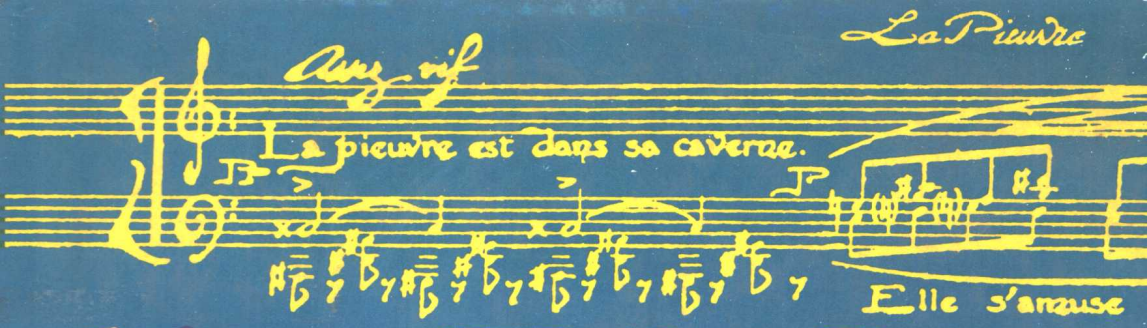

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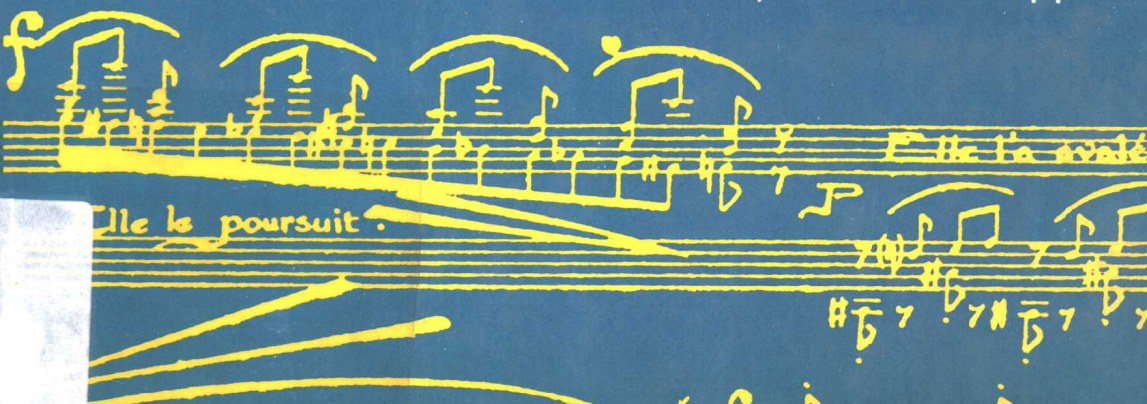

MUSIC AND THE BRAIN

Studies in the Neurology of Music

Edited by

MACDONALD CRITCHLEY
Honorary Consulting Physician, the National Hospital for Nervous Diseases, Queen Square, and King's College Hospital, London.
Emeritus President, World Federation of Neurology.

and

R. A. HENSON
Physician in Charge, Neurological Department and Chairman, Section of Neurological Sciences, The London Hospital.
Physician, The National Hospitals for Nervous Diseases, Maida Vale, London.
Honorary Consultant Neurologist to the Royal Society of Musicians of Great Britain.

With a Foreword by Sir Michael Tippett

WILLIAM HEINEMANN MEDICAL BOOKS LIMITED
London

Julius Caesar's Tower at Windsor Castle

The Bridge at Datchet (Reproduced by kind permission of Dr. and Mrs. Simon Holland)

(*Both drawings in black chalk and watercolour*)

Contributors

BENTON, A. L.

Professor of Neurology and Psychology, University of Iowa.

BLAU, J. N.

Physician, The National Hospitals for Nervous Diseases, Queen Square and Maida Vale, London.

CRITCHLEY, MACDONALD

Honorary Consulting Physician, The National Hospital for Nervous Diseases, Queen Square, and King's College Hospital, London.

Emeritus President, World Federation of Neurology.

DAMÁSIO, A. R.

Associate Professor of Neurology, University of Iowa.

Formerly Professor of Neurology, University of Lisbon, and Chief, Language Research Laboratory, Centro de Estudos Egas Moniz, Portugal.

DAMÁSIO, HANNA

Instructor in Neurology, University of Iowa.

Formerly Research Fellow, Centro de Estudos Egas Moniz, Portugal.

DEUTSCH, DIANA

Associate Professor, Department of Psychology, University of California, San Diego.

GOODDY, W.

Physician, The National Hospital for Nervous Diseases, Queen Square, and University College Hospital, London.

