Palacký University Olomouc
Faculty of Health Sciences

MANUAL of Physical Anthropology

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PREFACE

The Manual of Physical Anthropology provides expert information about physical anthropology and its application in the study and research of the biological variability of humans and human populations in time and space.
First, I would like to explain why we decided to write this book and what purpose it serves.

The Manual is the fruit of long-term international collaboration with excellent colleagues and my co-authors Barbora Matejovičová, Lidia Cymek, Jarosław Rożnowski, and Marek Švarc, President of Trystom, a manufacturer of anthropometric instruments.

The impulse for this publication stemmed from study exchange programmes which all its authors undertook as part of international cooperation and which were connected to university instruction of physical anthropology in the Czech Republic, Slovakia, and Poland. There came the need to prepare study materials for anthropology students and students of human biology. This is why we chose to publish chapters we consider vital to introducing physical anthropology.

Although anthropology, generally described as the study of humans, is much discussed these days, not all people understand what this fascinating and beautiful science, or multidiscipline, deals with. Physical anthropology plays a big role in the large group of anthropological disciplines from the historical and, above all, practical points of view.

The findings of physical anthropology affect daily life: sitting on a chair, working at a desk, driving a car, wearing different clothes, buying shoes, eval-

uating nutritional status on the basis of one's height and weight, doctors using reference standards for the physical growth and development of children, and so on. These are just a few examples of the application of physical anthropology in a variety of sciences such as sports anthropology, obesitology, paediatrics, and ergonomics, as well as in industry (e.g. the clothing and footwear industry). Things in the broadest sense of the word serve humans best if they match their physical proportions, age, and sexual characteristics. The use of physical anthropology methods allows physical dimensions to be measured and their proportions determined, and, above all, the knowledge that is acquired to be applied to our lives and utilized in a number of sciences.

The accurate measurement of physical dimensions and assessment of human variability require adequate and high-quality anthropometric instruments. These are produced by our long-term partner Trystom, and this is why this issue is included in this publication.

The book is written for students of healthcare disciplines, for students of medicine, for students of teaching degrees in human biology and kinanthropometry, and for postgraduate students and professionals (doctors, coaches, nutrition advisors, etc.). Instead of striving to provide comprehensive information on physical anthropology, our aim is to captivate and interest readers in this field of study. If we manage to do this, we will be happy.

The book is divided into eight chapters. The first chapter introduces physical anthropology, explaining its position and goals in the system of anthropological disciplines. This is followed by a chapter presenting the standardized methods of anthropometry and a chapter describing the organization of anthropological research and presenting a historical overview of major anthropological surveys. The subsequent chapters outline methods designed to evaluate body composition and human constitution and methods assessing the physical growth and development of children. The last chapter but one details methods serving to assess the physical parameters of an individual or group compared to the standard using the Z-score. The final chapter sets out the anthropometric instruments used in physical anthropometry and describes their technical parameters.

The reader may appreciate the glossary of terms in English, Czech, and Polish provided at the end of each chapter.

The book took a long time to finish, the process was far from easy, and all the co-authors showed a lot of understanding and patience. My sincere thanks therefore go to Barbora Matejovičová, Lidia Cymek, and Jaroslaw Rożnowski for their willingness and patience in our exhaustive correspondence so as to add further details to the chapters. I am also indebted to Eva Černínová for her diligent translation of the text, Simon Gill for revisions of the translation, and Zdeňka Malínská for her help with editing the images in the text. Next, I thank the editors of the book, Tünde Juríková, Pavel Bláha, and Lucie Stříbrná, for factual suggestions and further specifications.

Last but not least, I thank Marek Švarc, President of Trystom, for his financial support for the publication of the book.

Finally, I would like to thank my wife Dana for the support and patience she has devoted to me throughout my work on this book.

Miroslav Kopecký

1 INTRODUCTION to Anthropology

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1.1 Definition of Anthropology

The word anthropology is derived from two Greek words: ***anthrópos*** – man, and ***logos*** – word, science. In general, anthropology is the study of humans or anthropology is the study of man.

Humankind has gone through a relatively long and complicated development, which has refined humans as a species into cultural and social beings. Beings with highly developed mental skills, who work, produce, and create material and cultural wealth. Additionally, man is a social creature with particular traits of human behaviour and thinking, who is part of a particular society.

