A mean curve would agree fairly well with the periodic variation predicted from the observations of previous years.

Another important result of the investigation was the gradual realization that when the most suitable conditions of operation had been found, and the novel techniques mastered, the cæsium resonator became a remarkably simple instrument to use. There can be no doubt that this or some other atomic standard will revolutionize the technique of determining the unit of time, and will in practice be used to make the unit available, however it may be defined.

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Gelatin Light-scattering, by a New Enzymic Digestion Technique

In applying light-scattering techniques to molecular-weight and dissymmetry measurements for gelatin fractions in solution, serious doubts arose concerning the efficiency of the usual clarification methods (ultrafiltration, high-speed centrifugation). A convincing check of clarifying processes existed only for fractions of low molecular weight, where the experimental value of the dissymmetry, Z, should approximate to the theoretical value, unity, if all suspended impurities have been removed. For higher molecular weights, a solution free from impurities would be expected to give Z greater than 1, and the procedure adopted by other workers has been to repeat the clarification until Z became constant. It was suspected that this limit did not correspond with complete clarification, and that the use of this criterion caused significant errors in the 90° scatter (and M_w) and large errors in the values of Z.

The alternative, and novel, procedure was therefore adopted of measuring the light scattered from a solution which had been given only a moderately effective clarification, and then destroying the gelatin macromolecules by adding a solution of Armour crystalline trypsin. The residual scatter was mainly that of the solvent and the impurities, since the digestion products of the gelatin, and the added trypsin, have negligible scatter. Subtraction of the residual scatter from the original figures then gives the scatter due to gelatin alone, so that the molecular weight and true dissymmetry of the dissolved gelatin may be obtained. The effects of the addition of trypsin may be seen in Table 1.

In this experiment the gelatin solution was forced by air pressure (2 lb./sq. in.) through a '5 on 3' sintered glass disk into the metal semi-octagonal cell (capacity 50 ml.), held at 40·0° C. At the time '0·50 hr.', 2 ml. of the trypsin solution (concentration 10 mgm. per 100 ml. water) was pipetted into the cell. The trypsin solution had also been filtered through a '5 on 3' sintered glass disk. After 24 hr. a further 2 ml. of the trypsin solution was added, and the scatter increased by 2 per cent at each angle.

Table 1

Time (hr.)	Scatter (arbitrary units) at 135°	90°	45°	Apparent dissymmetry ($\lambda = 546$ mμ)
0	26·0	12·0	32·0	1·23
0·50	26·0	12·0	32·0	1·23
0·75	9·5	4·65	14·7	1·55
1·0	8·55	4·4	13·6	1·59
2·0	8·0	4·1	13·8	1·73
4·0	8·0	4·1	13·9	1·74
24·0	8·0	4·1	13·9	1·74

Gelatin concentration: 3·35 gm. per litre, in 0·5 molar saline, *p*H 6·8

These results show that the gelatin fraction contributed only two-thirds of the original 90° scatter, and gave unit dissymmetry of scatter, within experimental error. From the 90°-scatter due to gelatin a value of 22,000 was deduced for M_w.

In low-angle studies the extra accuracy available through the trypsin digestion technique is incompletely realized unless the solutions are clarified as effectively as possible. On the other hand, in the determination of molecular weight by the 90°-scatter method, where the suspended impurities contribute a smaller proportion of the total scatter, poor clarification may be adequate. For example, a 0·5 *M* saline neutral solution of another gelatin fraction was divided into two parts, and one part was filtered as in the above experiment whereas the other was filtered, under gravity, through a coarser sintered glass disk only. The following results were obtained:

	Type of filter 2	'5 on 3'
Molecular weight gelatin	119,000	115,000
Percentage original 90°-scatter due to gelatin	64	98

In principle, the method is applicable to many macromolecular systems, and may be found to be particularly useful for aqueous solutions, many of which are more difficult to clarify than non-aqueous solutions. The successful application of the technique rests principally upon selective breakdown of the macromolecules under investigation, and it is in this connexion that enzymic attack can be so valuable. It is also necessary that the mode of degradation should interfere as little as possible with the scattering from the solution, and that the impurities should not settle out of solution during the experiment. As the above experiments confirm, the gelatin/trypsin system meets these requirements.

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Shattering of Large Drops

The purpose of this communication is to present some experimental results obtained during a laboratory investigation of the mechanism of the break-up of drops. Results of previous workers indicate that drop deformation and turbulent air flow are major factors in the break-up of drops suspended in the air stream of vertical wind tunnels. Shattering break-ups have been observed for drops 5–9 mm. in diameter as a result of sudden changes in the velocity of the wind stream, or as a result of collisions between drops[1]. The fragments from the disintegrations of one hundred parent drops between 9 and 12 mm. in diameter have been collected and a size distribution determined[2]. No account of the actual mechanism