

INTRODUCTION

The IAU Colloquium No.49, on the formation of images from spatial coherence functions in astronomy, was held at Groningen, the Netherlands, during the period 10-12 August 1978. The colloquium was attended by 108 participants from 14 countries (U.S.A. 29, the Netherlands 20, U.K. 19, Germany 10, France 7, Australia 5, Canada 5, Japan 4, India 2, New Zealand 2, Sweden 2, Argentina 1, Belgium 1, Israel 1). It was sponsored by the Netherlands Foundation for Radio Astronomy, the International Astronomical Union, the Department of Education and Sciences, the Union Radio-Scientifique Internationale, the Leiden Kerkhoven-Bosscha Foundation and the State University at Groningen.

This volume contains 36 of the 37 papers presented. Nearly all papers are followed by a summary of the discussion that took place after their presentation. A few papers, published in full elsewhere, are given only as abstracts.

The majority of the papers are related to aperture synthesis in radio astronomy; a small number deal with optical astronomy and with applications in acoustics and medicine. The presentations are divided in 7 groups: aperture synthesis and its deficiencies, the problem of limited or missing phase information, techniques for processing and data display, optical interferometric methods, maximum entropy image reconstruction, other image improvement methods, and a survey of image formation from projections. Each group contains one or two invited lectures (see Table of Contents), intended as surveys of particular areas; on the average they occupy twice as many pages as the other papers.

Looking at the contents as a whole, one is struck by the fact that relatively little is said about the classic method of image formation through straightforward fourier inversion of the visibility data. On the other hand, many proposals are made for non-fourier techniques. They are prompted by the wish to cope with the phase problem or by the desire to achieve improved resolution in the image. The key to many of these methods is a simple one: the exploitation of previously neglected a priori knowledge of the brightness distribution and of the measurement errors. In spite of this simplicity we are confronted by a profusion of non-fourier image formation schemes. Some 20 different methods are listed in the Subject Index under the heading "Image reconstruction". A comparison of the relative performance of these methods - and of their combinations - is at present hampered by the fact that practically none of them has a closed form solution. More work is needed in the future to clarify the

situation. Progress in this area is not only expected through astronomically oriented investigations but also through contributions from geophysics, acoustics, statistical spectrum analysis and picture processing, where similar problems exist.

The editor gratefully acknowledges the cooperation of all authors in preparing the typescripts and expresses his gratitude to Mrs. M.H. van Haaster for her assistance with editing the book.

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