Preface

Parallel developments in quantum optics, atomic and molecular physics and condensed matter physics have realized the control of small optical systems, either in free space, in fibers, at interfaces or in semiconductors. Quantum optics of small material systems offers many exciting possibilities, both for fundamental research and for applications. In this context, the most obvious definition of small is: on the order of the wavelength. A more precise definition of is: sufficiently small that only one or a few optical modes come into play. This "mesoscopic" state of affairs implies that quantum noise is dominant. The material involved can be, on the one hand, semiconductor, glass, polymer, rare-earth or dye doped medium. On the other hand, trapped atomic or molecular species also present valuable model systems.
This text is taken from the document proposing the Royal Netherlands Academy of Arts and Sciences to adopt an international workshop on Quantum Optics of Small Structures as an official Academy Colloquium. The Colloquium was held 23 and 24 September 1999 in the 17th century "Trippenhuis" in the center of Amsterdam, home of the Academy. The meeting was organized by Daan Lenstra and Taco Visser of the Vrije Universiteit in Amsterdam. The present book contains most of the invited and contributed papers that were presented either as lectures or as posters.

One reason for organizing this workshop was the initiation of a research program - carrying the same name - funded by the (Dutch) Foundation for Fundamental Research on Matter (FOM) in 1998. Although internationally the above-described field is booming, often under the heading of Cavity Quantum Electrodynamics, a visible activity cluster in The Netherlands concentrating on fundamental optoelectronic research was clearly lacking. Through the new FOM-program a clear link should develop between modern optics and fields like microlasers, nanophysics and quantum optics. Thus, the Academy Colloquium provided the forum for international experts and Dutch scientists to meet and exchange ideas, and helped establishing a strong, coherent and visible research program in The Netherlands with considerable international impact.

The papers presented in these proceedings are organized in four parts, according to the four main sessions of the Academy Colloquium, but it must be emphasized that these parts have only vague boundaries. The collection of papers presented here will give the reader a good impression of the work that that has been presented and discussed during the workshop. We hope that with these papers all interested scientists who were not able to attend the Academy Colloquium on Quantum Optics of Small Structures can share in the synergy of that succesful meeting.

Daan Lenstra, Taco Visser and Ton van Leeuwen, Editors
Amsterdam, March 2000