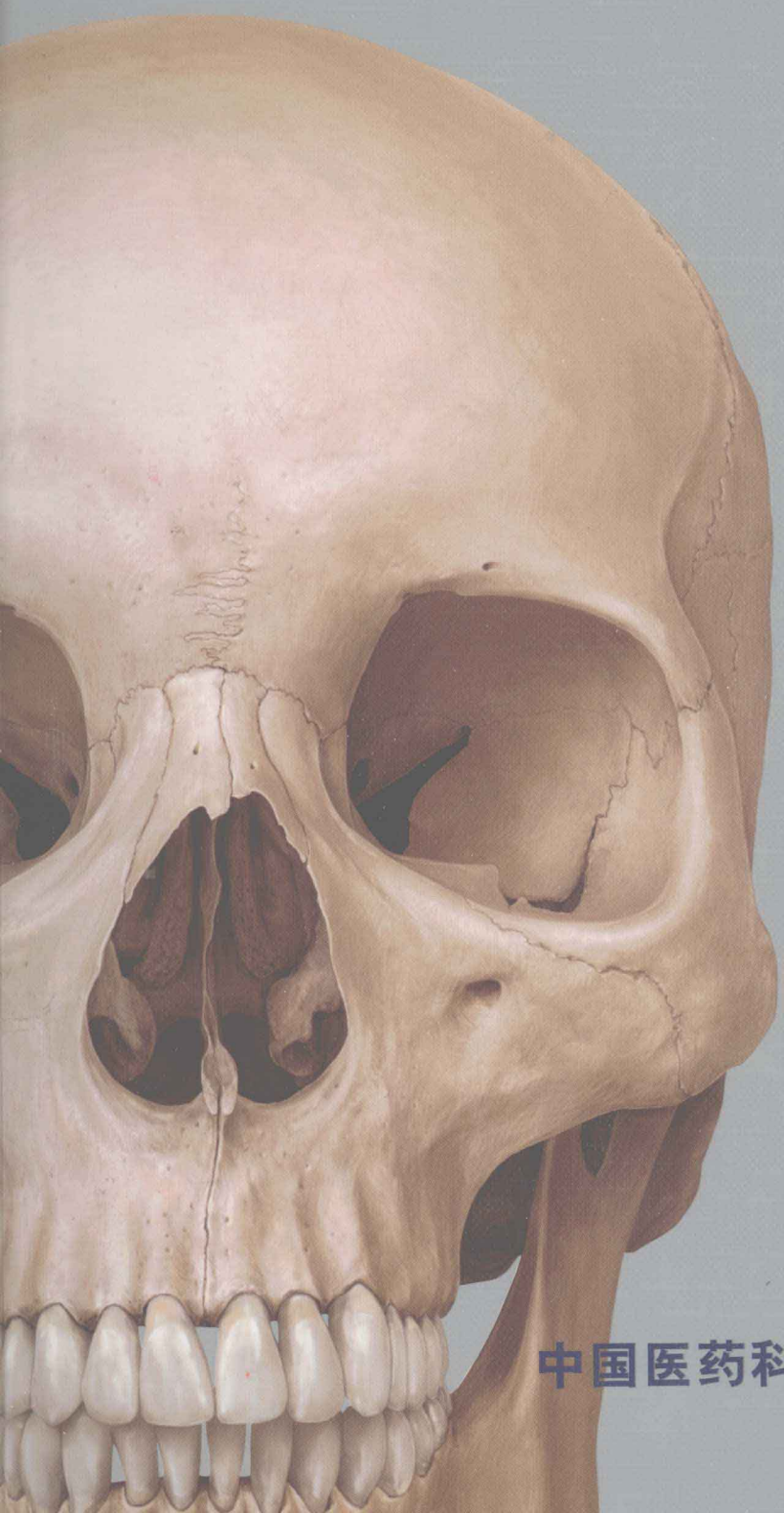
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THIEME 解剖图谱

Head and Neuroanatomy

头部与神经系统

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THIEME Atlas of Anatomy

THIEME 解剖圖



Head
and Neuroanatomy

THIEME
Atlas of Anatomy

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Foreword

Our enthusiasm for the THIEME Atlas of Anatomy began when each of us, independently, saw preliminary material from this Atlas. We were immediately captivated by the new approach, the conceptual organization, and by the stunning quality and detail of the images of the Atlas. We were delighted when the editors at Thieme offered us the oppertunity to cooperate with them in making this outstanding resource available to our students and colleagues in North America.