HARRER, G.

Professor, Department of Psychology, University of Salzburg.

HARRER, H.

Research Fellow, Department of Psychology, University of Salzburg.

HENSON, R. A.

Physician in Charge, Neurological Department and Chairman, Section of Neurological Sciences, The London Hospital.

Physician, The National Hospitals for Nervous Diseases, Maida Vale, London.

Honorary Consultant Neurologist to the Royal Society of Musicians of Great Britain.

HOOD, J. D.

Director, Medical Research Council Hearing and Balance Unit, The National Hospital for Nervous Diseases, Queen Square, London.

KHAMBATA, A S
Consultant Surgeon in Diseases of the Ear, Nose and Throat, Dartford Group of Hospitals, Kent.

MEYER, A.
Emeritus Professor of Neuropathology, Institute of Psychiatry, University of London.

MOFFETT, ADRIENNE
Research Fellow, Section of Neurological Sciences, The London Hospital.

PHILLIPS, C. G.
Professor of Anatomy, University of Oxford.

PRATT, R. T. C.
Consultant Psychiatrist, The National Hospitals for Nervous Diseases, Queen Square and Maida Vale, London.

SCHIPKOWENSKY, N.*
Professor, Department of Neurology and Psychiatry, University of Sofia.

SCOTT, D. F.
Physician in Charge, Department of Electroencephalography, The London Hospital.

SEARS, T. A.
Professor of Neurophysiology, Institute of Neurology, The National Hospital for Nervous Diseases, Queen Square, London.

TRETHOWAN, W. H.
Professor of Psychiatry, University of Birmingham.

WERTHEIM, N.
Professor of Neurology, University of Tel Aviv.

WYKE, MARIA
Principal Psychologist, The National Hospital for Nervous Diseases, Maida Vale, London.

* Professor Schipkowensky died before publication.

Acknowledgments

The authors listed below wish to acknowledge the help afforded them.

J. N. BLAU and R. A. HENSON are grateful to the patients who have permitted them to quote their case histories and to colleagues for access to their case notes.

DIANA DEUTSCH'S work was supported by United States Public Health Service grant MH-21001-04.

R. A. HENSON. Christopher Brown, Professor Norman Geschwind, Iris Hawes, Frances Henson, Dr. Robert Sherlaw Johnson, Dr. Anthony Milner, John Moutrie, Dr. Pamela Prior, Dr. Robert Simpson, Dr. Helmut Walcha. The Librarians of The London Hospital Medical College (J. P. Entract) and the Royal College of Physicians (L. M. Payne); the Staff of the Music Library, University of London; B.B.C. Audience Research Unit.

A. MEYER. Dr. Eliot Slater, Mrs. Ursula Baker, Dr. Raymond Hierons, Dr. Samuel Last, Dr. Nina Meyer, Dr. W. Pallie, Dr. S. F. Witelson. S. Karger, Publishers, for permission to reproduce figures.

W. H. TRETHOWAN. Professor E. W. Anderson, Dr. Howard Ferguson, Mrs. Joyce Finzi, Dr. Nigel Fortune, Mr. Michael Hurd, Mr. Robert Layton, Dr. Eric Sams, Mrs. Sue Savage, Dr. Eliot Slater.

MARIA WYKE. Mr. C. Gabriel, Miss A. Greenwood, Miss Eileen Ralph.

Preface

MACDONALD CRITCHLEY and R. A. HENSON

When the Danube Symposium on Neurology met in Vienna in 1972 the topic "neurology of music" was regarded as particularly apt. This was the first occasion when the subject had been submitted to serious discussion, although the sedative and even therapeutic effects of music had been referred to on and off since the pre-homeric myth of Orpheus and Eurydice. There had, of course, been a few highly technical studies dealing with certain psychological aspects. The success of the Vienna meeting was so obvious to both of us, who were present as participants, that we realised there was a place for a more exhaustive neurological study dealing with musical perception and execution as pertaining to the medical sciences. Prompted by our colleagues, we decided to co-operate in editing a volume with chapters written by several authors.

Originally we had hoped to cover the whole field, but this has not proved practicable. No consideration has been given to the problem of absolute pitch, nor to the neurology of musical notation, but with these exceptions we submit that the ground has been covered in the present state of our knowledge.

Our collaborators are drawn from the ranks of neurological exponents, and include workers in the clinical fields as well as in the basic sciences – anatomy, physiology, pathology, psychology and otology – as far as they pertain to the nervous system. It so happens that one contributor has had a professional musical training, the others being amateurs of varying degrees of knowledge and competence. Our co-authors were requested to write for musical readers as well as neurologists. This task proved more difficult in the case of some chapters than others, but we hope that on the whole an adequate compromise has been effected so that the reading matter will interest teachers and students of music, as well as medical men. Our musical friends besought us not to "write down" to them, and we have tried to act upon this advice. In a compendium such as this some overlap was inevitable, and we have allowed it to persist where editorial expurgation would have interfered with the writer's argument.

