Animated Chromatography

The spectacle is a representation of what happens inside a Chromatographic Column.

The chemist is asked: "what is in here? How much is there?" Simple and legitimate questions; the way to sensible answers is instead arduous and perilous.

What shall I do to recognize and quantify a substance? The motto of chromatography is all here: "tell me how you run, and I'll tell you who you are!". At the photo finish, marathon runners generally don't arrive together, nor do the molecules! But molecules have no legs to run, so I have to push them with a mobile phase, a current that can drag them. How can they be separated if I push them all the same way? Simple, I have to offer them the alternative, a stationary phase full of "armchairs" where they can sit for a while before resuming their run!

During their "random walk", mixed substances can stop on the stationary phase or enter the mobile phase and run. Like people, some substances are lazy and will pass more time on the armchairs offered by the stationary phase so that they will come to the end of their way later; others, the more lively, will prefer the mobile phase and therefore will reach the finish line first. First or last, it doesn't matter. The analytical chemist is only interested in their separation and recognition! After the long journey, instead of offering them a refreshing lemonade, we stimulate them (light, electrons, and more) to make them react. You know, from people's reactions, you can understand who they are! From the time needed to arrive at the detector, the analytical chemist confirms their identity by patiently observing molecular signals.

How do we quantify substances?

A pure substance is made up of identical molecules that all behave the same way; to know how many molecules are in a sample, we look at the intensity of their response at the photo finish that is the detector! The more they are, the more they respond!

How much serendipity inspired the intuition of a Russian botanist, Tswett, who, at the beginning of the 1900s, thought of separating the pigments of the leaves by percolating their extract through a powder obtained from ground shells in a glass "column"! We imagine the wonder in his eyes to see that the pigment, descending according to the force of gravity, separated into many differently coloured bands! Chromatography was born, that is, the writing of colour!

Today we can see even what is not coloured and substances that respond to stimuli other than light! We have chromatographs working at ultra-high pressure with sophisticated electronics and precision mechanics.

However, if Tswett had not thought differently from his contemporaries, who explained the phenomenon as an unpleasant accident perhaps due to problems of poor solubility etc ..., he would not have designed further experiments, he would not have come to the conclusion that molecules can be separated according to their speed.

How many theories have been written to explain the chromatographic mechanism! The language is mathematical; the pleasure is aesthetic!

Very similar to art.

CREDITS

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