

Brewer J M & Ashworth R B. Disc electrophoresis. *J. Chem. Educ.* 46:41-5, 1969.
[University of Georgia, Athens, GA]

How disc electrophoresis, one of the most popular electrophoretic methods, works is presented in simple terms. A cheap and easily constructed apparatus is described. Step-by-step instructions and practical information are given for both the analytical and preparative procedures [The SCI® indicates that this paper has been cited in over 175 publications, making it one of the most-cited papers ever published in this journal.]

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The article originated in my attempts to explain the mechanism of disc electrophoresis to biochemistry graduate students in my physical biochemistry course, and later to a very heterogeneous undergraduate introductory biochemistry class. I had used the method a great deal both on an analytical and preparative scale, but without understanding why it worked. (This was apparently true of many other users of the technique.) I had Ornstein's¹ paper on the electrochemical mechanism, but this was presented in terms of equations and I had already learned such presentations caused mass eye-glazing among students. So I sat down with the paper and after a couple of hours of concentrated thought had figured out why the technique worked and how I could present it in simple electrical terms using just words.

At the same time, my colleague, R.B. Ashworth, had decided that the prices for com-

mercial disc electrophoresis apparatuses were unreasonable and, being handy in technical matters, constructed a cheap apparatus from lucite, rubber stoppers, and Nichrome wire. He had considerable practical experience with the technique, as well.

I had written up my simpleminded explanation for the physical biochemistry students. I also taught a techniques course for our graduate students, one of the techniques being disc electrophoresis. Consequently, I added a step-by-step description of how to do an analytical disc electrophoresis experiment, so I wouldn't have to keep telling people how to do it, and included Davis's² formulation for the reagents.

I eventually realized there might be some general interest in what I had prepared. Ashworth was willing to contribute his apparatus recipe, and I prepared some additional remarks about practical aspects of gel polymerization, purifying the chemicals, and some common pitfalls of the method. I had done a lot of work with Jovin and colleagues' preparative disc electrophoresis apparatus³ and included directions for its use, as modified by my experience, so that the write-up evolved, with Ashworth's suggestions, into a brief review of the technique. We sent the article to a journal that was read by laboratory instructors and students, the *Journal of Chemical Education*. It was accepted without change.

The major virtue of the paper—it has its share of vices—is that it encompasses both the theoretical basis and practical applications of a very widely used technique, written by people with a great deal of practical experience in most of its aspects. As such, it is convenient to cite in a variety of contexts. Later, a further expanded and updated version appeared in our book⁴ as a chapter on electrophoresis.

- 1 Ornstein L. Disc electrophoresis—I. Background and theory *Ann. NY Acad. Sci.* 121 321-49, 1964 (Cited 3,740 times.)
- 2 Davis B J. Disc electrophoresis—II. Method and application to human serum proteins *Ann. NY Acad. Sci.* 121 404-27, 1964 (Cited 15,250 times)
- 3 Jovin T, Chrambach A & Naughton M A. An apparatus for preparative temperature-regulated polyacrylamide gel electrophoresis. *Anal. Biochem.* 9 351-69, 1964 (Cited 505 times.)
- 4 Brewer J M, Pesce A J & Ashworth R B. *Experimental techniques in biochemistry* Englewood Cliffs, NJ. Prentice-Hall, 1974. 374 p.