As consulting editors we were asked to review, for accuracy, the English edition of the THIEME Atlas of Anatomy. Our work involved a conversion of nomenclature to terms in common usage and some organizational changes to reflect pedagogical approaches in anatomy programs in North America. In all of this, we have tried diligently to remain faithful to the intentions and insights of the original authors.

We would like to thank the team at Thieme Medical Publishers who worked with us. Heartfelt thanks go firtst to Kelly Wright, Developmental Editor, and Cathrin E. Schulz, M.D., Executive Editor, for her assistance and checking and correcting our work and for their constant encouragement and availability. We are also grateful to Bridget Queenan, Developmental Editor, who provided a uniquely thorough, thoughtful, and cooperative approach from the moment she entered the process in the editing of this volume.

We would also like to extend our heartfelt thanks to Stefanie Langner, Production Manager, for preparing this volume with care and speed.

Lawrence M. Ross,
Edward D. Lamperti
Ethan Taub

Preface

As it started planning this Atlas, the publisher sought out the opinions and needs of students and lecturers in both the United States and Europe. The goal was to find out what the "ideal" atlas of anatomy should be—ideal for students wanting to learn from the atlas, master the extensive amounts of information while on a busy class schedule, and, in the process, acquire sound, up-to-date knowledge. The result of this work is this Atlas. The THIEME Atlas of Anatomy, unlike most other atlases, is a comprehensive educational tool that combines illustrations with explanatory text and summarizing tables, introducing clinical applications throughout, and presenting anatomical concepts in a step-by-step sequence that allows for the integration of both system-by-system and topographical views.

Since the THIEME Atlas of Anatomy is based on a fresh approach to the underlying subject matter itself, it was necessary to create for it an entirely new set of illustrations—a task that took eight years. Our goal was to provide illustrations that would compellingly demonstrate anatomical relations and concepts, revealing the underlying simplicity of the logic and order of human anatomy without sacrificing detail or aesthetics.

With the THIEME Atlas of Anatomy, it was our intention to create an atlas that would guide students in their initial study of anatomy, stimulate their enthusiasm for this intriguing and vitally important subject, and provide a reliable reference for experienced students and professionals alike.

"If you want to attain the possible, you must attempt the impossible" (Rabindranath Tagore).

Michael Schünke, Erik Schulte, Udo Schumacher,
Markus Voll, and Karl Wesker

Acknowledgments

First we wish to thank our families. This atlas is dedicated to them.

We also thank Prof. Reinhard Gossrau, M.D., for his critical comments and suggestions. We are grateful to several colleagues who rendered valuable help in proofreading: Mrs. Gabriele Schünke, Jakob Fay, M.D., Ms. Claudia Dücker, Ms. Simin Rassouli, Ms. Heinke Teichmann, and Ms. Sylvia Zilles. We are also grateful to Dr. Julia Jürns-Kuhnke for helping with the figure labels.

We extend special thanks to Stephanie Gay and Bert Sender, who composed the layouts. Their ability to arrange the text and illustrations on facing pages for maximum clarity has contributed greatly to the quality of the Atlas.

We particularly acknowledge the efforts of those who handled this project on the publishing side:

Jürgen Lüthje, M.D., Ph.D., executive editor at Thieme Medical Publishers, has "made the impossible possible." He not only reconciled the wishes of the authors and artists with the demands of reality but also managed to keep a team of five people working together for years on a project whose goal was known to us from the beginning but whose full dimensions we came to appreciate only over time. He is deserving of our most sincere and heartfelt thanks.

Sabine Bartl, developmental editor, became a touchstone for the authors in the best sense of the word. She was able to determine whether a beginning student, and thus one who is not (yet) a professional, could clearly appreciate the logic of the presentation. The authors are indebted to her.

We are grateful to Antje Bühl, who was there from the beginning as project assistant, working "behind the scenes" on numerous tasks such as repeated proofreading and helping to arrange the figure labels.