The scheme of the book is straightforward. The first chapter is intended to be a general introduction, while the remainder of Part I deals with various aspects of nervous function involved in musical activity. Part II

concerns the effects of nervous disease on musical functions, and also the converse state of affairs, namely, certain disorders which are provoked by music. The age-old topic of musical therapy is also critically discussed.

We are extremely grateful to Sir Michael Tippett for his kindness in sparing time to read the manuscripts and to write a preface. Dr. Geoffrey Bush, too, was good enough to peruse each chapter, thus saving us from a number of musical errors, but he must not be held responsible for any blemishes or *bêtises* which remain, or for the musical opinions expressed by the authors. Lastly, we thank our colleagues for their co-operation in this enterprise.

Foreword

SIR MICHAEL TIPPETT

The human practice of music is so ancient an art that the semantics are inevitably bedevilled by history. Thus 5th-century Augustine's *De Musica* is chiefly about what we would *now* call poetry. The 16th-century Agrippa who tried to relate 4-part vocal harmony to other quaternities such as that age-old earth-water-air-fire, belonged to the late Renaissance group of men, Bruno, Kepler, Fludd et al. who thought in a complex. A complex, some of whose elements even then could have been distinguished as religious reformation; post-Galen medicine; alchemy-music. In the historical manner the complex has since divided out we can feel that the semantics of medicine and science have become increasingly precise, while those of religion and aesthetics are still perhaps inevitably ambiguous. For example, when R. A. Henson writes "The use of microtones in contemporary music makes greater demands on the hearing powers of an audience than more traditional works," we must assume that the sounding of the microtones could be verified acoustically as factually accomplished, yet once we permit ourselves to listen musically (the crucially difficult word) then, in my opinion, we shall experience the microtones as no more than expressive divergences from an unconscious, or innate or whatever, notion of (tempered) whole tones and semi-tones. But this is not to suggest that medicine does not have, even now, somewhat similar difficulties. I can imagine that the answer to: what is memory?, just as to: what is music? though immediate to subjective experience is locked in a vicious circle to discursive description.

Attempting to make some general observation from my unmediated subjective obsessional experience of composition, I think the composer has, as it were, to exacerbate both sides of the psychosomatic equation. He must activate the nervous system in order to produce the affect (to be transmitted through performance independent to himself) so continuously as to engineer periodic nervous collapse. (I guess what he is activating is the neurological "clock" described by W. Gooddy.) At the same time in order to imagine, he must activate the psyche towards the more dream-like state, where "regression" to thinking in a complex is possible. It is a curious irony that all the enrichment of knowledge I have received from this book can only enter my music by an alchemy which transmutes the experience of

reading into metaphor; submitting once more to that "divine madness", to use Plato's jargon.

The book of course is the product of research. But medicine is chiefly a daily practice of therapy. Music too can be directly therapeutic; whether on the body or the emotions (or the reverse, as reported by Macdonald Critchley and D. Scott). But music is only tangentially a therapy. So there are two directions in the book – towards music, towards medicine. Yet so much overlaps, join, divides. Like the image of Yeats' gyres I often had a vision while reading of a tidal pulse – inwards from music into the body; outwards from the body into music. Or to quote a more passionate metaphor:

Marbles of the dancing floor
Break bitter furies of complexity

of body, of mind. Music to calm, perhaps,

That dolphin-torn, that gong-tormented sea.

Contents

PART I

1

R. A. HENSON

Neurological Aspects of Musical Experience

The neurological literature on music is commonly dull and lacking in interest to the general reader. There is a wealth of distinguished writing by neurologists on philosophical and literary matters, and music has fared ill by comparison. The reasons are not too far to seek, they include inadequate musical knowledge and a proper apprehension of venturing into difficult fields where traditional scientific guidelines are often unavailable. Even Henry Head limited his work on music to observations on the effects of brain damage on musical functions, although he had a good knowledge of music and the intellect and imagination to make a major contribution. Brain (1959) made some brief, perceptive comments, but his main interests lay elsewhere and he never pursued the subject of music in any depth.

On the other hand, the literature of music is rich. From the great days of Greece up to the present time philosophers, theologians and musicians have provided a stream of theory and criticism. After the commentaries of Plato, Aristotle and other Greeks, the early Christian fathers recorded their views on music and its relationship to life and worship; St. Augustine (A.D. 354–430) provided a remarkable analysis of musical experience in the sixth volume of his *De Musica*. Inevitably the Christian Church remained dominant in writings on music until the Renaissance, but from this time onwards the literature enlarged widely. Interested persons have a notable collection of antique and contemporary literature of high quality at their disposal. Furthermore, musicians have rightly made their own studies in practical or applied neurology. Teachers have expounded their ideas on motor activity and voice production as they relate to performance, hitherto with little assistance from neurophysiologists. Others have recorded their views on memory, an area where neurological knowledge is enlarging and increasingly capable of helping the musician.

