Music Electronics

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Preface

Let me be frank, I had a hidden agenda in writing *Music Electronics*. It was to write a book which would introduce the foundations of electronics in a fun and relevant manner. I came upon this idea following a spell of lecturing on a Media Technology course at Oxford Brookes University as a Visiting Fellow. British universities appear to have adopted a more flexible approach as to which courses students may attend as part of their overall degree programme and to the entry requirements for these courses. In itself, this seems to me to be a very good thing because early specialism has driven too many a soul into an unfulfilling career later in life. But it does mean that there is a very wide range of abilities and education in the students attending any particular course.

During the lectures, it was obvious that many of the students, and especially those with a less secure scientific background, found the basic electronics concepts difficult and abstract. My ruse therefore was to introduce electronics by stealth: sneaking in the hard stuff under the cloak of a *lack of respectability*! (Who would realise they were learning AC circuit theory when they were simply looking at guitar tone-stacks?) The problem with this approach was that, if the set reading was not to be very wide and onerous, it was necessary to produce voluminous lecture notes. It became clear that a book which covered audio engineering and the necessary underpinning electronics in a thorough, yet digestible, form would be a very useful text. Finding no such book, I decided to write this one.

This book covers material included in my previous book *Music Engineering* and, for some time, I considered all I need do was to revise *Music Engineering* to a third edition. Yet that text, at its core, is now fifteen years old and my ambition was to write a book which contained so much more, both in terms of modern techniques and in covering electronics fundamentals that I decided to write a new one. A new book deserves a new title, and I chose *Music Electronics*, a title which reflects that this volume is about the *electronics* of microphones, amplifiers, instruments, mixing and recording, and not simply about becoming a recording engineer - a misconception possible with the previous title. There are many books which already cover this latter topic and I had no wish to add to an already oversubscribed corner of the market. Not that this book won't help you to become a balance engineer should you have your heart set on that; microphone technique is covered quite fully, as well as the operational aspects of equalisation, mixing and so forth. But this book is aimed as both a comprehensive survey of electronic techniques in the service of music and as an introduction to electronics; driven by an interest and passion in music. My hope, as it was for the original course in Oxford, is that such a book will communicate a much more widely applicable set of skills which may serve the reader in other related walks of life: in television and radio broadcasting; in the multimedia industries; in venue management and services; and in technical services and design for manufacturing.

One irony in covering contemporary fashions in music production and techniques is the degree to which this text is obliged to cover relatively ancient technologies: valves; passive equalisers; analogue synthesisers and so forth. These are covered extensively here - more so than in any other book I know of - because of the continuing fascination young people have in these techniques and equipment. To the thoughtful and sensitive student, it's becoming clearer that, whilst digital electronics, software techniques and cheap manufacturing have delivered a recording studio to anyone who wants one, that in itself does not guarantee any degree of artistic credibility or achievement. Just as with music and art, inspiration and progress is always gained from a study of the past.

Finally, a couple of points about choices made whilst writing. The first concerns language. English may be an international language, but there are many technical terms and, of course, spellings which have sharp national boundaries. I agonised about many of these as I wrote *Music Electronics* - decisions made all the more troublesome because much of the book was written whilst I lived in New York. Nevertheless, in the end, I opted to employ the language I grew up with, and use the British English terms and spellings. For this reason, these pages are full of *valves*, not *vacuum tubes*, which have *anodes* rather than

plates, held in place by *discs* of *colourless* mica. I apologise to American readers for this decision. My justification is that I wanted to write in a natural style and these terms and spellings are natural to me.

Secondly, I do owe an apology to physicists. The following text ignores quantum theory. I tried many times in drafts to include an explanation of the "strangeness and charm" of this inner-atomic world. But, once one part of the theory is acknowledged, the edifice of simplification crumbles. For example, if one admits quantum effects in explaining the operation of semiconductors (which some consider absolutely necessary) then simple assumptions concerning electrical conduction in metals become, either insultingly simplified, or one is forced to quantum electrodynamics (QED) to explain conduction in terms of electrons interacting with photons. In a book which hopes to move the student on from Ohm's Law to the Fourier Transform in a few pages this became an unacceptable quagmire.

In my defence, I have not read an introductory presentation elsewhere which bridges the gap between the world of the electron and the world of electronics in a convincing manner. More profoundly, I believe that nothing more than classical physics is required fully to comprehend electronics even to the degree of repairing, modifying and designing circuitry. So long as the simplifications are identified and acknowledged, I don't feel too much harm is done in, for example, visualising current as a stream of free electrons in a metal, and much is gained in terms of elegant and straightforward theories and models in so doing. To this end, the subjects of equivalent circuits and transfer functions are introduced early to encourage thinking in terms of "black-boxes" in which amplification, filtering and so forth are treated as system-level, mathematical processes. Not only does this sidestep, to some degree, the necessity to understand the physics involved, it also prepares the reader equally for hardware and software implementations of the same process; a more appropriate understanding in a world of plug-ins and software studios.

Richard Brice
France 2012

WARNING

Potentially lethal voltages exist within many pieces of audio equipment and electric and electronic instruments. If you do not yet have the proper training in handling high-voltage electronics, please use the information in this book for information only.

Whilst the author and the publisher of *Music Electronics* have made every effort to ensure that the information contained here is accurate and complete, this book and any of the information contained within it should only be considered to be a general guide and not as the ultimate source of information. This book is supplied without warranties of any kind, express or implied, and the author and the publisher of this book assume no responsibility for any damage whatsoever to persons or property that may result from readers undertaking work on audio equipment, instruments or amplifiers.

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