

Handbook of Materials for Wind Musical Instruments

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*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. Jürgen 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
December 2018

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Contents

1	Introduction	1
	References	6
2	Organologic Description of Wind Instruments	7
2.1	Introduction	7
2.1.1	Systems of Musical Instruments Classification	7
2.1.2	Classification of Wind Instruments from an Acoustical Standpoint	9
2.2	Structural Elements and Historical Development of Lip Driven Brass Instruments	13
2.2.1	The Trombone	13
2.2.2	The Trumpet	16
2.2.3	The Horn	19
2.2.4	Wagner Tuba	26
2.2.5	The Tuba	31
2.3	Structural Elements of Reed Driven Instruments	33
2.3.1	The Clarinet	34
2.3.2	The Saxophone	42
2.3.3	The Oboe	46
2.3.4	The Bassoon	49
2.4	Structural Elements of Air Jet Driven Instruments	56
2.4.1	The Recorder	56
2.4.2	The Flute	58
2.4.3	The Pipe Organ	66
2.5	About the Protection of Innovation with Wind Musical Instruments and Organs	108
2.5.1	Background	108
2.5.2	Patents for Wind Instruments Manufacturing Between 1617 and 1852	108
2.5.3	The European Patent Convention	112

2.5.4	Patents for Musical Instruments in USA	114
2.5.5	Patents for Musical Instruments in Japan	114
2.6	Summary	114
	Appendix 1	117
	Appendix 2	117
	References	118

Part I Description of Materials for Wind Instruments

3	Wood Species for Reed-Driven Instruments—Clarinet, Oboe, Bassoon and for Baroque Flute	127
3.1	Introduction	127
3.2	Traditional Wood Species for Baroque Flute and for Clarinet, Oboe and Bassoon	131
3.3	Physical, Mechanical and Acoustical Properties of Traditional Wood Species	135
3.4	Porosity of Wood Species	141
3.5	Surface Roughness Characterisation of Wood Species	143
3.6	Effect of Surface Finishing Quality on Acoustical Characteristics of Instruments	146
3.7	Substitutive Species for Clarinet, Oboe, Bassoon	150
3.7.1	Substitutive Hardwood Species from Alaska Forests	151
3.7.2	Substitutive Hardwood Species from Australia	153
3.8	Summary	158
	Appendix 1	161
	Appendix 2	163
	Appendix 3	164
	References	164
4	Physical, Mechanical and Acoustical Properties of Cane for Reeds	167
4.1	Introduction	167
4.2	Modes of Vibration of Reeds	175
4.2.1	Vibration of a Single Reed for Clarinet	176
4.2.2	Vibration of a Single Reed for Saxophone	179
4.2.3	Vibration of Double Reeds	181
4.3	Shrinkage and Swelling of Cane	184
4.3.1	Shrinkage and Swelling of Reeds	185
4.3.2	Shrinkage and Swelling of Cane Specimens	187
4.3.3	Fungi as Factors Affecting the Physical Properties of <i>Arundo Donax</i>	190

4.4	About the Density of Cane	193
4.4.1	General Aspects	193
4.4.2	A Simple Laboratory Method for Density Measurement	199
4.4.3	About the Variability of Density	200
4.4.4	Structural Modification of Cane Microscopic Tissue Under Mechanical Stresses	205
4.5	About the Hardness of Cane	208
4.6	Mechanical and Acoustical Properties of Cane	211
4.6.1	Methodology for Measurements of Viscoelastic Parameters of Cane	212
4.6.2	Mechanical Parameters Deduced from Data by Finite Element Analysis	216
4.6.3	Effect of Relative Humidity and Extractives	218
4.6.4	About the Stability of Mechanical Properties of Cane	221
4.7	Mosso Bamboo a Substitute of Cane for Saxophone Reeds	223
4.8	Common Reed (<i>Phragmites Australis</i> Cav.) for Japanese Flageolet, the Hichiriki	226
4.9	About the Ageing of Reeds	228
4.9.1	Effects of Repeated Wet-Dry and Dry-Wet Cycles on Specimens	229
4.9.2	Effect of Dynamic Loading	231
4.9.3	Effect of Reed Making on the Sound of Instruments	242
4.10	Anatomical Structure of Cane and Musical Quality of Reeds	243
4.10.1	Cane or Giant Reed (<i>Arundo donax</i>) and Common Reed (<i>Phragmites australis</i>)	243
4.10.2	Mosso Bamboo (<i>Phyllostachys pubescens</i>)	246
4.11	Statistical Models for the Selection of Cane for Good Quality Reeds	246
4.11.1	Correlations Among the Quality of Reeds and the Descriptors of Musical Sounds	247
4.11.2	Multiple Regression Analysis	248
4.11.3	Principal Component Analysis	248
4.12	New Materials for Reeds	254
4.13	Cane with Improved Durability and Water Resistance	255
4.14	New Materials, Having Natural Cane Similar Anisotropic Parameters	256
4.15	Summary	258
	Appendix	259
	References	261

