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Gardner, Gilbert MacLean

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A Prospectus for the Revision of

FOUR PERSPECTIVES OF MAN

A Laboratory and Individual Study Guide
for Human Anatomy

by Dr. Lawrence W. Swan

Gilbert MacLean Gardner

DEDICATION

To the memory of my father,
George Watson Gardner,
this thesis is lovingly dedicated.

His constant faith
in my ability as an artist
will always be an
endless source of strength.

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PREFACE

I met Dr. Lawrence Swan for the first time in 1978 while I was studying art at San Francisco State University. He was teaching an introductory course there which was quite popular with the students. I had heard that his lectures were unusual and interesting, so I decided to take the class to improve my figure drawing and to satisfy my curiosity.

I remember getting off the science building elevator on the first day of class. To reach the laboratory, I had to walk down a long corridor. Painted on the wall next to me and extending the entire length of the corridor, was an immense timeline of geological and biological evolution. As I walked, my anticipation grew. I had to travel some four thousand million years before reaching the laboratory door. It was impressing to learn from the mural that the last inch of my walk represented man's short time on earth. I remember thinking to myself, what a way to make a point!

Upon entering the laboratory, I found myself in a fascinating zoological museum. On display were skulls and bones of every size and shape - elephants, opossums, apes, humans, and much more. I was startled to see, hanging from the ceiling like some fantastic mobile, the preserved entrails of a tiger inflated like a balloon. The walls and tables of the museum were covered with maps and diagrams, artifacts and relics of all kinds. Most amazing of all, were the specimen jars containing human embryos and fetuses preserved at different stages of development.

Later in the semester, the main themes of the museum and Dr. Swan's lectures became clear to me. He maintains throughout his lectures that before students can fully appreciate this marvelous human body of ours, they must first understand something about its origin. How does life evolve over millions of years? How does such a complex organism as the human body develop from a single cell in the womb? What makes man similar to other animals and at the same time so unique? A study of anatomy is intimately related to a study of evolution and embryology. These themes, or "perspectives" as he calls them, also form the basis for his workbook which students use throughout the course.

Several years later, as a graduate student in Medical Illustration at the University of California San Francisco, I had reason to recall Dr. Swan's anatomy class and his workbook. In partial fulfillment of the requirements for the Master of Arts degree, I was expected to complete a thesis-project of my own choosing which would involve either health related or scientific education. A revision of Dr. Swan's workbook seemed like the perfect project.

After renewing my acquaintance with Dr. Swan, I proposed my idea to revise Four Perspectives of Man. He responded with genuine enthusiasm.

The prospect of contributing to a new edition of the workbook excited me. In its original form, the workbook was printed as a supplement to Dr. Swan's lectures. It was my feeling, however, that the workbook contained elements

which would be useful and appealing to anatomy students universally. There are informative discussions and stories relating to anatomy which are not found in most textbooks. Many interesting illustrations and histories fill the pages. Most useful, I thought, was the way Dr. Swan conceived of different exercises to help students to learn anatomy. His idea of coloring was great. I remember how helpful coloring those complex structures had been to me as a new student of anatomy. He made learning fun.

Now, after many long hours of planning and redesigning, this present edition of Four Perspectives of Man is ready for your use and enjoyment. As you color your way through the seventeen chapters, I hope that the same spirit of life-discovery that I experienced in Dr. Swan's museum that first day will be passed on to you. Remember, as Dr. Swan would say, for you to be a student of anatomy, you must first be a student of life.

September 1984 Gilbert M. Gardner

INTRODUCTION

Anatomy is a life science. For the human body to come alive in your mind, several perspectives need to be considered together. Therefore, throughout this workbook you will be viewing the human body from four perspectives: anatomical, embryological, evolutionary, and cultural. Each of the seventeen chapters in the workbook is divided into three main sections. The anatomical perspective of the human body is studied in the section titled Anatomical. The embryological and evolutionary perspectives are considered together in the section titled Developmental and the cultural perspective is discussed in the section titled Cultural.

The Anatomical section in each chapter provides exercises which are designed to help you learn the many anatomical terms. You will begin by learning the general concepts and then will progress to more specific details. For example, in the exercises of the skull, you will learn the names of the bones first, then the parts of these bones, and finally the foramina through which arteries, veins, and nerves pass. A list of terms is provided as a guide to help you study your textbook. When you have an understanding of these terms, do the exercises which will help you to organize your knowledge.