We owe a great dept of thanks to Martin Spencker, Managing Director of Educational Publications at Thieme, especially to his ability to make quick and unconventional decisions when dealing with problems and uncertainties. His openness to all the concerns of the authors and artists established conditions for a cooperative partnership.

Without exception, our collaboration with the entire staff at Thieme Medical Publishers was consistently pleasant and cordial. Unfortunately we do not have room to list everyone who helped in the publication of this atlas, and we must limit our acknowledgments to a few colleagues who made a particularly notable contribution: Rainer Zepf and Martin Waletzko for support in all technical matters; Susanne Tochtermann-Wenzel and Manfred Lehnert, representing all those who were involved in the production of the book; Almut Leopold for the Index; Marie-Luise Kürschner and her team for creating the cover design; to Birgit Carlsen and Anne Döbler, representing all those who handled marketing, sales, and promotion.

The Authors

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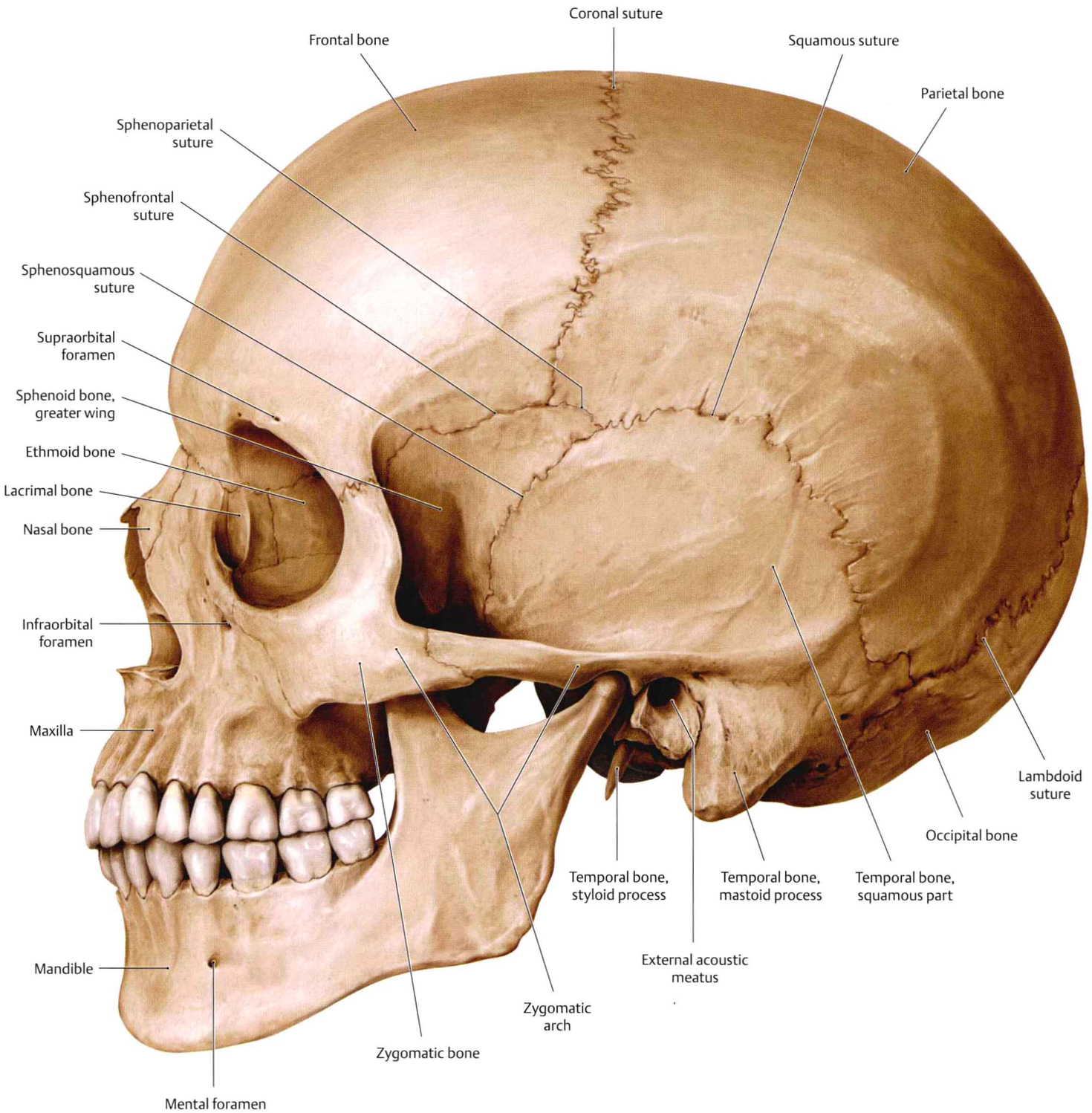
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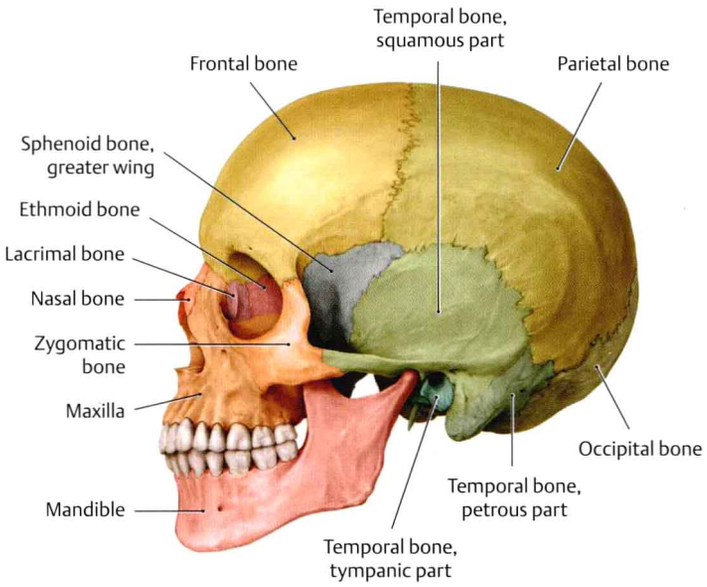
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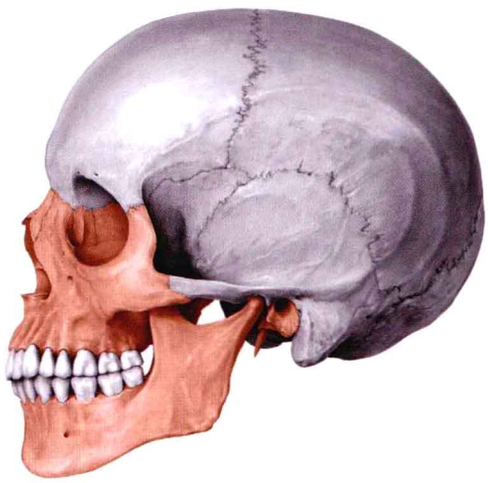
1.1 Skull, Lateral View