At the onset of human evolution, people would adapt to the natural laws. The gradual process of **hominization** *(the process of gradual physical and social changes from primates to humans; humanization)*, **sapientation** *(the process of human development following hominization, accompanied by the development of the brain, mind, and psyche)*, and the progressive formation of human societies have increasingly pushed into the foreground the laws of human society, which are complex and ultimately influence the biological development of humans. For these reasons, the humans of today are the focus of both biological and social sciences. Anthropology thus studies humans as biological beings, as well as their role in the structure of society. This interest in human issues and the role of people on the Earth is greatly increasing today, and is highly topical for the future development of humans on the planet.

Anthropology as a scientific field is defined as a science of humans that studies humans as natural, cultural, and social beings, their origin and development, their physical and psychological nature, activities, and manifestations in space and time; it studies changes in human existence at the individual level, as well as at the level of human groups and humanity as a whole.

Another important mission of contemporary anthropology is to predict the future development of human society on the basis of the **laws of nature**, and often, primarily, on the **laws of society**. At present, anthropology is a complex of disciplines that deals with the origin of humans and their physical and biosocial development, and monitors the forecasts and trends concerning the future development of humanity. The main purpose of anthropology is to contribute to the all-round development of humankind.

From the above it is clear that, rather than being a single branch of science the modern concept understands anthropology as a highly branched **multidis-**

cipline. The complexity and problems of human existence in all their variability have led to a gradual division of anthropology into specific fields with a defined subject area. Currently, there is strong interdisciplinary collaboration between biologically oriented professionals and experts focused on the humanities (psychology, education, sociology, linguistics, religion, philosophy, etc.).

The **subject matter of anthropology** and its study includes humans, the human body, and its phylogenetic and ontogenetic development, the peculiarities of its construction, human races, anthropological types, and the status and development of human society in natural conditions. In this sense, anthropology is regarded as an important liaison and interdisciplinary science between the natural sciences and social sciences.

1.2 Classification of Anthropological Sciences

The definition of anthropology as a study of humans is very general and does not reflect the current concept of anthropology in its full depth and breadth. The current approach to the classification and subject area of anthropological disciplines researching selected areas of humanity is holistic. The concept of anthropology as a multidiscipline rather than a single branch of science is more in line with the definition of **Jan Evangelista Purkyně** (1787–1869) (Figure 1.1), who describes anthropology as *"a science studying the natural character and circumstances of the versatile human race"* or the concept of the German-born American anthropologist **Franz Boas** (1858–1942) (Figure 1.2), who understood anthropology as *"a complex discipline of the study of humans and their work"*.

Figure 1.1
Jan Evangelista Purkyně (1787–1869)

Figure 1.2
Franz Boas (1858–1942)

Currently, there are two concepts and classifications of anthropological sciences, the concept of **general anthropology**, which is common in the United States and the United Kingdom, and the concept of **anthropology as a biological discipline**, applied in continental Europe.

The **American concept** of general anthropology includes the study of humans themselves, as well as everything related to their existence in connection with the cultural and social development of humankind.

The **continental, European concept** of biological anthropology chiefly concentrates on anthropology as a natural science. It should be noted that on the European continent, this concept has recently undergone a major change, and biological anthropologists increasingly apply the findings of, and cooperate with, a number of areas of the humanities. Similarly, the humanities in anthropology rely on findings generated by the various branches of biological anthropology.

The ever closer cooperation between the biological and human branches of anthropology is the logical consequence of the common subject of their research, which is humankind and its status in the widest context today.

Contemporary anthropologists view anthropology as a constantly evolving **holistic**, **comparative, and interdisciplinary science** that is characterized by the dynamic formation of new anthropological specializations.

The systematic classification of anthropological sciences is similarly complex.

American general anthropology is represented by the following disciplines:

- physical (biological) anthropology: studies the biological nature and variability of the human species and humans,
- anthropological archaeology (prehistoric and historic anthropology): studies the prehistoric and historic evolution of humans,
- sociocultural (social and cultural) anthropology: studies the cultural and social dimensions of the human race,
- linguistic anthropology: studies the relationship between human language, thought, and culture, and
- applied anthropology: deals with the application of theoretical anthropology in practice.

The other classification of anthropological disciplines is based on the perspective or approach which anthropology applies when studying humankind:

- humankind as the bearer and creator of values – ethical and philosophical approach,
- humans as natural beings – biological and anthropo-ecological approach,
- humans as cultural beings – cultural and civilizational approach,
- humans as social beings – social and societal approach.

Provided the above approaches to holistic research on humankind in space and time are observed, anthropological disciplines fall into the following special groups (Figure 1.3).

