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Letter to the Editor

Two-dimensional

Sir,

At a recent symposium devoted to progress in chromatography, the term "multi-dimensional chromatography" was used to signify the combination of several chromatographic systems or techniques. In the subsequent discussion attention was drawn to the well established usage of the term "two-dimensional chromatography" in paper (PC) and thin-layer chromatography (TLC). This can be defined as the use of a flat bed in such a way that migration in one direction is followed by migration at 90° to the first, usually under different solvent conditions^{1,2}. In comparison with the use of a single solvent system, the separation achieved is better if the separation principle in the two systems differs. This improvement may be evaluated visually on the chromatogram, and it is negligible if the spots of most substances are near the diagonal line of the resulting quadrangle.

The same principle is applicable to flat-bed zone electrophoresis and its combination with chromatography. The technique of column chromatography, where the effluent is applied to a moving sheet, which then serves for chromatography in the second dimension, is also possible³⁻⁵.

During informal discussion afterwards, the lecturer stressed that in mathematics and physics the term "dimension" is not necessarily limited to path length and is not measured only in metres. This would suggest that the term "two-dimensional", as traditionally used in PC and TLC, is incorrect and should be discontinued.

If this is so, one would have to look for an alternative term for use with flat-bed techniques. The terms "bi-directional" or, as used by Smith⁶, a "two-way procedure", could be possibilities.

However, before we decide to reject the traditional meaning of "two-dimensional" in PC and TLC, it would be advisable to examine whether the intrinsic meaning of "multi-dimensional chromatography" as used in the lecture referred to (*cf.*, ref. 7), corresponds to general usage. Various principles have been used in succession or even in parallel for analytical, preparative and other, not necessarily chemical, purposes for many years, without calling their combination a "multi-dimensional" procedure. The term "multi-dimensional chromatography", rather than referring to a combination of chromatographic procedures, was obviously selected with a view to modelling and treating the procedures mathematically by applying information theory in a virtual multi-dimensional space. (Incidentally, one of the earliest papers suggesting the application of information theory in systematic analysis by chromatography is that by Drozen⁸.)

Such an n -dimensional model may, of course, be applied more generally and

often one cannot include all the individual procedures or "dimensions" under a common designation, as one can do if one limits oneself to a single area, such as chromatography, psychological tests or medical symptomatology.

The use of identical terms with different connotations in different fields (information theory and chromatography in the case under discussion) is, of course, common. But why not speak about "multi-dimensional treatment of" or "approach to" chromatographic data and thereby avoid misunderstanding? If we were to agree that it is not necessary to redesignate a combination of n chromatographic procedures as " n -dimensional chromatography", it would cease to be necessary to abandon the established meaning of the term "two-dimensional chromatography" in flat-bed techniques.

I would welcome readers' opinions on this terminological question.

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