A Lateral view of the skull (cranium)
Left lateral view. This view was selected as an introduction to the skull because it displays the greatest number of cranial bones (indicated by different colors in **B**). The individual bones and their salient features as well as the cranial sutures and apertures are described in the units that follow. This unit reviews the principal structures of the lateral aspect of the skull. The chapter as a whole is intended to familiarize the reader with the names of the cranial bones before proceeding to finer anatomical details and the relationships of the bones to one another. The teeth are described in a separate unit (see p. 36 ff).



B Lateral view of the cranial bones
Left lateral view. The bones are shown in different colors to demonstrate more clearly their extents and boundaries.



C Bones of the neurocranium (gray) and viscerocranium (orange)
Left lateral view. The skull forms a bony capsule that encloses the brain, sensory organs, and viscera of the head. The greater size of the neurocranium (cranial vault) relative to the viscerocranium (facial skeleton) is a typical primate feature directly correlated with the larger primate brain.



D Ossification of the cranial bones
Left lateral view. The bones of the skull either develop directly from mesenchymal connective tissue (intramembranous ossification, gray) or form indirectly by the ossification of a cartilaginous model (enchondral ossification, blue). Elements derived from intramembranous and endochondral ossification (desmocranium, chondrocranium) may fuse together to form a single bone (e.g., the occipital bone, temporal bone, and sphenoid bone).
The clavicle is the only tubular bone that undergoes membranous ossification. This explains why congenital defects of *intramembranous* ossification affect both the skull and clavicle *(cleidocranial dysostosis)*.