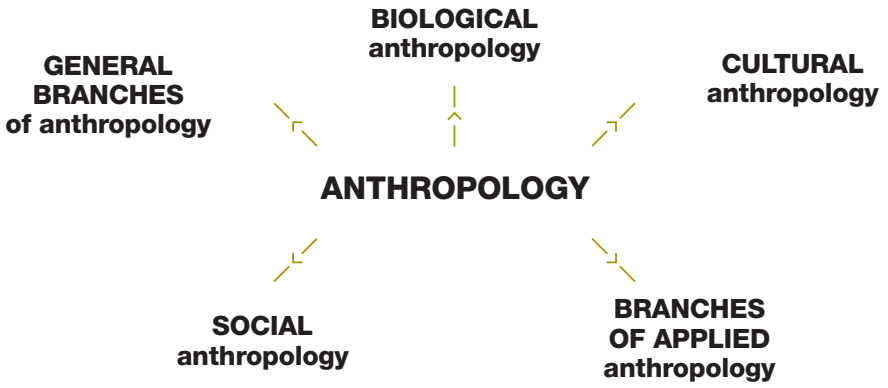


Figure 1.3
Main fields of anthropology

Nevertheless, the anthropologist endeavours to study man from an objective and scientific viewpoint. His goal is to arrive at a realistic and unbiased understanding of human diversity.

1.2.1 General branches of anthropology

This group of anthropological disciplines includes the following:

- **General anthropology** *(theoretical anthropology)* constitutes the theoretical and methodological foundations of anthropology. It examines the most common questions of human existence and the nature of humans as individuals and as a species on Earth.
- **Integral anthropology** creates a proportional model of the general position regarding humankind, directed and conditioned by the developmental trends of human sciences. Integral anthropology integrates the interdisciplinary links and borderland issues common to sciences that study the human species. It is the basis for the universal study of humans and seeks to understand the structure and nature of human beings and the anthropological roots of social phenomena.
- **Synthetic anthropology** is a broader concept of anthropology as a synthesis of all anthropological disciplines, primarily theoretical, biological, cultural, and social anthropology, as well as archaeology, linguistics, ethnology, and other concepts. This concept is typical of Anglo-American anthropologists.

- **Philosophical anthropology** *(philosophy of humans)* is not an anthropological discipline, however; it is classified under philosophy. It was formulated as a special philosophical discipline by **Otto Casmann** (1562–1607). He is important to the history of anthropology and psychology. He began the separation of these two subjects from the Aristotelian framework of metaphysics, becoming a classical example of the secularization of science in the early modern period. During his time at Steinfurt he produced the work *"Psychologia Anthropologica, sive doctrina animae Humanae"* (1594). There he consolidated the use of the term "anthropology" coined by **Magnus Hundt** (1449–1519). During his time in Stade, he wrote the second volume of *"Psychologia Anthropologica"* (1596) in which he described the construction of the human body. In 1594, Casmann defined anthropology as *"the doctrine of human nature. Human nature is an essence partaking of two worlds, the spiritual and the corporeal, yet united in one vehicle"*. This definition is still considered valid today. Modern-day philosophical anthropology is considered to have been founded by **Max Ferdinand Scheler** (1874–1928). He was a philosopher known for his work in philosophical anthropology. He wrote *"The Human Place in the Cosmos"* (1928). He formulates it as a special method of mental operation, related to multiple sciences and designed to define the essence of man. Philosophical anthropology is based on philosophical idealism. In present times, it is often associated with Existentialism and other schools.

1.2.2 Biological Anthropology

Biological anthropology was originally conceived as a natural history of humans. Another term referring to biological anthropology is physical anthropology. We believe that **biological anthropology is superordinate** to other anthropological disciplines that study the biological traits of humans and their races, and research the biological nature of humans at the level of individuals, groups, and humanity in space and time. From this perspective, biological anthropology involves physical anthropology in the narrow sense of the word, together with other anthropological disciplines. The category of biological anthropology includes the following major anthropological disciplines:

- **Physical anthropology** is the basic anthropological discipline; it is concerned with the structure and functions of the human body, the physical properties of members of different human groups, and heredity and biological changes in the human body.
- **Physiological anthropology**, or **functional anthropology**, is a branch of science that is derived from comparative human physiology. It deals with for instance, the relationships of skin colour and temperature regulation, variability in the intensity of basic metabolism, differences in the perception of various taste qualities, etc. Physiological anthropology focuses largely on studying the effects the environment has on humans, and especially on studying functional changes in humans.
- **Evolutionary anthropology** addresses the issues of phylogenetic and ontogenetic development.