Greek and Latin origins of terms are also included to aid in your study since anatomical words are chiefly

derived from Greek and Latin. If you know some of this vocabulary, then the anatomical words take on a descriptive meaning and their memorization is made easier.

The Developmental section in each chapter examines the biological origins of the human body. The studies of embryology describe the development of the individual, while those studies about evolution describe the progressive development of the human species. The logic of anatomical structures and relationships is not always obvious without an understanding of structural development. For example, the elaborate shoulder girdle and joint will make more sense once you realize this apparatus was originally adapted by our apelike ancestors for swinging and hanging from branches. Or the often confusing relationships of the adult brain masses will become less confusing once you have appreciated their development from the simple embrionic brain.

Your learning about human anatomy will be made easier and more interesting once you have acquired knowledge of embryology and evolution.

The Cultural section in each chapter examines the social and cultural developments which have contributed to our understanding of anatomy. Several biographies of important early anatomists and a number of interesting stories and discussions about anatomy throughout history are included as well.

There is much insipiration to be gained from the lives

and contributions of people like Galen, Vesalius, Harvey, and Hunter, just to name a few.

Long before the invention of color printing, Andreas Vesalius (the father of modern anatomy), instructed his students to color his anatomical diagrams. He knew this exercise would reinfore the learning process by requiring students to make close observations. It emphasized differences and subleties and, most importantly, required the student's input.

Coloring has as much value for students today as it did back in the sixteenth century. With Vesalius in mind, the illustrations in this workbook were designed for you to color. You will benefit most if your coloring is done with a sense of organization as well as artistry. For example, in the series of illustrations on the skeletal system, color the same bone with the same color.

The practice quizzes at the end of each chapter will help you to assess your progress. The quizzes should be taken only when you are satisfied that you know the material, after you have studied your textbook and have completed all the workbook exercises. Grade yourself with the answers found in the back of the book. Your score will give you an idea of your accomplishment.

This workbook is a laboratory study guide which includes many things that are not found in standard textbooks. It can be used in our out of the laboratory, in

class or in independent study. We hope that it will bring life to your study of human anatomy.

Sample Chapter

THE SKELETAL SYSTEM

AUTHOR'S OBJECTIVES

The author's objectives for treatment of this chapter will be to:

1. Discuss the number of bones in the human skeleton and the factors which cause variability.

2. Identify and explain the methods which can be used in determining the age and sex of a skeleton.

3. Discuss the significance of the visceral skeleton.

4. Briefly describe the evolution of the axial, appendicular, and visceral skeletal divisions.

5. Provide exercises to help students understand the organization and to identify all the major bones of the skeleton.

6. Provide a list of anatomical terms to help guide students while they study their textbook.

7. Provide a list of Greek and Latin words (and definitions) from which anatomical terms relating to the skeleton originate.

8. Explain the importance of comparative vertebrate anatomy for understanding human anatomy.

9. Provide a cultural background about the skeletal specimens studied in anatomy.

10. Provide practice quizzes at the end of the chapter to help students evaluate their level of understanding.

THE SKELETAL SYSTEM

STUDENT OBJECTIVES

After studying your textbook and completing the exercises in this chapter of the workbook, you should be able to:

1. Describe the components of the axial and appendicular skeletal divisions.

2. Identify the names of all the major bones of the skeleton excluding individual tarsals, carpals, and parts of the skull.

3. Identify the three types of vertebrae and ribs (number of each) and the three fused bones which make up the os coxae.

4. Describe which bones articulate with which others in the articulated skeleton.

In this chapter, the Anatomical section contains exercises to help you to learn the names of the bones which make up the human skeleton. Included also is a discussion on the methods used for determing the age and sex of a skeleton and a discussion on the number of bones in the skeleton. The Developmental section examines the evolutionary development of the skeletal divisions with particular attention given to the visceral skeleton. Finally, in the

ANATOMICAL

The average adult body contains approximately 208 bones. Composed of cells, fibers, and calcium salts, they are the hardest of all living tissue. Bones are classified by shape into four basic types: long, short, flat, and irregular. Together with the joints that connect them, bones form the skeletal framework of our bodies.

The skeleton is organized into two primary divisions: the axial and the appendicular skeletons. The axial skeleton consists of those bones which lie along the central midline axis of the body, while the appendicular skeleton includes those bones which form the free appendages (arm and legs) and girdles (shoulder and pelvic). A subdivision of the axial skeleton, the visceral skeleton (which includes the bones of the jaw, ear, and the cartilages of the neck), will be discussed in the Developmental section.

