

# This Week's Citation Classic

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**Marinetti G V.** Chromatographic separation, identification, and analysis of phosphatides. *J. Lipid Res.* 3:1-20, 1962.  
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**This review article deals with chromatographic methods for the qualitative analysis of intact phosphatides and their hydrolysis products. Chromatography of phosphatides was carried out on silicic acid-impregnated paper. Identification of the different phosphatides was carried out by partial chemical hydrolysis and by enzymatic cleavage. [The SC<sup>1</sup>® indicates that this paper has been cited over 665 times since 1962.]**

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"When I began my PhD research in 1951, I became interested in the structure, metabolism, and function of phosphatides and glycolipids. The isolation from brain tissue of certain phosphatides, such as sphingomyelin, or of glycolipids, such as cerebroside, in gram quantities for structural studies was relatively easy. However, when I became interested in metabolic studies on phosphatides, the awesome truth of the limited technology for the separation, identification, and analysis of small quantities of these lipids made it clear that these metabolic studies were not feasible. Therefore, I turned my efforts toward the development of paper chromatographic methods for the analysis of these lipids. This work was done over a period of several years in collaboration with George Rouser (now at the City of Hope Medical Center, Duarte, California) and James Berry (now at the University of Minnesota). We systematically tested various solvents of different polarity, using ordinary Whatman paper. Our first results were very discouraging since only smears or streaks were obtained. We tried hard to improve these systems but to no avail. It was apparent that some type of modification of the filter paper would be required to resolve this problem.

"Column fractionation of lipids was a major effort of the PhD thesis of Dorothy Rathmann of the biochemistry department of the University of Rochester.<sup>1</sup> She found that silicic acid gave a partial separation of some phosphatides by column fractionation. I thought that if it were possible to impregnate filter paper with silicic acid, I might achieve a better system for phosphatide separation. This was accomplished, and I will never forget the day when I developed the phosphatide chromatogram with Rhodamine 6G to detect the lipids. There before my eyes was a beautiful sight to behold—a clear separation of the various phosphatides as discrete spots. This technique opened the doors to the solution of numerous problems dealing with the analysis, biosynthesis, and enzyme degradation of phosphatides in microgram amounts. Indeed, this chromatographic breakthrough (which was developed independently by Lea, Rhodes, and Stoll in Cambridge, England<sup>2</sup>) led to the elucidation of how phosphatides are biosynthesized and degraded in cellular and sub-cellular systems. This led to a flurry of activity in the period 1960-1972. The time was right for this area of research to proceed with all due speed since phosphatide and glycolipid biochemistry had too long lagged behind protein, carbohydrate, and nucleic acid biochemistry.

"My review article apparently found wide appeal and served as a springboard for the next phase of technology, namely thin-layer chromatography utilizing silicic acid-coated glass plates or plastic sheets. The article was timely for the area of membrane biochemistry since, after the burst of research in the 1960s dealing with the elucidation of the manner in which phosphatides are biosynthesized, attention turned to the role of phosphatides in cell membranes. This may account for the article's frequent citation. I was fortunate to have written the review article at a propitious time. I hope it helped to promote research in these exciting frontier areas of biochemistry. I published a more recent review in this field in 1976."<sup>3</sup>

1. **Rathmann D M.** *Adsorption analysis of phospholipids.* Unpublished PhD thesis, University of Rochester. Rochester, NY. 1944, 156 p.
2. **Lea C H, Rhodes D N & Stoll R D.** Phospholipids. 3. On the chromatographic separation of glycerophospholipids. *Biochemical J.* 60:353-63, 1955.
3. **Marinetti G V,** ed. *Lipid chromatographic analysis.* New York: Marcel Dekker. 1976. Vol. 3