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Laurent T C & Killander J. A theory of gel filtration and its experimental verification. *J. Chromatography* **14**:317-30, 1964.
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The separation of molecules according to size when chromatographed on granulated gels was explained in terms of sterical exclusion of the molecules from the gel grains. The gel was assumed to be made up of a three-dimensional random network of fibers and the exclusion was calculated for spherical molecules of varying diameter. Theoretical values agreed with experimental data. [The *SCI*® indicates that this paper has been cited in over 1,160 publications since 1964.]

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Recognition of a paper does not always mean that it describes a fundamentally new idea. It could also mean that contributions by other scientists have made the time "ripe" for a new approach, that a discovery turns out to have unexpected aftereffects ("serendipity"), or that the work describes a useful technique. I believe that all these elements have contributed to make our paper known.

My main research line concerns the physiological function of the polysaccharides, especially hyaluronate, in connective tissue. I arrived in Uppsala in 1961 and at that time was occupied by the problem of how hyaluronate sterically interacts with proteins. I had shown earlier that hyaluronate acts as a filter when proteins move through a solution of it, and Ogston and Phelps[1] had published data that showed that proteins are sterically excluded from compartments containing hyaluronate. Hyaluronate is, however, difficult to prepare in sufficient quantities, and I therefore used another polysaccharide, dextran, in model experiments. Dextran was kindly supplied in large amounts by AB Pharmacia, Uppsala. By various techniques I could demonstrate that dextran molecules in solution, like hyaluronate, sterically exclude various proteins from the solvent.

A few years earlier, a new technique named gel filtration (which should correctly be called gel chromatography) had been developed by Porath and Flodin.[2] Substances chromatographed on granulated gels made, e.g., from cross-linked dextran (Sephadex) are separated according to molecular size. The technique rapidly became very useful in biochemical work. Johan Killander at the Department of Clinical Chemistry in Uppsala developed a great expertise in using the technique and accumulated a large amount of data on the size separation of various materials. He was looking for a unified theory to explain his data at the time we met.

Killander and I started to collaborate in 1962. We showed that gel filtration is best described as a partition chromatographic process and that the partition coefficient of a solute, which we named K_{av}, was equal to the volume fraction of the gel grains available to it. The remaining volume fraction was sterically excluded for the solute. K_{av} could be described in terms of the exclusion of a spherical particle from a network of randomly distributed fibers according to an equation given by Ogston.[3] The exclusion of a protein from a dextran gel was the same as its exclusion in a dextran solution.

The paper was a sidetrack into the theory of chromatography from my main interest, the physiology of polysaccharides. The results have, however, had implications for understanding physiological processes. The paper formulated the theoretical background for a technique that has become very powerful in chemistry. The time was ripe for this theory and several other authors were also trying to describe gel filtration in terms of volume exclusion. The technique has subsequently been widely used for rapid determination of molecular size (and, indirectly, molecular weight), and our paper gave a rationale for these determinations.

1. **Ogston A G & Phelps C F.** The partition of solutes between buffer solutions and solutions containing hyaluronic acid. *Biochemical J.* **78**:827-33, 1961. (Cited 135 times.)
2. **Porath J & Flodin P.** Gel filtration: a method for desalting and group separation. *Nature* **183**:1657-9, 1959. [See also: **Porath J.** Citation Classic. *Current Contents/Life Sciences* **24**(19):21, 11 May 1981.]
3. **Ogston A G.** The spaces in a uniform random suspension of fibers. *Trans. Faraday Soc.* **54**:1754-7, 1958. (Cited 185 times.)