- **Anthropology of childhood** exclusively studies the biology of the child, its ontogeny, and the peculiarities of the physique and function of the young organism.
- **Paleoanthropology** *(prehistoric anthropology)* is a branch of anthropology that deals with the development of humans and their status, way of life, and physical and mental qualities in prehistoric times. It also investigates the evolution of the animals closest to humans *(Primatology)* and the animal ancestors of humans *(Hominoidea).*
- **Historical anthropology** is a historical discipline that deals with a person in history. It examines the person's behaviour, attitudes, feelings, and way of thinking, while trying to interpret them in the context of the individual's contemporary perceptions.
- **Ethnic anthropology** addresses the origin and evolution of human races, identifying and classifying the different anthropological types and studying their distribution in the past and present. It also deals with theoretical issues of human races and ethnic groups.
- **Differential anthropology** studies differences between various ethnic groups, national groups, and cultural areas. By comparing the differences, differential anthropology aims to formulate basic cultural images and the most characteristic collective ideas about communal life and to trace the roots of current socio-political systems.
- **Morphological anthropology** deals with the descriptive status of the human body.
- **Systematic anthropology** studies the Hominid system and the place humans hold in the animal taxonomy. In general, it also addresses the issue of systems in human society.
- **Zoological anthropology** is a comparative study of humans and animals (zoology and primatology), and also studies the zoological characteristics of humankind.

1.2.3 Cultural Anthropology

Cultural anthropology is the study of the human species and its culture. It focuses on humans as cultural factors and monitors the origin and main characteristics of cultures in various climatic and geographic conditions on Earth and the methods and peculiarities of cultural life and securing a livelihood. Furthermore, it investigates the way people communicate and behave toward each other, exchange experience and objects, etc. It analyzes human beings and their material culture, and applies the findings of human ecology, ethnology, and partly also of prehistory, comparative linguistics, and other sciences.

1.2.4 Social Anthropology

It studies: humankind and society; human social phenomena and their levels; areas of human social life, i.e. family relationships; forms of sexual life; life

skills; family, religious, economic, and other systems and organizations that are fundamental to the life of human society. This branch of anthropology emerged in the second half of the 19th century in response to comprehensive research into the formation and evolution of human society.

1.2.5 Branches of Applied Anthropology

The following branches apply theoretical knowledge in the practical areas of human activity:

- **Forensic anthropology** makes practical use of anthropological findings in judicial settings in determining paternity, and in anthropological expertise.
- **Criminal anthropology** makes practical use of the methods of biological anthropology for criminological purposes, particularly in the identification of deceased persons. It studies the physical and psychological characteristics of criminals and compares them with those of the rest of the population.
- **Pedagogical anthropology** deals with the application of anthropological findings in the learning process, and contributes to identifying and using optimal methods of youth and adult education and training.
- **Ergonomic anthropology** (*physical ergonomics*) is a multidisciplinary system of findings about human work. It studies the properties of the human body, and seeks how best to adapt work and the occupational environment to human beings. It focuses on human performance and human factors at work; it inspects machines, and designs effective workplaces and equipment in order to streamline operations and ensure maximum performance efficiency. All these issues are addressed with regard to human characteristics and needs. Anthropology provides ergonomic data on the age specifics, characteristics, and dimensions of humans in diverse geographic, professional, ethnic, and other groups.
- **Sports anthropology** is the practical application of biological anthropology in sports and in the evaluation of human performance. It examines groups/individuals and studies the impact that regular physical activity has on their development; it measures the performance of the human body/its individual organs at rest, during exercise, and immediately after exercise.
- **Psychological anthropology** studies the influence of culture on the psyche, relations between the physical and the mental aspect of humans, and relations between personality and culture.
- **Psychoanalytic anthropology** studies ethnographic phenomena, myths, dreams, fairy tales, legends, magic rituals, etc.
- **Linguistic anthropology** studies the evolution of language as a cultural resource and the thinking and communication of people of different nations and tribes of the world.
- **Political anthropology** studies political systems and societies and the emergence and development of individual political phenomena (authority, government, power, law) in human society.
- **Economic anthropology** studies economic phenomena and systems in human society and their relationships to humans.

- **Urban anthropology** focuses on the study of urban populations and subcultures.

This list of anthropological disciplines is not exhaustive, nor can it be complete, with regard to new scientific disciplines that seek to understand and learn about humankind and human society from various angles.

In the broadest sense, anthropology can also be defined as a social science that includes human biology and the evolution of humanity and its races, and whose focal point also includes the development and structure of culture, humans, and society, i.e. questions of cultural and social anthropology.