Begin by studying the articulated skeleton. Using the list of terms as a guide, learn the names and numbers of bones which make up the skeletal divisions. Do not concern yourself with the details of the bones at this time. The parts of individual bones, the names of the individual tarsals, carpals, and the bones of the skull will be covered in subsequent chapters.

As you learn the names of the bones, do the exercises to help you organize your knowledge. Color each bone after you have filled in its identification. Use a

contrasting color for each of the skeletal divisions. For example, color all of the bones of the axial skeleton red and the appendicular skeleton blue.

Next, draw your attention to the way in which bones articulate. For example, does the femur articulate with the tibia and fibula? Does the humerus articulate with the axial skeleton? Note how the ribs join the sternum (true ribs with costal cartilages join directly; false ribs attach indirectly and floating ribs do not articulate with the sternum at all). Be careful when you study the laboratory specimens, the mounted skeleton may be misleading. Bones which are mounted by the manufacturer are often attached in unnatural ways for support. Typically, the scapula is wired to the rib cage.

After you have studied the adult skeleton, examine the skeleton of the human fetus. Note the bones of the pelvis, the shape of the thorax, the distribution of cartilage, and the sections of the skull.

Finally, examine the skeletons of the cat and other mammals. By comparing the morphology of other animals, you will appreciate how evolution has modified the structures of different animals thus suiting them to a variety of enviornments.

Study your textbook and complete the workbook exercises. When you feel that you have mastered the material, take the practice quizzes and compare your results with the answers found in the back of the book.

LIST OF TERMS

1. appendicular skeleton
2. axial skeleton
3. carpals
4. cervical vertebrae
5. clavicle
6. coccyx
7. digits
8. false ribs
9. femur
10. fibula
11. floating ribs
12. fused bones
13. hallux
14. humerus
15. hyoid
16. ilium
17. incus
18. ischium
19. lumbar vertebrae
20. malleus
21. mandible
22. metacarpals
23. metatarsals
24. os coxae
25. patella
26. pectoral girdle
27. pelvic girdle
28. phalanges
29. pollex
30. pubis
31. radius
32. sacrum
33. scapula
34. sesamoid bones
35. skull
36. stapes
37. sternum
38. tarsals
39. thoraic vertebrae
40. tibia
41. true ribs
42. true bertebrae
43. ulna
44. vertebral column
45. visceral skeleton

GREEK AND LATIN ORIGINS OF WORDS

branchium G. a gill
carpus G. the wrist
cervix L. the neck
chondros G. cartilage
clavicula L. a key
coccyx G. a cuckoo
costa L. a rib
coxa L. the hip
faces L. a face
ischium G. the hip
lumbus L. the loin
malleus L. a hammer
mandibula L. a jaw
os L. a bone
patella L. a little dish
pector L. the breast
pelvio L. a basin
phalanx G. soldiers in ranks
pollex L. the thumb
pubes L. hair appearing at puberty
pubi L. the region of the pubes
radius L. a spoke, a ray
sacrum L. the sacred bone
femur L. the thigh
fibula L. a clasp, buckle

gnathus G. the jaw
hallux L. the great toe
humerus L. the shoulder
hy G. Y or U shaped
ilia L. the flank
incus L. an anvil
scapula L. the shoulder blade
sesamoid G. seed like
skelet G. a dried body, mummy
stapes L. a stirrup
sternum G. the breast bone
stetho G. the chest
tarsas G. the ankle
thorax G. a breast plate
tibia L. the shin
tuber L. a knot, swelling
vertebra L. a joint
ulna L. the elbow

The Number of Bones in the Human Skeleton

The number of bones in the skeleton varies considerably, especially with age. In the child, bones such as the os coxae, sacrum and coccyx are composed of separate bones. Furthermore, young growing bones have caps of bone (epiphyses) separated from the main part of the bone by growth cartilage. These small pieces of bone unite with the main shaft of the bone when growth is complete (maybe as late as 22-23 years of age) but they could be considered as distinct bones. Counting all these pieces would give the child an enormous number of bones. At maturity the average person may have approximately 208 bones if minor sesamoid bones are not considered and the sternum is counted as three separate bones. Two sesamoid bones at the base of the hallux and pollex are consistently present although the two bones associated with each pollex are not usually mounted with the laboratory skeleton. Small sesamoid bones at the base of the index finger and little finger are usually present as is a sesamoid bone in the tendon of the peroneous longus muscle as it turns under the side of the foot beside the tarsals. Counting all these, the average adult could have about 222 bones. Accessory bones, extra bones that originate when normal fusion of bones fails to occur in fetal life, may also alter the number of bones found in the human skeleton. Small accessory bones associated with the carpals and tarsals are frequent. Small bones (Wormian bones),

the size of a fingernail or smaller, frequently develop along a suture in the skull. Larger bones of this sort at the back of the skull are frequent amont the Indians who live on the West Coast of South America, and hence these bones are referred to as Inca bones.

