

This Week's Citation Classic

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Robison G A, Butcher R W & Sutherland E W. Cyclic AMP. *Annu. Rev. Biochem.* 37:149-74, 1968. [Departments of Pharmacology and Physiology, Vanderbilt University, Nashville, TN]

The article reviews work on cyclic AMP, which had by 1968 been recognized as a second messenger mediating many of the actions of a number of hormones. [The SC® indicates that this paper has been cited over 860 times since 1968.]

G. Alan Robison
Department of Pharmacology
University of Texas
Houston, TX 77025

"This article and another review article published around the same time¹ were by-products of a monograph which we were working on at the time, and which was finally published three years later.² Sutherland and T.W. Rall and their colleagues had first published on cyclic AMP in 1957. The literature on this subject grew slowly at first, but, by the time I joined the group in 1962 (Butcher was already there, having been a graduate student with Sutherland), it had begun to grow more rapidly. By the end of 1965, by which time we had moved from Western Reserve to Vanderbilt, we were still able to keep up with the literature but it was getting to be a problem.

The decision to write a monograph on the subject was to some extent based on the feeling that if we were having trouble in this regard, others might be having even more trouble. It struck us that we could perhaps do our colleagues a favor by summarizing everything that was known about the subject. With this in mind, we prepared a list of 100 references for the Institute for Scientific Information® so that we could get weekly ASCA® reports on what was being published.

"That was the start of a rather hectic period in our lives, since we soon realized that the literature was growing even faster than we had thought. It began taking a substantial amount of our time just to read these papers, which to an increasing extent were leading us into areas of research about which we knew nothing. As we wrote in the preface to our 1971 monograph, it was a difficult book to write 'because the subject refused to sit still. It was not simply that it behaved like a naughty child

at the photographer's, for that would be expected in any viable field of scientific research. Rather, it has seemed to us more like an imaginary child who, in the course of having his picture taken, suddenly grew to adult proportions and than left the studio badly in need of a shave.'

"Three years earlier it had not seemed quite that bad, and we were well prepared when the request came to write an article for the *Annual Review of Biochemistry*. We simply took the various outlines and drafts we had been working on for the monograph and turned them into a review article of the requested number of pages. With an appropriate shift of emphasis, we did the same thing for the *Circulation* article.

"I think the main reason these articles were cited so often is that they appeared at a time when a large number of investigators were just starting to write papers about cyclic AMP, which was then sufficiently unfamiliar that most authors felt the need to refer to an earlier article whenever they first mentioned it. Our reviews were particularly handy for this purpose because they were among the first to deal with the subject as a whole, most earlier reviews having dealt with only one or a few aspects of it. Our monograph was later used for the same purpose, until cyclic AMP gradually became so familiar that the automatic citation of a review article no longer seemed necessary. I think another factor, since there were other review articles that could have been cited instead, is that these reviews were written for the express purpose of being useful to the reader. I think they were appreciated for that reason.

"More satisfying than the frequency with which these reviews were cited was the experience, years later, of meeting young investigators who told us they had been stimulated to enter the field by reading one or another of these reviews, and who had subsequently gone on to make important discoveries of their own. Of course it was the subject itself that was exciting, rather than our writing about it, but it was good to know that we hadn't completely prevented the excitement from showing through."

1. **Sutherland E W, Robison G A & Butcher R W.** Some aspects of the biological role of adenosine 3', 5'-monophosphate cyclic AMP. *Circulation* 37:279-306, 1968.
2. **Robison G A, Butcher R W & Sutherland E W.** *Cyclic AMP*. New York: Academic Press, 1971, 531 p.