

This Week's Citation Classic

Malins D C & Mangold H K. Analysis of complex lipid mixtures by thin-layer chromatography and complementary methods.
J. Amer. Oil Chem. Soc. 37:576-8, 1960.
[Technological Lab., Bur. Commercial Fisheries, US Fish and Wildlife Serv., Seattle, WA and Univ. Minn., Hormel Inst., Austin, MN]

Studies in 1959 revealed that the standardized techniques of thin-layer chromatography according to Stahl¹ opened up new and exciting possibilities for the resolution of complex mixtures of lipids. Ultimately, these microtechniques largely replaced paper and column chromatographic systems for the routine analysis of industrial and biological mixtures. [The SC[®] indicates that this paper has been cited over 275 times since 1961.]

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March 27, 1980

"My recollections of 1959 include seemingly endless hours spent in a converted chicken coop at the Hormel Institute in Austin, Minnesota. Hermann Schlenck and his associates, Donald Sand and Joanne Gellerman, turned out some fine work on the synthetic chemistry of lipids in this celebrated coop (others worked in a converted stable, remnants of the estate of Jay C. Hormel).

"I met Helmut Mangold (now professor and director, Institut für Biochemie und Technologie, H.P. Kaufmann-Institut, Münster, FRC) in this unusual environment.

"Mangold extolled the virtues of the then largely unknown technique of thin-layer chromatography (TLC), but few listened. He suggested that I use Stahl's TLC procedure to analyze the acetoglycerides my colleagues and I had synthesized from marine oils. I mildly berated him for spending so much time with sophomore issues, such as fiddling around with powders on glass plates.

"To our surprise, the 'Stahl technique' worked wonders, and my colleagues and I published a paper which included a thin-layer chromatogram of herring oil acetoglycerides.² We stated: 'The work indicated that the method

(TLC) may have wide use for the separation and identification of other lipid classes as well.' On reflection, it was an extreme understatement.

"Mangold asked me to join him in a *blitzkrieg* effort to look into the potential of TLC for the separation of complex mixtures of lipids. We scurried around obtaining as many types of mixtures as possible, which were placed on thin-layer plates. Remarkable separations were obtained in less than an hour. We advocated the virtues of TLC over paper and column chromatography, but not everyone was convinced.

"My time at Hormel had run out, so the work continued between Seattle and Austin. We only had one Stahl applicator (perhaps the only one in the country), so we shipped it back and forth. I attempted a thin-layer separation of 'glycerides' from dogfish liver. Two large spots appeared where only one (triacylglycerols) usually occurred. Had we completely separated triacylglycerols from diacylglycerol ethers for the first time and in less than an hour? We had indeed.³ But credibility is hard to establish. Some time went by before some colleagues accepted this finding. After all, no one had apparently obtained a complete separation by column or paper chromatography — the yardsticks of that time. But once the doubters used the technique in their own work, the method was quietly sanctified.

"In this and subsequent papers, we demonstrated how Stahl's standardized plates could be used for preparative purposes and for reverse-phase chromatography.^{4,5} We also showed that resolved lipids could be removed from plates and analyzed in a complementary way by other techniques, such as gas-liquid chromatography.^{4,5} A number of papers (authored by us separately and together) demonstrated the great power and versatility of TLC. Those were great times.

"Relatively simple and rapid thin-layer chromatographic techniques, used in conjunction with complementary methods (e.g., gas chromatography), are described for the analysis of complex synthetic and natural mixtures of lipids. This would account for the frequent citation of the paper."

1. **Stahl E.** Thin-layer chromatography: a laboratory handbook. New York: Springer-Verlag. 1969. 1.041 p.
2. **Gruger E H, Jr., Malins DC & Gauglitz E J, Jr.** Glycerolysis of marine oils and the preparation of acetylated monoglycerides. *J. Amer. Oil Chem. Soc.* 37:214-7, 1960.
3. **Mangold H K & Malins D C.** Fractionation of fats, oils, and waxes on thin-layers of silicic acid. *J. Amer. Oil Chem Soc* 37:383-5. 1960.
4. **Malins D C & Mangold H K.** Thin-layer chromatography. (F J Welcher, ed.) *Standard methods of chemical analysis* New York: D. Van Nostrand. 1966. Vol. 3. p. 738-80.
5. **Malins D C.** Recent developments in the thin-layer chromatography of lipids. (Holman R T. ed.) *Progress in the chemistry of fats and other lipids.* Oxford: Pergamon Press, 1966. Vol. 8. Pt. 3. p. 303-58.