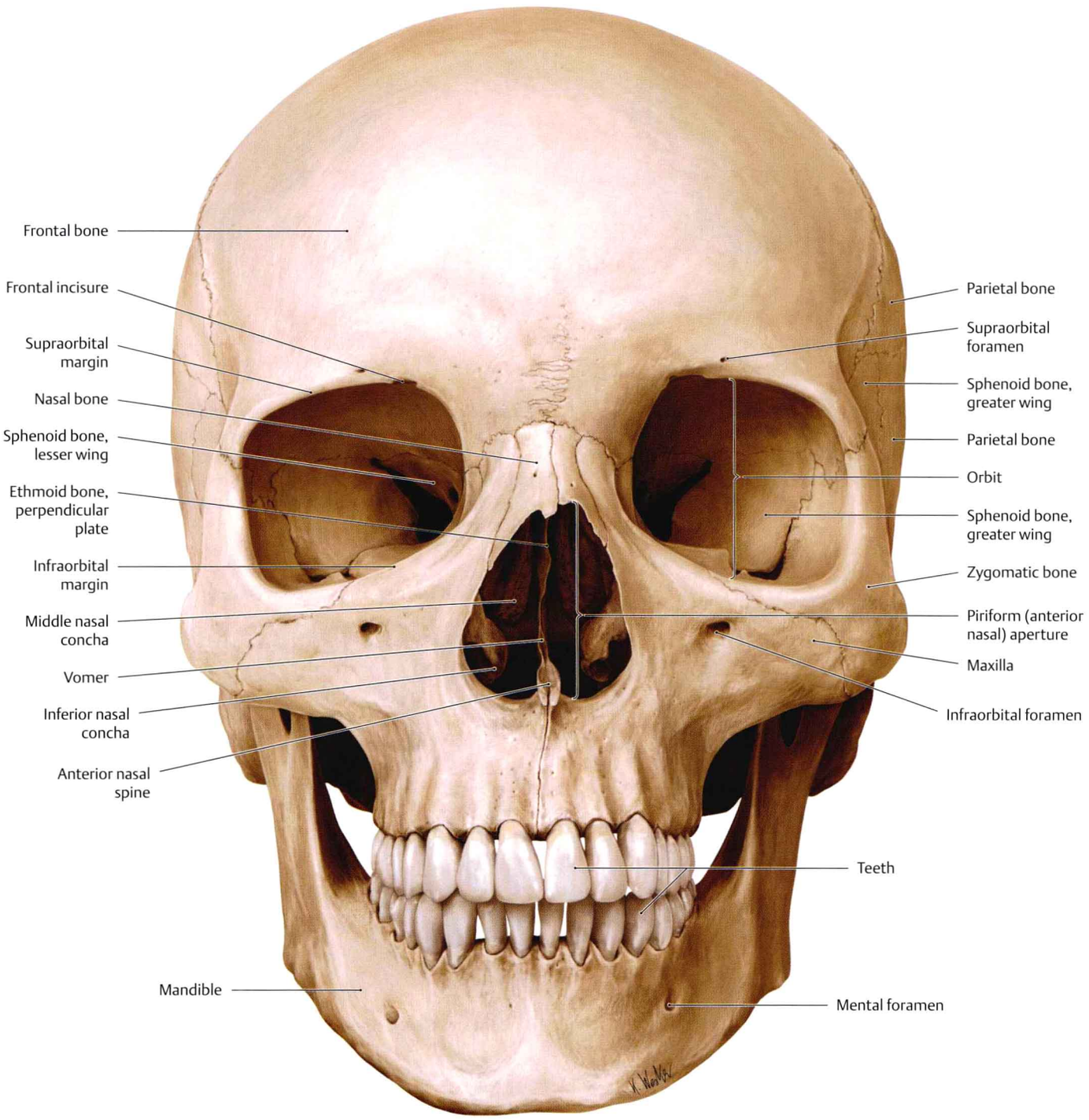
E Bones of the neurocranium and viscerocranium

