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André Leblanc

# The Cranial Nerves

Anatomy Imaging Vascularisation

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Forewords by C. Libersa, G. Cornélis, and P. Lasjaunias

Second enlarged edition  
with 293 figures comprising 722 illustrations in all



Springer

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André Leblanc  
Author – Researcher  
Service de Radiologie  
Centre Hospitalier Régional et Universitaire d'Amiens  
F-80030 Amiens, France

*Private address:*  
20, rue Sainte Colombe, F-80800 Aubigny, France

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## Foreword

André Leblanc's book was originally conceived to help in the radiologic location of the orifices at the skull base transmitting the cranial nerves. With the passage of time it has become a true atlas of anatomy, radiology, computed tomography and magnetic resonance imaging, whose final range far exceeds the initial aims.

Having followed the conception of this book from the outset, I am well able to assess the stringency with which this study has been pursued. Based on everyday radiologic practice, André Leblanc has perfected a series of methods allowing very precise visualization of even the smallest orifices of the skull base, using a relatively simple technique and confirming this with clear pathologic evidence.

He has set out, with intense and laudable personal endeavor, to perfect his anatomic knowledge so as to provide even greater precision to the interpretation of the radiographs. It is for this reason that he was induced to collaborate with my laboratory, where he was able to utilize the remarkable studies of my friend and pupil, Professor Jean-Paul Francke. Finally, thanks to the kindness of Professors Cornélis and Doyon, he has enriched his book with computed tomographic sections and magnetic resonance images which add

even more importance to this remarkable production.

The final outcome of this long research is the work now completed after so much persistent exertion, and also after so many transient hold-ups that André Leblanc has been able to overcome, thanks to an unwavering faith in the utility of his work.

Thus it is that collected here, for each cranial nerve, will be found its anatomic description, its course and distribution, its radiologic identification in the different regions it traverses, a review of its pathology and the computed tomographic aspects of its relations. All this is clear, precise and profusely illustrated.

Though mainly intended for radiologists and their co-workers, it will also be of the greatest usefulness to students, anatomists and clinicians. André Leblanc's work is a veritable treatise on the cranial nerves, a valuable guide of indisputable didactic importance, and one that merits the esteem that everyone is bound to accord it.

*Professor Claude Libersa*  
Lille Medical Faculty

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## Foreword

When, in 1980, André Leblanc showed me the first outline of his work, I immediately agreed to collaborate in the performance of the research in computed tomography required to bring it to fruition. I did, indeed, have a good many reasons to welcome André Leblanc's "new method" with enthusiasm. Among these, I stress the fact that I had never had the good fortune to come across a work so rich in detail, one in which willingness to go to the extremes of precision in description was obvious in every line and every diagram. Another reason, as I saw it, lay in the organization of the book: its division into 12 chapters, each corresponding to the study of a single nerve; the actual study of this nerve, itself divided into 3 sections: a precise and profusely illustrated anatomic description, a complete review of the pathology and symptomatology relevant to the nerve in question with a detailed account of the necessary radiologic postulates; and, finally, a description of the computed tomographic images that can be obtained.

A third reason, which also seemed to me one of the most important, was that André Leblanc's "new method" arrived at the very time to coincide with the perfection of the so-called "high-resolution" scanners and of magnetic resonance imaging. In fact, the great advances in scanning technology have allowed us, in the space of a years, to pass from coarse imaging of the brain substance to imaging of very high resolution. Our present scanners produce real anatomic sections of the skull base that are extremely sharp, precise

and detailed. It is unfortunate that too few are able to validly interpret them because of inability to keep in mind – and this is perfectly normal – the multitude of details comprised in the thorough study of the cranial nerves and their pathways.

This is why I am convinced that André Leblanc's book, based on his new investigative technique, constitutes a reference work of outstanding value, both for students, who will find there very many diagrams as well as descriptions, and for technicians – whether or not they work with scanners – who can inform themselves effectively and without waste of effort on the views to carry out and the images to obtain. Radiologists themselves can only feel happy to have at hand this genuine working tool, which should allow them to direct procedure effectively and rapidly and to make interpretation of the images obtained less arduous and problematic.