5	Metallic Materials for Lip Driven and Air Jet Driven Instruments	267
5.1	Introduction	267
5.2	The Brass	267
5.2.1	The Alloy	269
5.2.2	Authenticity of Early Brass and Alloy Provenance	271
5.3	Brass as a Raw Material for Wind Musical Instruments	272
5.3.1	Brass Technology for Wind Instruments in Saxony	272
5.3.2	Brass Technology in England Between 1651–1867	274
5.4	Chemical Composition of Period Brass Instruments	275
5.4.1	Chemical Composition of Trombones Made in Nuremberg During the Sixteenth Century	276
5.4.2	Chemical Composition of Brass Wind Instruments Made in England Between 1550–1992	278
5.5	About the Finishing of Lip Driven Instruments	279
5.6	Nickel Silver, Silver and Other Precious Metals for Flute	282
5.7	Alloys for Organ Pipes	282
5.8	Summary	284
	References	285
6	Fibrous Auxiliary Materials—Felt, Cork, Paperboard	287
6.1	Introduction	287
6.2	The Felt	289
6.2.1	Felt Structure	290
6.2.2	Physical and Mechanical Properties of Felt	291
6.2.3	Acoustical Properties of Felt	293
6.3	The Cork	295
6.3.1	Cork Structure	299
6.3.2	Physical and Mechanical Properties of Cork	299
6.4	The Cardboard	303
6.4.1	Cardboard Structure	303
6.4.2	Physical and Mechanical Properties of Cardboard	303
6.5	Summary	308
	References	309
7	Organic Auxiliary Materials—Leather and Parchment	311
7.1	Introduction	311
7.2	Leather for Wind Instruments	312
7.3	Leather for Pipe Organs	319
7.4	Parchment, Vellum and Goldbeater's Skin or Skin Fish	321
7.4.1	Parchment and Vellum	321
7.4.2	Parchment Manufacturing	323
7.4.3	Goldbeater's Skin or Skin Fish	326
7.5	Application of FT—Raman Spectroscopy to the Characterization of Parchment and Vellum	328

7.6	Morphology of Historical Parchment with SEM Imaging	329
7.7	Summary	332
	References	333

Part II Basic Acoustics of Wind Instruments

8	Resonant Air Column in Wind Instruments	337
8.1	Introduction	337
8.1.1	Mechanical Reed Instruments	338
8.1.2	Lip Valve Instruments	339
8.1.3	Air Jet Instruments	339
8.2	Fundamentals of the Mechanism of Air Excitation in Tubes	339
8.3	Modelling Wind Instruments	342
8.4	Impedance Spectrum	343
8.5	Bore Geometry	347
8.6	Tone Holes	349
8.7	Mouthpiece of Wind Instruments	350
8.8	Mute	354
8.9	Summary	355
	Appendix	356
	References	357
9	Effect of Wall Material on Vibration Modes of Wind Instruments	359
9.1	Introduction	359
9.2	Description of Acoustical Characteristics of Wind Instruments with Impedance Curves	362
9.3	Physical Factors Affecting Wall Vibration of Wind Instruments	364
9.3.1	Wall Vibration Modelling	365
9.3.2	Effect of Wall Thickness of a Tube	370
9.3.3	Effect of Transverse Section of the Tube	371
9.3.4	Effect of Coupling Between Musical Instrument Structure and Internal Air	371
9.3.5	Effect of Coupling Between the Musical Instrument Structure and External Air	373
9.4	Effects of the Nature of Wall Materials of Wind Musical Instruments	376
9.4.1	Material's Effect on the Vibration of a Cylindrical Tube	376
9.4.2	Materials Effect on the Vibration of a Post Horn	377
9.4.3	Materials Effect on the Vibration of a Trombone and a Trumpet	383