Neurocranium (gray)	**Viscerocranium** (orange)
• Frontal bone • Sphenoid bone (excluding the pterygoid process) • Temporal bone (squamous part, petrous part) • Parietal bone • Occipital bone • Ethmoid bone (cribriform plate)	• Nasal bone • Lacrimal bone • Ethmoid bone (excluding the cribriform plate) • Sphenoid bone (pterygoid process) • Maxilla • Zygomatic bone • Temporal bone (tympanic part, styloid process) • Mandible • Vomer • Inferior nasal turbinate • Palatine bone • Hyoid bone (see p. 31)

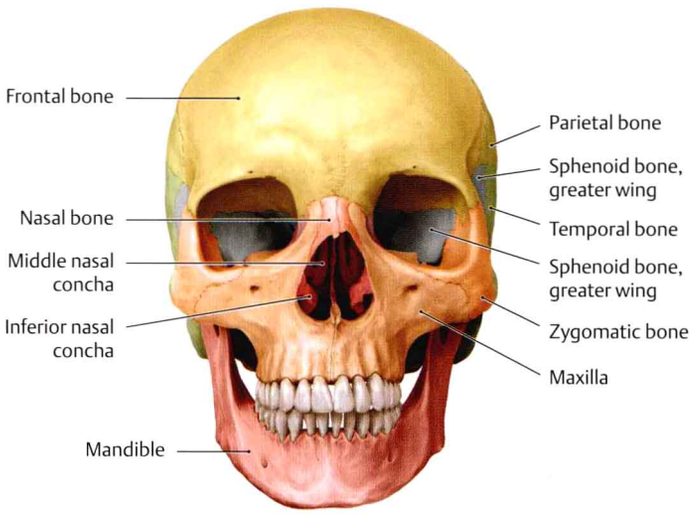
F Bones of the desmocranium and chondrocranium

Desmocranium (gray)	**Chondrocranium** (blue)
• Nasal bone • Lacrimal bone • Maxilla • Mandible • Zygomatic bone • Frontal bone • Parietal bone • Occipital bone (upper part of the squama) • Temporal bone (squamous part, tympanic part) • Palatine bone • Vomer	• Ethmoid bone • Sphenoid bone (excluding the medial plate of the pterygoid process) • Temporal bone (petrous and mastoid parts, styloid process) • Occipital bone (excluding the upper part of the squama) • Inferior nasal turbinate • Hyoid bone (see p. 31)