I pay due homage to André Leblanc for having carried through this gigantic work, and I am grateful for the trust he showed in asking me to collaborate with him. I dare to expect that his book will achieve the success it deserves. But, whatever the outcome, I shall always feel very proud to have had the opportunity to add my modest contribution.

*Professor Georges Cornélis*  
St-Luc University Neuroradiology Clinic  
Louvain en Woluwe, Brussels

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## Foreword

This is the second, enlarged edition of André Leblanc's atlas of the cranial nerves. The first edition, published in 1992, was a successful conclusion of long and fastidious work that was carried out with a meticulousness that did credit to its author. André Leblanc's roots are firmly in the French anatomoclinical tradition: he combined dissections, cross-sections, and views of the skull with functional anatomical information on the cranial nerves and with conventional tomography and magnetic resonance imaging. He contributed to the anatomoradiological tradition with this work, a compilation which featured architectural ideas and rigorous selection in terms of both, information and images. In short, he became a model for the French school. He did not seek to make strict correlations, but managed to associate views in the same planes with general views centred on the cranial nerve, thereby combining the three-dimensional, two-dimensional, and schematic aspects. This capacity for linking detailed vision with a general view is rare today and certainly deserves emphasis here: it is modern and at the same time true to our tradition.

The first edition and the posters which accompanied it were a showcase for the French school. André Leblanc's book can now be found all over the world, and his posters hang in the majority of general radiological and neurological departments. The wide recognition is a source of pride for him and for us, and surely an encouragement to read this work in a little more detail. This distribution over international boundaries of the work of a man whom our own system might classify as marginal should prompt reflection on the part of those responsible for the system. Does progress not always have its origins in a marginal phenomenon?

The multidisciplinary character of André Leblanc's approach and the addition of vascularisation in this new edition illustrate the extent to which the anatomical foundations of imaging are an essential accompaniment to the development of therapeutic techniques. Indeed, some years after the creation of groups for neurosurgery of the skull base and the introduction of minimally invasive or endovascular approaches, knowledge of the anatomy of the cranial nerves and their vascularisation has become a source of clinical precision, a series of significant markers, and a surgical challenge. Just a few years ago, skull base syndromes represented obstacles or contraindications to therapy. Today, surgeons' knowledge of the anatomy of the nerves and ability to respect them during treatment are an index of their skill and precision. Functional rehabilitation and immediate reconstruction of these anatomical structures are the aspects most recently focused on.

This second edition is thus a reference not only for clinicians, surgeons, and neuroradiologists but also for anatomists. It represents a successful balance between erudite detail and clinical practice. Working with a book like this is a sheer pleasure: it provides authentic material for teachers, and will be pleasantly easy to use for students or others who have the good fortune to become acquainted with it.

I share the pride of Professor Cornelis in the first edition at having had the opportunity to follow this project from its very beginning and to see the author's persistence rewarded.

*Professor Pierre Lasjaunias*  
UFR Kremlin Bicêtre, Université Paris Sud

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## Preface and acknowledgments

This work presents a simple and original radiologic technique, thanks to which most of the vulnerable points of the cranial nerves, wherever they may be situated, can be rapidly visualized. The course of each nerve is studied both anatomically, by dissections and macroscopic serial sections, and radiologically.

Naturally, the classical lesions are reviewed. But, over and above the association with the anatomy and computed tomography (CT), the main interest of this book lies in the description of the numerous unpublished lesions at the foramina and orifices of the skull base. These lesions, demonstrated by myself, called for numerous preliminary explorations of the dry bone and anatomic specimens, contrasting with the facility of actual execution. They are valid whatever the morphology and the patient's condition, and take account of possible asymmetries.

The different pathologic affections of the cranial nerves are summarized. In the presence of a given syndrome, they allow precise definition of the zones to be radiographed. By simple angular calculation, and whatever the radiologic material utilized (old or otherwise), it is possible to clearly visualize the suspect zones, easily and rapidly.

Each nerve is studied from its origin right up to its muscle, with its anastomotic, ganglionic and terminal branches, with its intracranial, extracranial and intracanalicular course and path. The canals and orifices transmitting the cranial nerves are visualized precisely in their axes.

It is true that computed tomography and magnetic resonance imaging have become the preferred methods for radiologic exploration of the skull. But while these techniques are more particularly suited to detecting intracranial pathologic processes, the images of the foramina at the skull base often still lack definition.