1.3 Physical Anthropology

1.3.1 The Origin and Development of Physical Anthropology

It is very difficult to describe the origin and formation of physical anthropology, as physical anthropology developed together with anthropology until almost the 18th and 19th centuries, which marked the differentiation of human sciences.

The beginnings of physical anthropology go back to antiquity, especially to Greece and Rome, as this was when attention started shifting toward the scientific knowledge of humans and their anatomy, variability, and position in nature. Physicians examined the structure and function of the human body, and philosophers studied the most general questions of human existence and the role of humans in the animal kingdom.

The term "anthropology" was first used by **Aristotle of Stagira** (384–322 BC) in reference to a science examining the natural character of humans. Aristotle carried out the first major synthesis of anthropological, natural science, and philosophical findings about humankind. Around 330 BC this Greek thinker founded his own *"peripatetic school of philosophy"* in Athens. Aristotle's school was the first educational institution to seek to systematically research nature, while also laying important scientific foundations for the development of medicine. Aristotle paid great attention to exploring wildlife and aimed at producing systematic descriptions of plants and animals. His anatomical observations of animal organisms, captured in the first anatomical descriptions, were of particularly major importance for medicine. In his *"Metaphysics"* and *"Historia Animalium (History of Animals)"*, he defined humans as social beings, **zoon politikon**, and examined the inherent nature of the human species. He used this term primarily to refer to the exploration of the spiritual qualities of humans. Aristotle introduced the concept of anthropology in the wider context of the philosophical study of humankind, society, and nature. He claims that humans emerged and lived in nature not as individuals, but first as a human group and then a society. Instead of restricting the anthropological point of view to human biology – physical anthropology only, he saw humans as

biosocial beings. Aristotle thus anticipated the constitution of disciplines that are now known as cultural anthropology and philosophical anthropology.

The work that for many centuries had a major impact on ancient and medieval ideas about the human body was written by a Greek physician working at the court of the Roman emperors – **Galen of Pergamon** (*Claudius Galenus,* 129–200 or 216 AD). He helped popularize medical and anthropological findings by giving public lectures on anatomy, physiology, and therapy. Galen's work is the most comprehensive synthetic collection of ancient knowledge of the human body. Although many of his ideas were time-specific, he remains one of the most important figures in the history of medicine and physical anthropology. As a writer he was very productive and his principal works with respect to the history of anthropology are: *De usum partium corporis humani, libri XVII; De anatomicis administrationibus, libri XV; De ossibus ad tirones; De musculorum dissectione,* and an entire series of monographs on muscles, nerves, foetal formation, etc. Galen practiced dissection exclusively on animals, especially apes, as was later demonstrated by Vesalius, Cuvier, Camper, and Broca. His treatise fundamentally influenced the history of European medicine.

Galen's work represents the heyday and at the same time, the twilight of ancient studies of the human body. Late Antiquity did not yield any breakthrough discoveries in anthropology and natural sciences. The fall of the Western Roman Empire in 476 AD brought a temporary halt to the developmental continuity of science.

Under the influence of scholasticism, feudal Europe radically suppressed empirical research on the human body. Medieval Church institutions particularly hampered the inductive approach to the study of humankind and nature. This way of thinking was considered erroneous, and ultimately dangerous. The Bible became the criterion of true knowledge, and if a discrepancy between scientific findings and the Bible occurred, the former would be considered false. This contradiction later resulted in an open conflict between religious circles and natural scientists. At the beginning of the Middle Ages, the level of education dropped.

It was only in the Renaissance, from the 14th to the 16th centuries, that anthropology began to be understood as the study of the human physique in a broader sense. The work of naturalists clearly reflects the interest of the Renaissance in the human body. Body proportions were also intensely studied by the Italian masters.

Leonardo da Vinci (1452–1519) built a canon of the human body based on the relationship between the individual body parts and the body height. He studied the anatomy of the heart in the hospital of Santa Maria Nuova in Florence, and captured the findings in his drawings. Focusing on anatomy from 1489 onward, Leonardo planned to publish a textbook on anatomy based on his own designs. Leonardo was the first to portray dead bodies as if they were alive by rendering them with a facial expression and drawing them in motion. Leonardo managed to convey the spatial depth of the structure of the human body by illustrating various cross-sections (for example of the skull) in his drawings (Figure 1.4).

