

# This Week's Citation Classic

CC/NUMBER 8  
FEBRUARY 22, 1982

**Bachmann B J, Low K B & Taylor A L.** Recalibrated linkage map of *Escherichia coli* K-12. *Bacteriol. Rev.* 40:116-67, 1976.  
[Yale Univ. School of Medicine, New Haven, CT and Univ. Colorado Medical Center, Denver, CO]

This paper presents a critical review of all data on the linkage of genes on the *Escherichia coli* K-12 chromosome, a list of genes and their functions, and a graphic representation of the circular chromosome. [The *SCI*<sup>®</sup> indicates that this paper has been cited over 1,185 times since 1976.]

Barbara J. Bachmann  
Department of Human Genetics  
Yale University School of Medicine  
New Haven, CT 06510

October 27, 1981

"The series of linkage maps of *Escherichia coli* K-12 was begun by A.L. Taylor in 1964<sup>1</sup> and has served since as an essential tool in experimental work directed toward understanding the genome of this organism. Early editions of the 'map paper' presented extensive mapping data from Taylor's laboratory, in addition to providing syntheses of all published data, a standardized system of nomenclature, a list of gene functions, and a graphic representation of the chromosome. By 1972,<sup>2</sup> the number of gene loci on the map had increased from 100 to 460. As explorations in molecular biology came to be focused to a large extent on this one organism, the map paper became essential to many who were not primarily microbial geneticists.

"In 1975, another revision of the map was badly needed and Taylor realized that he could not spare the time required to continue the series. It seemed reasonable for me to take over the review because, as curator of the *E. coli* Genetic Stock Center, I need to keep track of all of the loci on the map in order to respond to requests for strains. Taylor agreed to assist with this edition,

and came to Yale to help in the analysis of the data.

"First, Brooks Low recalibrated the map, which is still based on the time-of-entry of markers by conjugation, using the large set of Hfr strains which he had assembled—and many of which he had isolated. To our surprise and delight, the result was a 100-minute map (which is so convenient a figure that some have assumed that this length was chosen arbitrarily). This map paper contained around 680 gene loci and a bibliography of 763 citations. Obviously, not every person using *E. coli* could afford to perform this synthesis for himself. It is the drawing, the bibliography, and the table of gene functions that are most often used. Apparently, few people read the text, which contains many qualifications and exhorts the reader to consult the original literature.

"I later came to appreciate Taylor's many reasons for wishing to relinquish this task. Each time the map is drawn it is necessary to go over all data ever published and to reconcile the widely varying, and sometimes conflicting, results obtained in different laboratories. It is also necessary to arbitrate disputes regarding gene symbols. Constructing the map is one way to offend a great many people simultaneously. When the entire map is fitted together, almost no gene is put exactly where any one person said it was and the position is seldom precisely known.

"I revised the map again in 1980,<sup>3</sup> with the generous assistance of a great many of the authors of the data, and Low contributed a review of mapping techniques. The number of gene loci mapped has continued to increase linearly with time. The 1980 edition contains almost 1,000 loci, representing possibly close to one quarter of the genes of the best known of all organisms."

1. Taylor A L & Thoman M S. The genetic map of *Escherichia coli* K-12. *Genetics* 50:659-77, 1964.  
[The *SCI* indicates that this paper has been cited over 205 times since 1964.]
2. Taylor A L & Trotter C D. Linkage map of *Escherichia coli* strain K-12. *Bacteriol. Rev.* 36:504-24, 1972.  
[The *SCI* indicates that this paper has been cited over 665 times since 1972.]
3. Bachmann B J & Low K B. Linkage map of *Escherichia coli* K-12, edition 6.  
*Microbiol. Rev.* 44:1-56, 1980. [The *SCI* indicates that this paper has been cited over 200 times since 1980.]