These images are rarely made along an axis allowing detection of a lesion of small dimensions or a minimal fracture line, as can be done by radiography using the methods described in this work. It is common to obtain films of CT scans showing the foramen ovale, the foramen lacerum, the auditory tube, the jugular foramen, etc.; but it remains rare to see the orifices and courses of the greater and lesser petrosal nerves, superficial and deep, and of their grooves, which run in different directions. The importance of obtaining such films is set out in the book.

Progress in computed tomography and magnetic resonance imaging has made available greater possibilities in multidimensional orientation and reintegration; the new methods are readily applied for our present purposes, but interpretation of the films is all the trickier. This means that the radiologist must be able to refer to very detailed anatomic studies; and in the anatomical field, as in that of imaging, this atlas will be a valuable guide. It is supplemented by numerous sections obtained by the most recent types of magnetic resonance imaging and CT scanning (high definition).

The importance of this book may be illustrated by reference to some of its essential features. It provides valuable teaching material in a field where exploration is difficult. It is a guide for the anatomist, the radiologist, the neurosurgeon, the otorhinolaryngologist, the ophthalmologist and the medical student. It deals with the neuralgias, and with the early diagnosis of neurinomata, fractures and small tumors from the appearance of the earliest clinical signs. The radiographs discussed are easy to perform, whatever the morphology or condition of the patient, and the films are obtainable with a minimum of time and radiation, even with simple equipment. There is a general revival of interest in view of the development of computed tomography and magnetic resonance, whose better spatial resolution allows demonstration of the foramina of the skull base in their axes and of the course of the cranial nerves.

This book summarizes fifteen years of work and research in electroradiology carried out by me with the help of the Anatomy Institute of Lille Medical Faculty, then in neuro-radiology [computed tomography (CT)] at the Saint-Luc University Clinic of Brussels, in the Department of Neuro-radiology (MRI) of Kremlin Bicêtre Hospital Center in Paris, and finally in the Department of Neuroradiology (MRI) of A. Z. St-Jan in Brugge. I thank particularly my brother René Leblanc and Dr Jean Jacquier who taught me the rudiments of this discipline around 1955 at the Medico-social Center of Mines at Auchel, so making it possible to produce this work. I also thank the members of the Photographic Department of the Lille Medical Faculty: Messrs Gérard Espouy, Jean-Pierre Delattre, Jacques Delattre, Jules Herman, and Ms. Maryse Caron of the Sud Hospital in Amiens for the production of the greater part of the photographic material in this book and Jean-Jacques Vérité for the reproduction of my drawings and anatomic diagrams, as well as Mr and Ms Deraison (polygraphique, Amiens) for the preparation of most of the photoengravings. I wish to express my warmest thanks to Dr David Le Vay who undertook the difficult task of translating the book into the English language.

Finally, I am deeply indebted to Professor P. Lasjaunias, thanks to whom my book could at long last – even though I did not believe in it – appear, for the possibility to use his angiographic views enhancing this new edition.

*A. Leblanc*

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The author would like to thank Professor J.P. Francke for carrying out all the dissections and serial macroscopic sections in color intended for this book.

This second edition is further enhanced by numerous recent MRI views and additionally by angiographic views of the craniofacial arteries.

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## Participants

Alejandro Berenstein  
Professor of Radiology and Neurosurgeon  
New York University and  
Bellevue Medical Center  
New York

Jan W. Casselman  
Doctor of Neuroradiology and  
Head and Neck Radiology  
A. Z. St-Jan Brugge  
Ruddershove, Belgium

Georges Cornélis  
Professor of Neuroradiology  
Catholic University of Louvain  
Saint Luc University Clinic  
Brussels

Dominique Doyon  
Professor of Radiology  
University Hospital Center  
Kremlin Bicêtre  
Université Paris Sud

Jean-Pierre Dumortier  
Department of Neuroradiology  
Saint Luc University Clinic  
Brussels

Jean-Paul Francke  
Professor of Anatomy and  
Organogenesis  
Faculty of Medicine  
Université Lille II