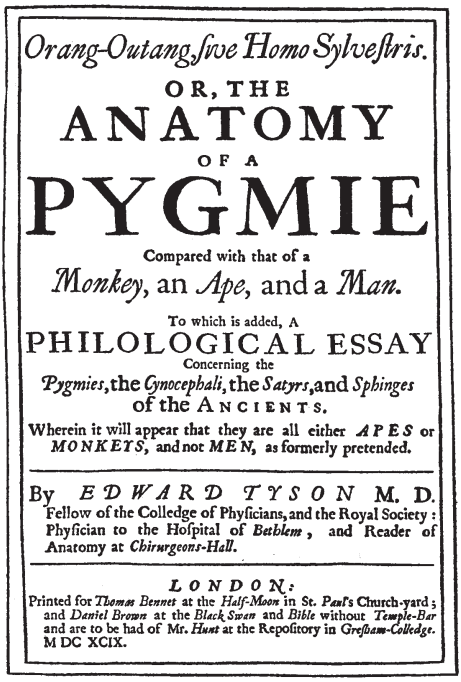
Figure 1.4
Anatomical drawings by Leonardo da Vinci

The first indication of physical anthropology as an independent anthropological discipline was presented by the German physician and philosopher **Magnus Hundt** (1449–1519) in his treatise *"The Anthropological Treatise on Man's Dignity, His Nature and Qualities, as well as the Elements, Parts, and Limbs of the Human Body"*, published in 1501. In his book he referred to the study of the human body as "anthropology". He coined the term anthropology, and, together with Otto Casmann, has been mentioned as a founder of anthropology since they used the term in the 16th century.

Anthropology and medicine embarked on a period of new development only in modern times, during the Renaissance, thanks to the work of **Andreas Vesalius** (1514–1564), the *"reformer of anatomy"*. A professor of anatomy at Padua and Basel, his major work is *"On the Fabric of the Human Body in Seven Books (De humani corporis fabrica libri septem)",* written in 1543. The work contains multiple excellent drawings, as well as a very detailed and clear description of the structure of the human body. In his book, Vesailus pointed out over 200 errors, especially numerous mistakes made in medieval and Galenian anatomy. The historical significance of this work resides in the fact that instead of relying on authorities, like the majority of works written till then, this one is based on actual knowledge of the human body. Vesalius did not hesitate to correct the erroneous judgements of his predecessors, including such authorities as Aristotle and Galen. He criticized Galen's animal anatomy for uncritically transferring its findings to humans. While his monumental work brings no miraculous revelations, the drawings, for which he hired the illustrator **Jan Steven van Calcar** (*Joannes Stephanus Calcarensis,* 1499–1546), are so impressive that they soon found many admirers. Vesalius's work thus came out in 25 editions, and in countless illegal copies.

In the late 17th century, attention began turning to the kinship between the human species and animals. In 1698, the Englishman **Edward Tyson** (1651–1708), a comparative anatomist, published his *"Orang-Outang, sive Homo sylvestris, or the Anatomy of a Pygmie Compared with that of a Monkey, an Ape, and a Man"* in London (1699) (Figure 1.5), the first work on the structural similarities between humans and apes. He identified the degree of similarity

between humankind and different types of animals, and found that in terms of development, humans are closest to chimpanzees. This marked the first successful description of the great ape in scientific literature. The particular chimpanzee Tyson studied, referring to it as *"pygmie"*, had been loaded onto a ship in Angola and brought to England. Shortly after, it succumbed to complications from a jaw infection it had sustained from a fall on board. After it died, Tyson performed a detailed dissection, and was shocked to find that while the ape shared 34 similarities with monkeys, the amount of similarities it shared with humans came to no fewer than 48. Tyson resolved this oddity by highlighting physical similarities and mental or spiritual discrepancies. The pygmie embraced both the entities: physically it was human while mentally it was not, thus representing a link between the material world of animals and the spiritual world of people. Tyson's work opened the question of the role of humankind in the animal kingdom.



Orang-Outang, ſive Homo Sylveſtris.

OR, THE

ANATOMY

OF A

PYGMIE

Compared with that of a

Monkey, an *Ape*, and a *Man.*

To which is added, A

PHILOLOGICAL ESSAY

Concerning the

Pygmies, the *Cynocephali*, the *Satyrs*, and *Sphinges* of the ANCIENTS.

Wherein it will appear that they are all either *APES* or *MONKEYS*, and not *MEN*, as formerly pretended.

By *EDWARD TYSON* M. D.
Fellow of the Colledge of Phyſicians, and the Royal Society: Phyſician to the Hoſpital of *Bethlem*, and Reader of Anatomy at *Chirurgeons-Hall.*

LONDON:
Printed for *Thomas Bennet* at the *Half-Moon* in St. *Paul's* Church-yard; and *Daniel Brown* at the *Black Swan* and *Bible* without *Temple-Bar* and are to be had of Mr. *Hunt* at the Repoſitory in *Greſham-Colledge.* MDC XCIX.