With advancing age, bone may fuse. This is typical in the skull where the sutures are progressively obliterated until, in some cases the whole skull is essentially one bone. At the same time, however, older people may acquire more sesamoid bones in their tendons.

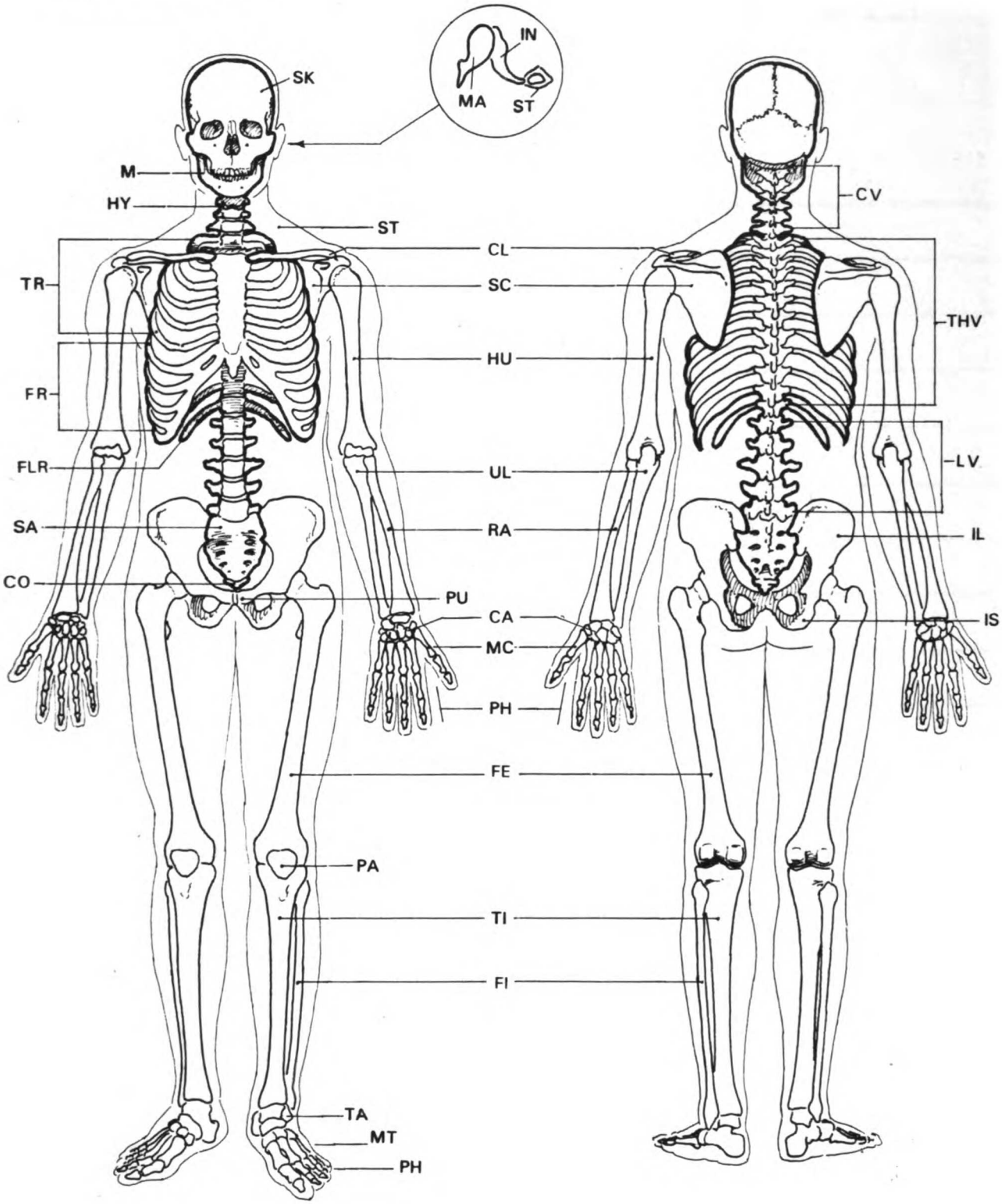
Other mammals may have approximately the same number of bones in the appendicular skeleton. Hoofed animals have a reduction in their carpals, tarsals and phalanges. Other mammals usually have more bones in their axial skeletons with more vertebrae and a tail (caudal vertebrae, as many as 50 in the pangolin). They may have fewer ribs (9 pair in some whales) or as many as 20 pair in the hyrax, but most mammals have 12 to 14 pairs of ribs. Almost all mammals have 7 cervical vertebrae, the exceptions are the sea cow (6) and sloths (6 or 8). Many carnivores, insectivoires, rodents and bats have a special bone, the baculum, in the penis. Cattle have a circular strengthening bone in the heart, the os cordis, and marsupials (kangaroos, oppossums, etc.) have special marsupial bones arising from the pelvis that aid in supporting the pouch in which the young are nursed.