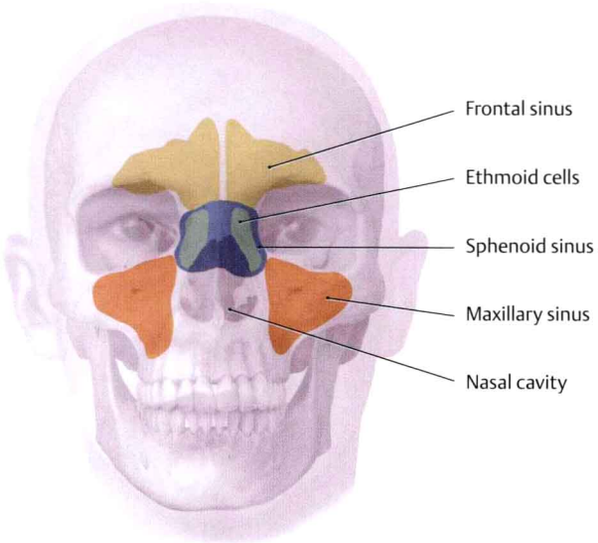
1.2 Skull, Anterior View



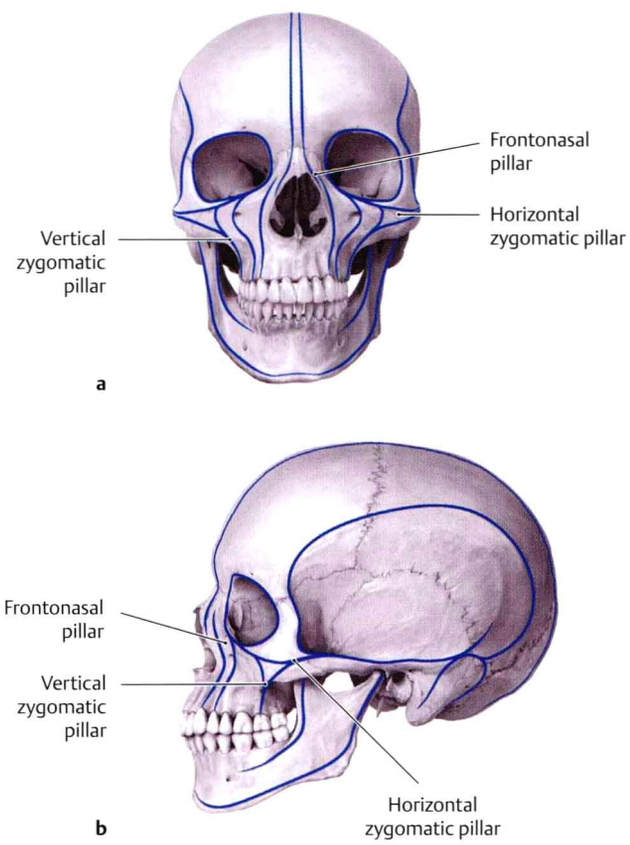
A Anterior view of the skull
The boundaries of the facial skeleton (viscerocranium) can be clearly appreciated in this view (the individual bones are shown in **B**). The bony margins of the anterior nasal aperture mark the start of the respiratory tract in the skull. The nasal cavity, like the orbits, contains a sensory organ (the olfactory mucosa). The *paranasal sinuses* are shown schematically in **C**. The anterior view of the skull also displays the three clinically important openings through which sensory nerves pass to supply the face: the supraorbital foramen, infraorbital foramen, and mental foramen (see pp. 77 and 93).



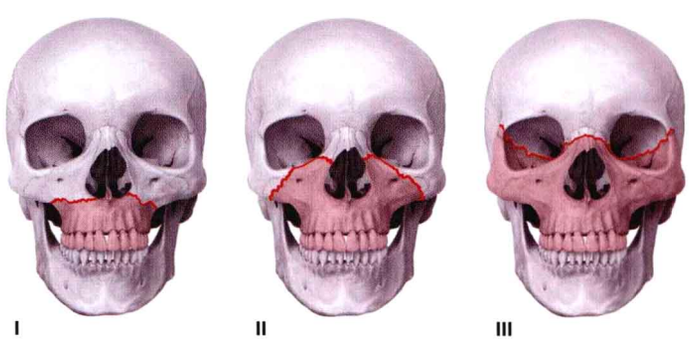
B Cranial bones, anterior view



C Paranasal sinuses: pneumatization lightens the bone
Anterior view. Some of the bones of the facial skeleton are pneumatized, i.e., they contain air-filled cavities that reduce the total weight of the bone. These cavities, called the paranasal sinuses, communicate with the nasal cavity and, like it, are lined by ciliated respiratory epithelium. Inflammations of the paranasal sinuses (sinusitis) and associated complaints are very common. Because some of the pain of sinusitis is projected to the skin overlying the sinuses, it is helpful to know the projections of the sinuses onto the surface of the skull.

