

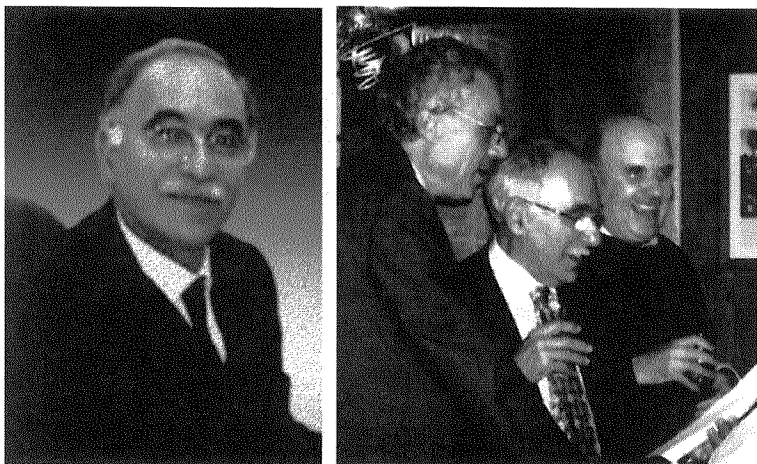
## PREFACE

This book is dedicated to Paolo Perfetti an outstanding scientist and a wonderful friend. It is a collection of articles that were presented at the Workshop on Synchrotron Radiation and Nanostructures, held in Rome in November 2008 — that was also in the honor of Paolo and attracted many of his friends worldwide.

Paolo Perfetti, in a long and illustrious career, made fundamental contributions to the development of synchrotron radiation and scanning probe microscopy and to their applications in materials science and biology. It would take a whole book to describe in detail his many results in a variety of domains. Hence we could only note some of the most important ones here.

As early as 1971, Paolo pioneered molecular beam epitaxy (MBE), then a technique in its infancy and almost unknown outside the USA. Not even the name was universally known and used, so Paolo developed one of the first systems worldwide under a different name: “Bis technique” after R. F. Bis, author of early work in the epitaxy of lead chalcogenides (R. F. Bis *et al.*, *J. Vac. Sci. Technol.* **9**, 226 (1972)). During the same period, he became interested in semiconductor heterojunctions and their interface properties. One of the earliest works witness the shift of a then very young Federico Capasso from laser research to a bright career in interface engineering (P. Perfetti, M. Antichi, F. Capasso and G. Margaritondo, *Infrared. Phys.* **14**, 255 (1974)).

Working in Berkeley in collaboration with David Shirley, Paolo invented a new and very productive line of research: the use of photoemission to measure heterojunction band discontinuities (P. Perfetti, D. Denley, K.A. Mills and D.A. Shirley, *Appl. Phys. Letters* **33**, 66 (1978)). Many scientists adopted this approach in the following decades. This was also one of the milestones in the development of synchrotron radiation and specifically of synchrotron-based photoemission.



*Paolo Perfetti: a formal appearance at his office (left) and a more informal version as a “fraschetta” singer with the editors of this book (right).*

Synchrotron radiation remained a key element of Paolo’s career for more than 30 years and made him famous throughout the world. His synchrotron-based contributions include photoemission, spectro-microscopy, X-ray diffraction, X-ray absorption and EXAFS — and span diverse subdomains from solid interface formation to catalysis.

The natural continuation of Paolo’s work in synchrotron radiation was his more recent activity in free electron laser (FEL) science. He contributed to the first use of FELs in scanning near-field microscopy (A. Cricenti *et al.*, *Appl. Phys. Letters* **73**, 151 (1998)). He was a moving force then for the new giant Italian FEL projects SPARC and SPARX.

The research work of Paolo was not limited to synchrotron radiation and FEL techniques: his search for new phenomena and of their explanation brought him to master different tools such as electron energy loss, inverse photoemission, neutron experiments, laser deposition and Kelvin probe analysis. In recent years, he increasingly worked on problems outside the traditional boundaries of physics: neurobiology, physiology and other biomedical subdomains.

Paolo is not only an outstanding scientist and a pioneer of new techniques, but also a science leader. He was a key person in the development of the Frascati synchrotron project (PULS). For many years (1987-2008), he was the Director of the Istituto di Struttura della Materia (ISM) of the Consiglio Nazionale delle Ricerche (CNR) in Rome, Italy — a reference worldwide for solid state physics, interface science, novel microscopies and other domains. The workshop that led to this book was also to celebrate his retirement after 21 years of leadership.

We are very happy to honor him with this volume, containing a collection of contributions from his present and former co-workers, as well as from friends in the scientific community. This is our way to thank him for his friendship, enthusiasm and human wisdom. He is an example of rigor, honesty and dedication to science.

The workshop took place in November 21, 2008 at the CNR Research Area of Tor Vergata, Rome, Italy. It was attended by 75 scientists from seven countries. Others who could not personally attend sent personal messages, greetings and best wishes to Paolo. The day was crowned by wine and “porchetta” at a Frascati “fraschetta”, accompanied by bawdy Roman songs to which Paolo participated with great enthusiasm (offsetting his objectively limited singing skills).

The workshop’s objective was to present the capabilities of state-of-the-art synchrotron radiation and scanning probe microscopy techniques, together with general theory work, in elucidating the fundamental electronic and structural properties of semiconductor and metal surfaces, interfaces, nanostructures, layers and diverse biological systems.

We are grateful to the workshop sponsors, the Department of Materials of CNR and the Ecole Polytechnique Federale de Lausanne (EPFL). We also wish to thank all the staff members of the ISM-CNR for the excellent support, organization and hospitality.

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