9.4.4	Material Effect on the Vibration of a Flute	392
9.4.5	Materials Effects on the Vibration of the Wall of Organ Pipes	401
9.5	Effects Induced by Pipe's Wall Surface Quality	407
9.5.1	Effect of Wall Roughness	407
9.5.2	Effect of Surface Coating	409
9.5.3	Effect of Thermal Losses	409
9.6	Effect of Thermal Treatment on the Properties of Metallic Materials	410
9.7	The Brassiness of Lip Driven Wind Instruments and Corresponding Instruments' Quality	413
9.8	Summary	418
	References	420
10	Effects of Bore Shape and Tone Holes	425
10.1	Introduction	425
10.2	Bore Shape and Tone Holes in Woodwind Instruments	431
10.3	Acoustical Loses in Bores	433
10.4	About the Tone Holes and the Crack of the Corpus and Other Defects	435
10.5	Tone Holes and the Sound Field	436
10.6	Summary	439
	References	440
11	Methods for Measuring the Acoustic Properties of Wind Instruments	443
11.1	Introduction	443
11.2	Direct Impedance Measurement Techniques	447
11.2.1	Volume Velocity Measurement	447
11.2.2	Pressure Measurement with Microphones	449
11.3	Impedance Sensors	454
11.4	Stimulus Signals for Impedance Measurements	456
11.5	About the Intensimetric Analysis of Signals	457
11.6	About Air Leaks in Wind Instruments	458
11.7	Nondestructive Optical Techniques for Detection of Vibrations of Wind Instruments	461
11.7.1	Laser Doppler Vibrometry	461
11.7.2	Holographic and Speckle Interferometry	464
11.8	Summary	468
	References	469

Part III Manufacturing of Wind Instruments

12 Manufacturing of Metallic Tubes for Wind Musical Instruments	475
12.1 Introduction	475
12.2 Brass as an Alloy	476
12.3 Constructive Particularities of Lip Driven Brass Instruments	479
12.4 Manufacturing of a Trumpet	482
12.4.1 Manufacturing of Structural Elements of a Trumpet	482
12.4.2 About the Consistency of Trumpet Manufacturing	485
12.5 Manufacturing of Metallic Tubes for Air-Jet Driven Instruments	488
12.5.1 Alloys for Metallic Tubes of Organs	490
12.5.2 Effects of Composition, Mechanical Treatment and Casting Techniques on Mechanical Parameters of Alloys	496
12.5.3 About the Metallic Sheets for Organ Pipes	499
12.5.4 Construction of a Labial Metallic Organ Pipe	500
12.5.5 Construction of a Lingual Metallic Pipe	507
12.5.6 About the Mechanical Properties of the Tongue of a Lingual Pipe	515
12.5.7 Comparison of Pipes Made by Different Manufacturers	517
12.6 Manufacturing of Metallic Tubes for Flutes	519
12.6.1 Alloys for Flutes	520
12.6.2 Manufacturing of Metallic Tubes for Flutes	522
12.7 Summary	522
References	523
13 Manufacturing of Tubes and Pipes in Wood	527
13.1 Introduction	527
13.2 Manufacturing of Tubes for Reed Woodwind Instruments	527
13.2.1 Technological Aspects of Tube Manufacturing	527
13.2.2 About the Consistency of Reed Woodwind Instruments Manufacturing	528
13.3 Manufacturing of Pipes in Wood for Organs	532
13.3.1 About the Oldest Historical Organ with Pipes Made in Wood Exclusively	534
13.3.2 Stops Made in Wood for the Modern Pipe Organs	536
13.3.3 Structural Aspects of Pipe Made in Wood	540
13.3.4 Constructive Particularities of Pipes Made in Wood	540
13.3.5 Manufacturing Process of Wood Organ Pipes	547

13.3.6	Tunning Appliances for Stops Made in Wood	552
13.3.7	Mitring of Long Wood Pipes	553
13.4	Summary	556
	References	558
14	Manufacturing of the Reeds for Reed Driven Instruments	559
14.1	Introduction	559
14.2	Technological Aspects of Reed Manufacturing	561
14.2.1	Hand Reed Making	562
14.2.2	Modern Technology for Reed Making	568
14.3	Synthetic Materials for Reeds	572
14.4	Summary	573
	Appendix: List of Patents for Reeds	574
	References	576
15	Manufacturing and Functions of Pads and Keys for Woodwind Instruments	579
15.1	Introduction	579
15.2	Function and Structure of Pads for Woodwind Instruments	580
15.3	Padding of Woodwind Instruments	581
15.4	Biological Attack on Pads of Wind Instruments	585
15.5	Keys Function	587
15.6	Summary	592
	References	592
16	Digital Fabrication of Some Wind Instruments	593
16.1	Introduction	593
16.2	Operational Mode and Parameterized Digital Model	595
16.3	Digital Fabrication of a Saxophone Mouthpiece and of a Saxophone Alto	602
16.4	Digital Fabrication of a Flute	606
16.5	Digital Fabrication of a Trumpet	607
16.6	About the Advantages and Limitations of Digital Technologies for Wind Instruments	610
16.7	Summary	611
	References	612
 Part IV About the Durability and Degradation of Materials		
17	Procedures Used for Cleaning Metallic Wind Instruments	617
17.1	The Background	617
17.2	Mechanical Cleaning of Instruments	619
17.3	Chemical Cleaning of Instruments	619