Figure 1.5
Title Page of Tyson's Orang-Outang (1699) (by Comas, 1960)

Anthropology became a natural science in the 18th century, following its separation from medical disciplines, under which it had been classified until then. Gradually, the foundations of physical anthropology as a biological discipline began to take shape. An important role was played by the dispute about the evolution of species.

Anthropology established itself as a natural science in the 18th century thanks to the Swedish naturalist **Carolus Linnaeus** (1707–1778).

In 1735, Linnaeus published his systematic work *"Systema Naturae"*, in which, for the first time ever, he classified humans under the order of Primates, class Mammalia, and phylum Vertebrata. Humans were assigned the scientific designation Homo sapiens – wise man. According to Linnaeus, the only aspect that distinguishes the human species from apes is the psychological one.

The first ideas of species variability and evolutionism were professed by the French naturalist **Georges-Louis Leclerc, Comte de Buffon** (1707–1788), a specialist in anthropogenesis (Figure 1.6), in his great and multi-volume work *"Histoire Naturelle, générale et particuliere des animaux (1749–1789; Natural History, General and Particular)"*. The problems of special anthropological interest which he presents in this book are the existence and variations of species, relations between man and the animals, and the human races. Buffon dealt in detail with the position of humans in relation to other species, and with the origin of humanity. Buffon made humans a part of natural history. He advocated the monogenetic theory of the origin of humankind, and was the first to discuss human ontogenetic development in his work.

Figure 1.6
Georges-Louis Leclerc, Comte de Buffon (1707–1788)

The concept of anthropology in the modern sense was first used by the German naturalist **Johann Friedrich Blumenbach** (1752–1840) (Figure 1.7), who is considered the father of anthropology. It was in his treatise *"On the Natural Variety of Mankind (De generis humani varietate nativa liber)",* published in 1775 in Göttingen, that he used the term 'anthropology' in the modern sense. In the preface to the third edition of his work, dated 1795, Blumenbach considers human races to be varieties of a single species. He divided humankind into five major races: the Caucasian, the Mongolian, the Ethiopian, and the transition races of the American and the Malysian. The elementary characteristic on the basis of which the races were divided was skin colour. Blumenbach contributed to the development of anthropology with his textbook of comparative anatomy and his craniological research, where he provided highly accurate descriptions of human skulls.

Figure 1.7
Johann Friedrich Blumenbach (1752–1840)

The scientific and ideological significance of anthropology began to manifest itself and grow considerably only in the second half of the 19th century, in relation to a whole series of major discoveries, and the arrival of the English naturalist **Charles Robert Darwin** (1809–1882) (Figure 1.8). His theory of evolution penetrated into anthropology. In 1859, Darwin published *"On the Origin of Species by Means of Natural Selection, or the Preservation of Favoured Races in the Struggle for Life"*, in which he supplied evidence of the existence of biological evolution, dealt with the causes and methods of the formation of species and the development of plants and animals, and also placed humans in connection with the whole living world of nature.

Figure 1.8
Charles Robert Darwin (1809–1882)

Another work of Darwin's, *"Descent of Man and Selection in Relation to Sex"* (London, 1871), became to some extent a milestone in the history of anthropogeny. In the eight chapters of this book, Darwin introduces scientific evidence of the animal origin of humankind and of the development of human beings under natural laws from simple to more complex forms. Darwin's doctrine sparked paleoanthropological research. The new anthropological questions required a great quantity of factual material. Collected craniological data had to be evaluated in a uniform and objective manner, which helped develop a branch serving to measure morphological characteristics – anthropometry.

The greatest influence on the development of anthropometry was the versatile French scientist, anatomist, pathologist, histologist, and anthropologist **Pierre Paul Broca** (1824–1880) (Figure 1.9). He founded the Society of Anthropology (Société d'Anthropologie) in Paris (1859) and the Laboratory of Anthropology of Paris (Laboratoire d'Anthropologie de Paris, 1876). Broca specialized in craniometry (measurement of the cranium) and designed anthropometric instruments. The outputs of Broca and his contemporaries were collected in a comprehensive monograph by **Paul Topinard** (1830–1911), titled *"Éléments d'anthropologie générale"* and published in 1885.

