# Handbook of Materials for Wind Musical Instruments

Voichita Bucur

# Handbook of Materials for Wind Musical Instruments

Springer

Voichita Bucur
School of Science
RMIT University
Melbourne, VIC, Australia

ISBN 978-3-030-19174-0 ISBN 978-3-030-19175-7 (eBook)
https://doi.org/10.1007/978-3-030-19175-7



This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

*This book is dedicated to the memory of Prof. Neville H. Fletcher (1930–2017) eminent Australian physicist, educator and distinguished scholar in musical acoustics*

# Preface

*Handbook of Materials for Wind Musical Instruments* follows my previous book published by Springer in 2016 entitled *Handbook of Materials for String Musical Instruments*. As I explained in the preface of that book, the idea of connecting the science of materials with the characteristics of materials used for musical instruments became a reality following my long conversations in 2011 with Dr. Grahame Smith, who at that time directed the CSIRO—Materials Science Laboratory in Clayton (located near Melbourne, Australia) and where I was Senior Visiting Scientist. At that time, we talked about a very general project comprising three volumes. The first volume related to the materials for string musical instruments, the second volume for wind musical instruments and the third volume for percussion instruments. Because of the span of the subject, we decided to limit the content of these books to the musical instruments used in symphony orchestras. Therefore, the present book on materials for wind musical instruments refers to the following families of instruments: flute, clarinet, oboe, bassoon, saxophone and brass instruments—trumpet, horn, trombone and tuba. The evolution of wind instrument construction determined the increasing complexity of a symphony orchestra from the seventeenth century to modern times. Instruments of the orchestra grew continuously reaching a pinnacle with Romantic western music, in which wind instruments were particularly featured. Professor Heath Lees from the University of Auckland, New Zealand, an eminent specialist in Wagner's music, in his book *Mallarmé and Wagner: Music and Poetic Language* described the wind instruments of the Romantic orchestra. *"In the orchestra's landscape of effects, flutes were clear and pure in tone, often related to angelic context, or more abstractly to the spirituality itself. In contrast with the open -breathed sound production of the flute, the clarinet's single—reed activity appeared somewhat heavier, its purity of tone more highly coloured and seductive, and was usually reserved for sensual scenes or ideas. The excitability of the oboe's double reed implies an excessively emotional quality, cloying or plaintive.*

*Of the brass instruments, the trumpets were inevitably martial or heroic, while the horns were traditionally hunting instruments and therefore sounded instantly pastoral. Trombones were normally kept for special, brass choir moments, the required regal or religious solemnity".*

Historical investigation of the evolution of wind musical instruments, which goes from iconography to restoration and conservation can explain the improvement of their sound quality. Instrument makers employed the most appropriate technology of their era. The economic and production changes which occurred in different periods allow us to better understand the evolution of wind instruments. Therefore, this book presents the state of the art in the field of the properties and characteristics of materials for wind musical instruments in classical symphony orchestras, also giving an overview of their manufacturing and of the methodology for testing their acoustical quality.

My work for this volume was made possible thanks to my association with RMIT University, in Melbourne, with the School of Science, Acoustic Research Group directed by Prof. John Davy. He very kindly accommodated me in his laboratory. My new position as adjunct professor at RMIT University from 2016, allowed me to have access to the library of this venerable institution and to the significant logistics required in writing this book over more than four years. I am very grateful to Prof. John Davy for creating excellent conditions for the completion of my task in writing this book.

The manuscript of this book was technically revised by Dr. Grahame Smith and Prof. Neville Fletcher. After his retirement from his position at CSIRO, Dr. Grahame Smith continued with infectious enthusiasm to be, as I mentioned, a reviewer of this volume. The manuscript has 21 chapters and evolved in three stages: the first draft, the second draft and finally the third version submitted to the publisher of about thousand pages, which in total means effectively, about three thousand pages. I am profoundly grateful to Dr. Grahame Smith for his support over so many years, during the evolution of this manuscript.

Professor Neville Fletcher (1930–2017)—Australian National University, Canberra, reviewed almost all of the manuscript for this book, doing an enormous amount of work in reading and commenting on the manuscript. Unfortunately, and vary sadly, the vicissitudes of life do not allow him to see this book published. As I mentioned in the preface of my previous book on string musical instruments, I owe Prof. Neville Fletcher a great debt of gratitude for his enthusiastic contribution, his generosity and encouragement offered to me over the years writing this manuscript. This book is dedicated to his memory.

I am also very grateful to Mr. Len Tosolini for proofreading the manuscript of this book.

My long-standing colleague in musical acoustics, Dr. Jean Marie Heinrich enriched this book giving me access to his very big data base on *Arundo donax* and reeds making, allowing me to explain the importance of rigorous selection of cane for reeds and presenting detailed results concerning the variability of this natural material. He also revised many chapters, making comments on the organology of the bassoon and oboe, the botany of cane and practical aspects related to reed making. I am very grateful to him.

I was honoured by the gracious assistance relating to the chapters on pipe organs (organologic description and conservation) given by two outstanding organists, M. Daniel Roth—St. Sulpice in Paris and M. Raymond Douglas Lawrence OAM, director of music at the Scots' Church, Melbourne and professor for organ at the to them.

I sincerely thank all colleagues, musical instrument makers, museums, scientific organisations and publishers cited in the reference lists. This book is based on the work of many colleagues in the Musical Acoustics community, including the Australian Acoustical Society, the French Acoustical Society, Italian Acoustical Society, Spanish Acoustical Society, the Acoustical Society of America, the Acoustical Society of Japan and German Acoustical Society (DEGA). Their corresponding works are cited in the references of each chapter. M. Jűrgen Perchermeier, from Germany, introduced me to the techniques for finishing brass instruments with epoxy resin lacquer. I am very thankful to him.

My scientific interest in ultrasound led me to the question of using ultrasonic techniques for cleaning metallic elements of musical instruments. This subject is detailed in chap. 17. I am very thankful for the revision of this chapter to Prof. Juan A. Gallego – Juárez, eminent specialist in high power ultrasonics.

For the publication of this manuscript by Springer I acknowledge the important contribution of Dr. Mayra Castro and the technical staff involved in the production of this book.

My sister Despina Bucur Spandonide- architect, gave me unstinting support through interesting discussion on musical instruments and enchanted me with the radiance of her presence. I am very grateful to her.

In conclusion, in this book I try to reflect the interdisciplinary nature of the subject concerning properties of materials for wind musical instruments. My approach was one of having in mind the role of physical science in wind musical instruments i.e. one of understanding the principles underlying the traditional practice of manufacturing and the use of specific materials for each type of instrument. I hope that this book is of use to students, scientists, advanced scholars and musicians who can be inspired by the topics I discussed. As mentioned by Maître Jean Gouillou in his book «La musique et le gest» (Music and gesture) *"..... I will not hesitate to pretend that every instrument must be the result of a culture and the fruit of a long evolution before reaching its maximum power of incantation and a material—form relationship whose effectiveness will transcend what a purely technical analysis might suggest"*.

Melbourne, Australia Voichita Bucur
December 2018

## References

Guillou J (2012) La musique et le gest. Editions Beauchesne, Paris
Lees H (2007) Malarmé and Wagner: music and poetic language. Routledge, London

# Contents