterpene, sesquiterpene, and diterpene biosynthesis have opened up broad new areas of terpene investigation.

Rod has been actively pushing back the boundaries of terpene biochemistry for over 30 years by directing a series of long-running, well-targeted, research programs and introducing new experimental approaches. Back in the era of radiotracer experiments, terpenes were not favored objects of study in plant metabolism. Incorporation rates were low, intermediates for the critical cyclization processes were hard to define, and there was no basic knowledge of how most of the enzymes worked. In the 1970s, however, Rod developed cell-free systems that demonstrated the formation of many cyclic terpenes from the intermediate geranyl diphosphate, and subsequently undertook a lengthy series of enzymological studies to elucidate the complex carbocationic mechanism of the cyclizing enzymes (terpene synthases) responsible for generating such an enormous range of different carbon skeletons. Later, Rod and his coworkers were also leaders in bringing molecular and structural approaches into terpene metabolism. These allowed the identification of many fascinating structure–function relationships among terpene synthase proteins and generated a range of new insights on the evolution of this remarkable enzyme family.

Besides terpene synthases, Rod Croteau's extraordinarily productive research program has also tackled other families of terpene-forming catalysts, such as prenyltransferases, cytochrome P450s, and the enzymes of menthol biosynthesis. He is currently in the final stages of a herculean effort to elucidate the entire biosynthetic pathway of the blockbuster anti-cancer drug taxol, and characterize all of the proteins and genes involved. Another major focus has been the studies on regulation of terpene biosynthesis and accumulation in peppermint. This short summary cannot do much justice to Rod's remarkable record of scientific accomplishments; further reading of some of his 350 superbly-written publications, many of which were published in Phytochemistry, is highly recommended. A selection of my top 25 choices of "Croteau Classics" are given below.

Rod's scientific career stretches from the age of Woodstock to the age of penny stocks. A native of Springfield, Massachusetts, he completed his undergraduate and Ph.D. degrees at the University of Massachusetts, Amherst. Rod first began working with terpenes in 1970 during post-doctoral research at Oregon State University (Corvallis) with W.D. Loomis. He continued in this field later at Washington State University (Pullman), where he joined the faculty of the Institute of Biological Chemistry in 1974. Along with colleagues, such as John Browse, Norman Lewis, Frank Loewus, Tom Okita and C.A. "Bud" Ryan, he has made this department one of the world's leading addresses for plant biochemistry.

In addition to his long list of superb publications, Rod has compiled a host of other scientific honors. For example, he has been elected to the National Academy of Sciences (USA) and enjoyed continuous grant support from multiple private and federal donors (including two NIH MERIT awards). Another measure of Rod's success is the large number of Ph.D. students, post-docs and collaborators (over 150) that have passed through his Pullman laboratory. With his high standards for good science, his unaffected honesty, his rich sense of humor and his world-famous patience, Rod has been a much beloved adviser and mentor to many of us. We join with the contributors

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and editors of this special issue in wishing him a very happy 60th birthday and continued scientific success.

Selected Croteau Classics

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