Of equal importance for the development of anthropology in the 19th century were various societies, museums, and institutions that emerged in the world's leading centres of research: the British Association for the Advancement of Science – Section of Anthropology in London (1822), Société d'Anthropologie in Paris (1859), Anthropologische Gesellschaft in Vienna, Austria (1870), and the Russian Anthropological Society in St. Petersburg (1888); other countries included Sweden (Stockholm, 1873) and the United States (Washington, 1879; New York, 1880). Anthropology now began to develop not only as a natural science of humans, but also as a social discipline of the physical, cultural, and social development of humankind. Along with the foundations of the modern physical anthropology emerged the foundations of cultural and social anthropology.

Figure 1.9
Pierre Paul Broca (1824–1880)

1.3.2 Definition of Physical Anthropology

Physical anthropology falls under biological anthropology.

Physical anthropology emerged as that branch of anthropology which focuses on man as a biological organism.

Physical anthropology researches the biological variability of human populations in time and space.

Physical anthropology studies living man, his ontogenetic development from birth to adulthood, changes caused by ageing, physical activity, and diversity of physical activity (sport, type of employment), diseases and, of course, heredity, innate qualities, and ailments.

Physical anthropology focuses on the biological variability of humanity, facilitating the understanding of the position humanity has in nature and the description of humans as biological entities. Physical anthropology has forced humanity to admit that humans continue to form an integral part of nature.

It is a branch of science that studies the origin, evolution, and patterns of changes in the physical composition of the human species and its races. Physical anthropology is concerned with morphological studies that serve to differentiate people through measurements (anthropometry) and type specification (anthropobiology).

While holding a fundamental traditional position among the various branches of anthropology, physical anthropology also plays a key role and is of vital importance to anthropology in general.

Physical anthropology is divided into:

- osteology (the science of bones),
- somatology (the science of the human body and its structure and function),
- anthropometry (somatometry).

In the broadest sense, physical anthropology *(biological anthropology)* is a modern science of humans that is concerned with the biological variability of humankind, and is aimed at learning the maximum about human biology, in particular the structure and function of the human body and the mechanism of its physical growth, development, and ageing. Furthermore, it endeavours to help ensure a healthy lifestyle of populations and establish universally applicable laws that govern biopsychic development across all human groups.

It is a science of the physical characteristics of the human species and its origin and races, a science that focuses on the diversity (variability) of human body characteristics in the past and present, while monitoring and interpreting their development.

Although physical anthropology is closely affiliated to medicine, there is a significant difference. While medicine basically deals with ill people, seeking ways to heal them, physical anthropology mainly studies healthy individuals and their variabilities in order to, among other reasons, **detect deviations from normal development and healthy physique in a timely manner and alert the physician**. Therefore, physical anthropologists design miscellaneous

standards of physical growth and development, termed '**reference values**', which help evaluate the health of children and adults.

Current physical anthropology is a synthetic discipline that researches human biology using a wide range of scientific branches.

Physical anthropology addresses the following issues:

- comprehensive study of the growth, development, and function of the human body within various racial, ethnic, cultural, and social groups,
- individual variations in the shape and function of the human body,
- growth changes from the early stages of embryonic development up to old age,
- sexual dimorphism,
- qualities of the human physique that develop in response to different living conditions and types of occupation – the relationship of the body structure and the external environment.

Summary

- Anthropology is, in short, a science of humans. The modern perspective understands anthropology more as a multidiscipline than a single branch of science. Anthropology is a synthesizing science. There is strong interdisciplinary collaboration and combination between biologically oriented professionals and experts focused on the humanities (psychology, education, sociology, linguistics, religion, philosophy, etc.).
- Anthropology as a scientific field is defined as a science of humans that studies humans as natural, cultural, and social beings, their origin and development, and their physical and psychological nature, activities, and manifestations in space and time; it studies changes in human existence at the individual level as well as at the level of human groups and humanity as a whole.
- There are two concepts and classifications of anthropological sciences. The concept of "general anthropology", common in the United States and the United Kingdom, studies all aspects of human beings. It is divided into physical (biological) anthropology, anthropological archaeology, social and cultural anthropology, linguistic anthropology, and applied anthropology. The continental, European concept understands anthropology as a biological, purely natural science. It classifies anthropology into five main branches: general anthropology, biological anthropology, cultural anthropology, social anthropology, and applied anthropology.
- Physical anthropology is classified under biological anthropology. Physical anthropology is concerned with research on the biological variability of human populations in space and time; it studies living human beings, their ontogenetic development from birth to adulthood, the changes induced by ageing, physical activity, and diversity of physical activity (sport, types of occupation), diseases and, of course, heredity and innate qualities.