17.4	Ultrasonic Cleaning of Metallic Wind Musical Instruments	621
17.4.1	About Ultrasonic Cleaning	621
17.4.2	Principle of Ultrasonic Method for Cleaning	623
17.4.3	Ultrasonic Equipment	626
17.4.4	Practical Aspects of Ultrasonic Cleaning	628
17.4.5	Microbial Contamination	631
17.4.6	Presence of Pathogenic Bacteria	631
17.4.7	Methods of Sterilization of Wind Musical Instruments	632
17.5	Summary	634
	References	635
18	Degradation of Organ Pipes and of Brass Instruments	637
18.1	Introduction	637
18.2	About the Tin Pest	637
18.3	Tin Pest Failure and Degradation of Resonators	647
18.4	Degradation of the Reeds	649
18.4.1	Chemical Composition	651
18.4.2	About the Mechanical Properties of Reeds and Their Degradation	654
18.4.3	Vibration Modes of the Reeds	654
18.4.4	The Residual Stress in Tongues	655
18.5	Atmospheric Corrosion and Ageing of Historical Organ Pipes	659
18.6	Damages by Biological Agents of Metallic Pipes and of Pipes Made of Wood	668
18.7	About the Protection of Pipe Organ Against Fire	669
18.8	Degradation of Tubes of Brass Instruments	671
18.9	Summary	675
	References	676
19	Restoration and Conservation of Metallic Wind Musical Instruments	679
19.1	Introduction	679
19.2	Conservation of Acoustical Specifications of a Wind Musical Instrument	682
19.3	Restoration of a Historical Trombone	682
19.4	Corrosion Inside Historical Brass Wind Instruments	685
19.4.1	Chemical Composition of Alloys for Horns	687
19.4.2	Imaging of Corroded Zones of Horns' Slides	688
19.4.3	Electrochemical Techniques for Corrosion Detection	689
19.5	Corrosion of Metallic Structural Elements Containing Silver . . .	692
19.6	About Ethics in the Conservation and Restoration of Metallic Wind Instruments	694

19.7	New Approach in Conservation of Brass Wind Instruments . . .	697
19.8	Summary	703
	References	704
20	Restoration of Pipe Organs	707
20.1	Introduction	707
20.2	About the Polemic: To Play or to Preserve Period Pipe Organs	721
20.3	Early Music Revival Movement	722
20.4	Organ Revival or Organ Reform Movement	724
20.4.1	Orgelbewegung in Germany and Other German Speaking Countries	726
20.4.2	Cecilian Movement in Italy	730
20.4.3	Organ Reform in England	732
20.4.4	Organ Revival in US	732
20.4.5	Organ Building Development After the Second World War	734
20.5	Technological Advances and Organ Building in the 20th and 21st Centuries	737
20.6	About Restoration, Conservation and Preservation of Historical Organs	744
20.6.1	Restoration of Historical Organs	749
20.6.2	Types of Actions for Restoration, Conservation and Preservation of Historical Organs	760
20.7	Summary	764
	Appendix 1: Evolution of the Organ and Registration in France from 17th to 20th Century (Data from Guilhemjoan 1998)	768
	Appendix 2: Structural Components of a Modern Organ Made in 2008 by the Holtkamp Organ Company—Cleveland for the Cathedral of St Louis in New Orleans—Opus 2093. (http://www. holtkamporgan.com/Controls/ImageViewer/ImageViewer.aspx)	770
	Appendix 3: Saint Sulpice Church in Paris and the Organ Rebuilt in 1862 by Cavaillé-Coll. Roth and Dud Attenti (2014) Explained in Detail the Historical and Structural Aspects of the Organ Built by Aristide Cavaillé-Coll	773
	Appendix 4: Reconstruction of the Organ of St Eustache Church in Paris	776
	Appendix 5: Technical Specification of the New Organ Built by van Den Heuvel in Paris, for St Eustache Church	778
	Appendix 6: Stop List for the Organ in St Eustache Church in Paris—8000 Pipes	780
	References	782

21 Marble, The Nondegradable Material for Pipe Organ 787

21.1 Introduction 787

21.2 Marble for Pipes Organs 788

21.3 Marble Organs 790

21.4 Physical and Mechanical Parameters of Marble 791

21.5 Summary 799

References 799

Index 801

**Index of Names of Wind Instruments Makers, Composers and
of Organ Builders and Places Where the Organs Were Built 817**