Philippe Halimi  
Professor of Radiology  
Hospital Center Boucicaut  
Paris

Pierre Lasjaunias  
Professor of Anatomy  
University Hospital Center  
Kremlin Bicêtre  
Université Paris Sud

Claude Libersa  
Professor of Anatomy and  
Organogenesis  
Faculty of Medicine  
Université Lille II

Jean-Claude Libersa  
Professor of Dental Pathology and  
Therapeutics  
Université Lille II

Natacha Belly Touge  
Radiologist  
Hospital Center Laënnec  
Paris

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The olfactory nerves arise from neurosensory cells situated in the olfactory mucous membrane.  
The apparent origin of the olfactory fibers occurs at the olfactory mucous membrane (nasal cavity, superior nasal concha).  
The true origin of the constituent nerve fibers is located at each olfactory patch, where each nerve fiber separates from the base of the olfactory cell.

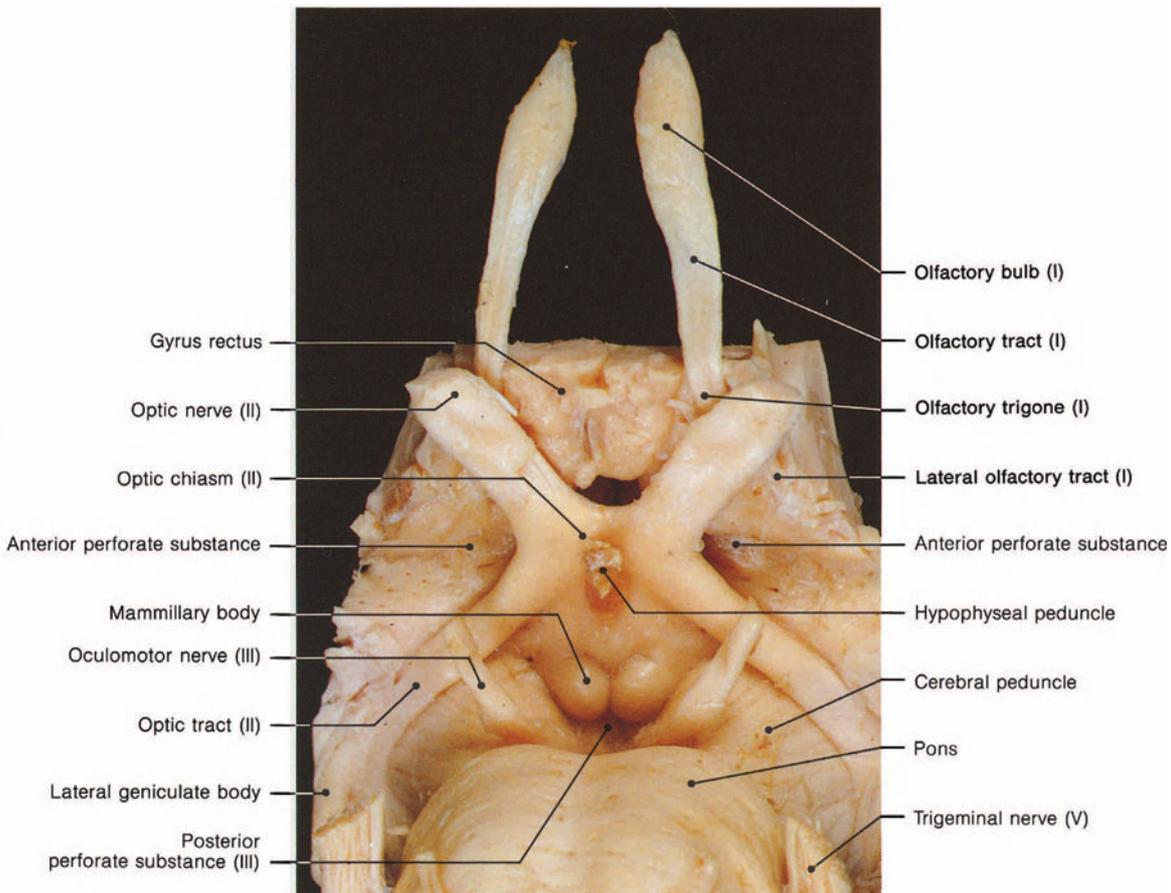


Fig. 1.1. Inferior view of olfactory bulbs