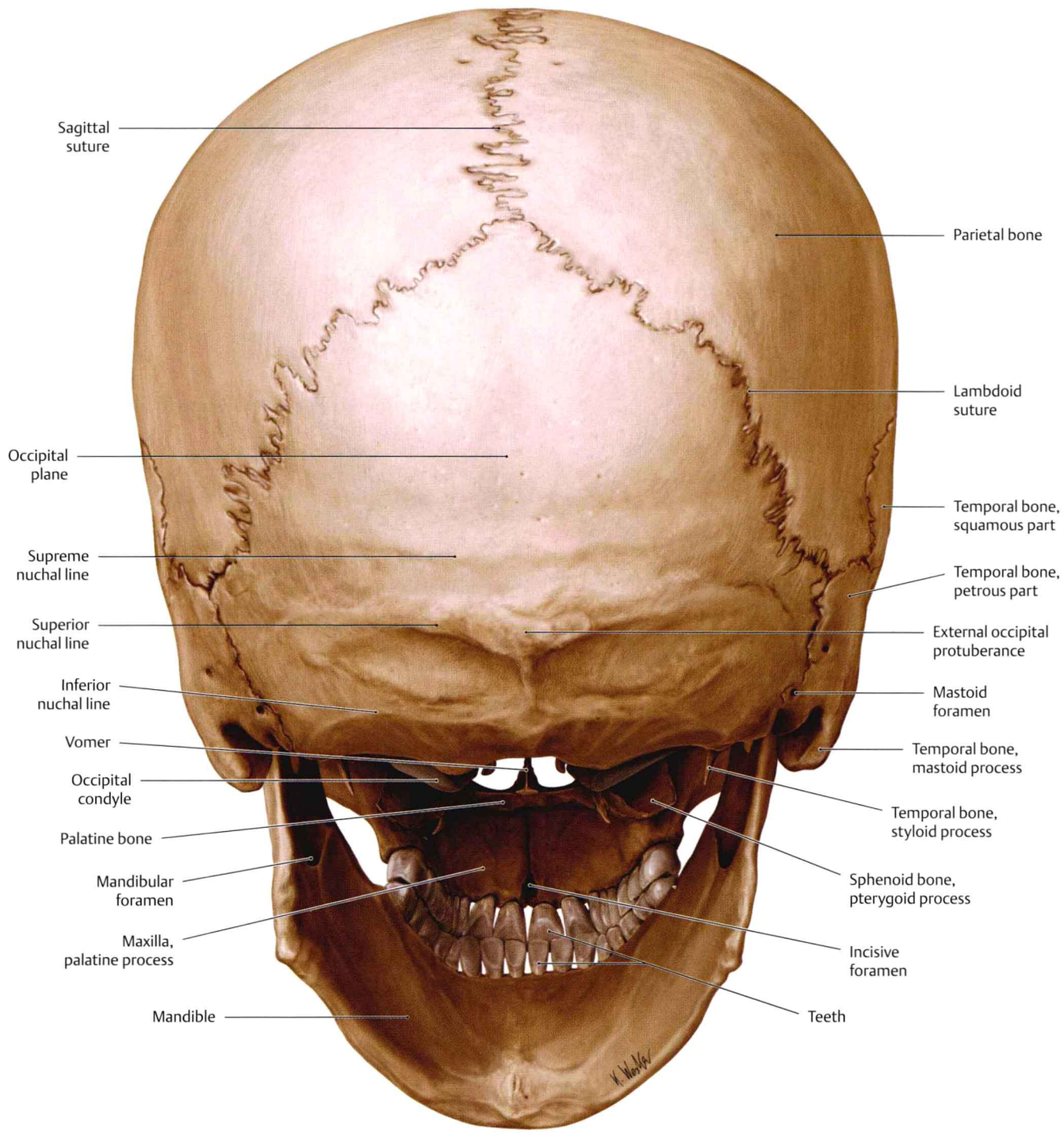


D Principal lines of force (blue) in the facial skeleton
a Anterior view, **b** lateral view. The pneumatized paranasal sinuses (**C**) have a mechanical counterpart in the thickened bony "pillars" of the facial skeleton, which partially bound the sinuses. These pillars develop along the principal lines of force in response to local mechanical stresses (e.g., masticatory pressures). In visual terms, the frame-like construction of the facial skeleton may be likened to that of a frame house: The paranasal sinuses represent the rooms while the pillars (placed along major lines of force) represent the supporting columns.



E LeFort classification of midfacial fractures
The frame-like construction of the facial skeleton leads to characteristic patterns of fracture lines in the midfacial region (LeFort I, II, and III).
LeFort I: This fracture line runs across the maxilla and above the hard palate. The maxilla is separated from the upper facial skeleton, disrupting the integrity of the maxillary sinus (*low transverse fracture*).
LeFort II: The fracture line passes across the nasal root, ethmoid bone, maxilla, and zygomatic bone, creating a *pyramid fracture* that disrupts the integrity of the orbit.
LeFort III: The facial skeleton is separated from the base of the skull. The main fracture line passes through the orbits, and the fracture may additionally involve the ethmoid bones, frontal sinuses, sphenoid sinuses, and zygomatic bones.

1.3 Skull, Posterior View and Cranial Sutures



A Posterior view of the skull
The occipital bone, which is dominant in this view, articulates with the parietal bones, to which it is connected by the lambdoid suture. The cranial sutures are a special type of syndesmosis (= ligamentous attachments that ossify with age, see **F**). The outer surface of the occipital bone is contoured by muscular origins and insertions: the inferior, superior, and supreme nuchal lines.