

## PREFACE

In October 2007, the “Abdus Salam” International Centre for Theoretical Physics (ICTP) organized a school in mathematics at the Biblioteca Alexandrina in Alexandria, Egypt. From the 3rd century B.C. until the 4th century A.C. Alexandria was a centre for mathematics. Euclid, Diophante, Eratostene, Ptolemy, Hypatia were among those who made the fame of Alexandria and its antique library. The choice of the Biblioteca Alexandria was symbolic. With the reconstruction of the library it was natural that one also resumes the universal intellectual exchange of the antique library. The will of the director of the Biblioteca, Ismael Seralgedin made that school possible.

The topic of the school was “Algebraic approach of differential equations”. This special topic which is at the convergence of Algebra, Geometry and Analysis was chosen to gather mathematicians of different disciplines in Egypt. This topic arises from the pioneer work of E. Kolchin, L. Gårding, B. Malgrange and was formalized by the school of M. Sato in Japan. The techniques used are among the most recent and modern techniques of mathematics. In these lectures we give an elementary presentation of the subject. Applications are given and new areas of research are also hinted. This book allows to understand developments of this. We hope that this book which gathers most of the lectures given in Alexandria will interest specialists and show how linear differential systems are studied nowadays.

I especially thank the secretaries Alessandra Bergamo and Mabilo Koutou of the mathematics section of ICTP and Anna Triolo of the publications section of ICTP for all the help they gave for the publication of this book.

Lê Dũng Tráng

### Erratum

The school on “Algebraic Approach to Differential Equations” was organized by Lê Dũng Tráng from the ICTP and Egyptian colleagues, Professor Darwish Mohamed Abdalla from Alexandria University, Professor Fahmy Mohamed from Al-Azhar University, Professor Yousif Mohamed from the American University in Cairo. Professor Ismail Idris from Ain Shams replaced Professor Fahmy who had to leave during the conference. Special thanks are going to Professor Mohamed Darwish for his dedication in organizing the school.