Music as we know it today is some eight centuries old, although its origins lie deep in history. The polyphonic style reached its first known flowering in the thirteenth century with the composition of the canon *Summer is i-cumen in*; the earliest extant complete setting of the Ordinary of

the Mass by one composer is Machaut's (*c.* 1300–*c.* 1372) *Messe de Nostre Dame* (Hughes, 1953). Development has proceeded at differing rates since this time and modern composers continue the exploratory process with new ideas on style and performance. In confining this study to serious Western music only a segment of musical history is covered, but the neurological substrate of musical experience does not change, and it is hoped that the ideas and conclusions contained will prove capable of wider interpretation.

The Nature, Development and Prevalence of Musical Ability

Billroth, the Viennese surgeon, was one of the first to attempt definition of the substrate of musical ability or talent. His *Wer ist musikalisch?* was published in 1894. Later, many psychologists have explored the subject in depth, devising tests of musical aptitude and studying the development of talent. Notable among early workers was Seashore, the fruit of whose long experience is contained in his *The Psychology of Musical Talent* (1919) and *Psychology of Music* (1938). Many other important contributions have been made in more recent years and Shuter (1968) has provided a valuable review of these.

The essential auditory requirements for rewarding expressive or receptive musical activity include the capacity to perceive tones and tonal relationships, not simply the specific acoustic properties of a note, such as pitch, duration, timbre and intensity, but the sounding of notes consecutively, melody, tones sounded simultaneously, harmony, and tones sounded in terms of time, rhythm (Hanson, 1942). The musician must also be able to recognise the horizontal relationship of tones or counterpoint. Memory is essential for musical appreciation and performance, and an emotional response is necessary for full experience. While generalisations of this sort can be validly made, it is a truism to recall that the requirements differ according to the individual and that there are wide variations in any unselected group of persons. The majority are able to enjoy music in one form or another and are sufficiently equipped to sing a tune. For the composer, professional performer, amateur executant and serious listener other attributes are needed. The professional performer must possess exceptional motor skills and motivation and persistence in practice, while the composer must have a deep understanding of musical form and structure and the imagination or inspiration to energise his professional expertise.

Musical aptitude and talent declare their presence early in life (Chapter 11), and professional executive potential is usually evident in the first

decade. According to Révész (1953) almost one half of the children he tested showed musical aptitude by the age of five. Shuter (1968) traced the development of musical ability from infancy to maturity. A favourable home or educational environment naturally encourages the process, while absence of such stimulus can delay the appearance and recognition of unusual talent. Musical capacity continues to enlarge during the third decade. Middle and old age form no barrier to new experience or creative ability if the mental faculties are preserved.

The prevalence of musical talent and interest is a matter of social and neurological concern. Serious musical enjoyment was the prerogative of the few until comparatively recent times. Though the common people of the Middle Ages had their folk music and dance, with entertainment from wandering minstrels of different types, and material deriving from these sources played an important part in musical development, it was the Church, royal courts and establishments of other rich and powerful people which were the main repositors of good music. Later the area of performance widened with the emergence of a wealthy merchant class ready to dispense patronage and the spread of private music-making. The first public concerts, in the modern sense of the term, were arranged by the violinist John Banister in London in 1672. When this series ceased in 1678 Thomas Britton, a Clerkenwell charcoal hawker, inaugurated his concerts which continued for thirty-six years. For the first time performances of serious music by outstanding musicians, such as Purcell and Handel, were open to the public. However, Purcell was probably best known by the public from his theatre music and Handel from his oratorios and music performed in the Pleasure Gardens. Music by leading composers was played to large audiences at Gardens like Vauxhall, particularly in the eighteenth century when Glee clubs and other private music groups flourished.

There was a rapid expansion of musical societies and educational facilities in the Victorian Age, but the advent of gramophone and radio in particular has awakened latent interest and increased knowledge and enjoyment among the population at large. On the educational side improved facilities for instrumental training and enthusiastic teachers in schools have shown that there is a large reservoir of musical skills among the young. The proliferation and enlargement of school choirs and orchestras has been a remarkable phenomenon over the past twenty-five years, and standards of performance are often high.

A B.B.C. Audience Research Report (1964) investigated the public for serious music. The final sample of 1250 persons over fifteen was explored by lengthy interview and questionnaire. It was concluded that the serious