Preface

A remarkable paper on the formation and properties of speckle patterns was published in the *Proceedings of the Indian Academy of Sciences* in 1943. The author, **G.N. Ramachandran,** was then a research student working with C.V. Raman at the Indian Institute of Science in Bangalore. This paper has been chosen for reproduction in this issue because it brings out, for the first time, many features of speckle patterns which later proved to be of great relevance to ground-based high-resolution optical techniques. These include

> (i) The experimental verification of the probability distribution of the intensities

> (ii) The fact that individual speckles have a size set by the diffraction limit of the whole aperture

> (iii) The demonstration that time averaging produces a pattern whose properties are determined not by the whole aperture but by the individual uncorrelated units which make up the aperture

> (iv) The fact that information about the object itself, not just its auto-correlation, is contained in the speckle image.

This last point is made by a plate taken with a triangular source, and one cannot help being struck by the triangular correlations in the image. This picture makes intuitive the idea proposed and exploited by Weigelt and others that the triple correlation contains the full information about the object and can, in particular, distinguish an object from its inverse (i.e., the object rotated by 180 degrees).

Of course, all these features of speckle patterns are now well appreciated by people working in the field of high resolution imaging, but it may be of interest to trace them to one of their original sources in the physics literature, motivated largely by observations of natural phenomena and laboratory experiments. This paper by G.N. Ramachandran certainly deserves wider note than it has received so far.