the one side we have a great volume of purely analytical reasoning begun by Cauchy in France, and pursued under varying assumptions by Green and MacCullagh in England, by F. Neumann and others in Germany. On the other side we have the purely experimental work beginning with Wollaston and Brewster in England, the refined methods for measuring the speed of light invented by Fizeau and Foucault, the beautiful contrivances for experimental research and verification of Jamin and many others. Out of so many fruitful conceptions which have resulted in an enormous accumulation of new knowledge of actual phenomena of light and wave-motion —the real and sole end and aim of all theory—I will for the purpose of illustration single out one which in the middle of the century opened out an entirely new field of inquiry, forming almost a new science by itself. I refer to spectrum analysis.

31. Spectrum analysis.

The phenomena of dispersion (rainbow scattering) and absorption (partial or complete extinction) of light were among the earliest known, and had been among the longest studied, properties of bodies. Being, besides, connected with the physiological, subjective, and artistic effects of light, they have always commanded special interest. And yet, so far as either the emission or the undulatory theory is concerned, they have always presented special difficulties. When the wave theory was first propounded, it was generally understood on the analogy of the phenomenon of sound that difference of colour depends upon difference of frequency, or where the velocity of propagation (as *in vacuo* or in atmospheric air) is the same, on the length of the waves. The diffi-