The Age and Sex of the Skeleton

Questions concerning the sex and age of skeletons can be answered better after a knowledge of parts of bones has been acquired. The most obvious indications of the sex of the skeleton can be obtained by noting the angle of the pubic bones. If they diverge at an angle that approximates the spread of the index and middle finger (approximately 50-60 degrees), it is usually a male pelvis. If the pubic bones diverge at an angle approximating that made by the index finger and thumb (approximately 80-90 degrees), the pelvis is usually female. Male skulls usually have prominent superciliary ridges, the rounded protuberances that lie above the orbits of the eyes at about the level where the eyebrows would be in life. The sacrum and sternum and other bones differ in males and females. In most cases, adult male bones are larger and have more prominent ridges on them where the larger male muscles attach to the bones.

The age of the skeleton may be difficult to ascertain. If it has all four third molars (wisdom teeth) it is usually over 18 years of age. If the sagittal suture which runs front and back across the top of the skul is fused, the skeleton is usually over 35 years of age. Partial closure of this suture may indicate an age in the late twenties. Older skulls have more and more fusion of the sutures. The age of the skeletons of children can usually be ascertained within a year because growing bones fuse at a fairly definite time in life.

Exercise



Anterior View **Posterior View**

AXIAL SKELETON
(Exercise 2.1)

SK _____

ST _____ (fused)

TR _____ ( )

FR _____ ( )

FLR _____ ( )

SA _____ (fused)

CO _____

CV _____ ( )

THV _____ ( )

L V _____ ( )

Visceral Skeleton

M _____

HY _____

MA _____

IN _____

ST _____

APPENDICULAR SKELETON
(Exercise 2.2)

CL _____

SC _____

HU _____

UL _____

RA _____

CA _____

MC _____

PH _____

IL _____

IS _____

PU _____

FE _____

PA _____

TI _____

FI _____

TA _____

MT _____

PH _____

DEVELOPMENTAL

Five hundred million years ago in ancient Ordovician seas, the earliest known vertebrates appeared. These jawless fish, similar to the lamprey of today, evolved an internal support structure that was the evolutionary beginning of our human skeleton. By studying the development of the human skeleton and comparaing it to other vertebrate skeletons, you will see how evolution selectively conserves and modifies anatomical structures in one species, while eliminating others, to create a new and more adaptive species.

Five important stages in the evolution of the human skeleton are compared in the following illustrations. Figure 2.1 illustrates the evolution of the axial and appendicular skeletons and figure 2.2 details the evolution of the visceral skeleton. As you study and color the illustrations, pay particular attention to the shape of each anatomical structure as it changes from one evolutionary stage of development to the next.

The Evolution of the Axial and Appendicular Skeletons (Figure 2.1)

Begin by coloring the axial skeleton in each of the five evolutionary stages using the same color throughout. Notice the transformantion that occurs in the relative length and curvature of the vertebral column. What changes occur in the shape of the individual vertebrae, the skull,

and the structures of the neck? At what stage do the ribs and teeth first appear?

Next, using a different color for contrast, color the appendicular skeleton. Observe at what stage the pectoral and pelvic girdles first appear and when they become attached to the axial skeleton. At what stage do distinct bones in the limbs i.e. the humerus, radius, ulna, and digits, develop? How does the external shape of the limbs reflect the activity of each animal and its mode of locomotion?

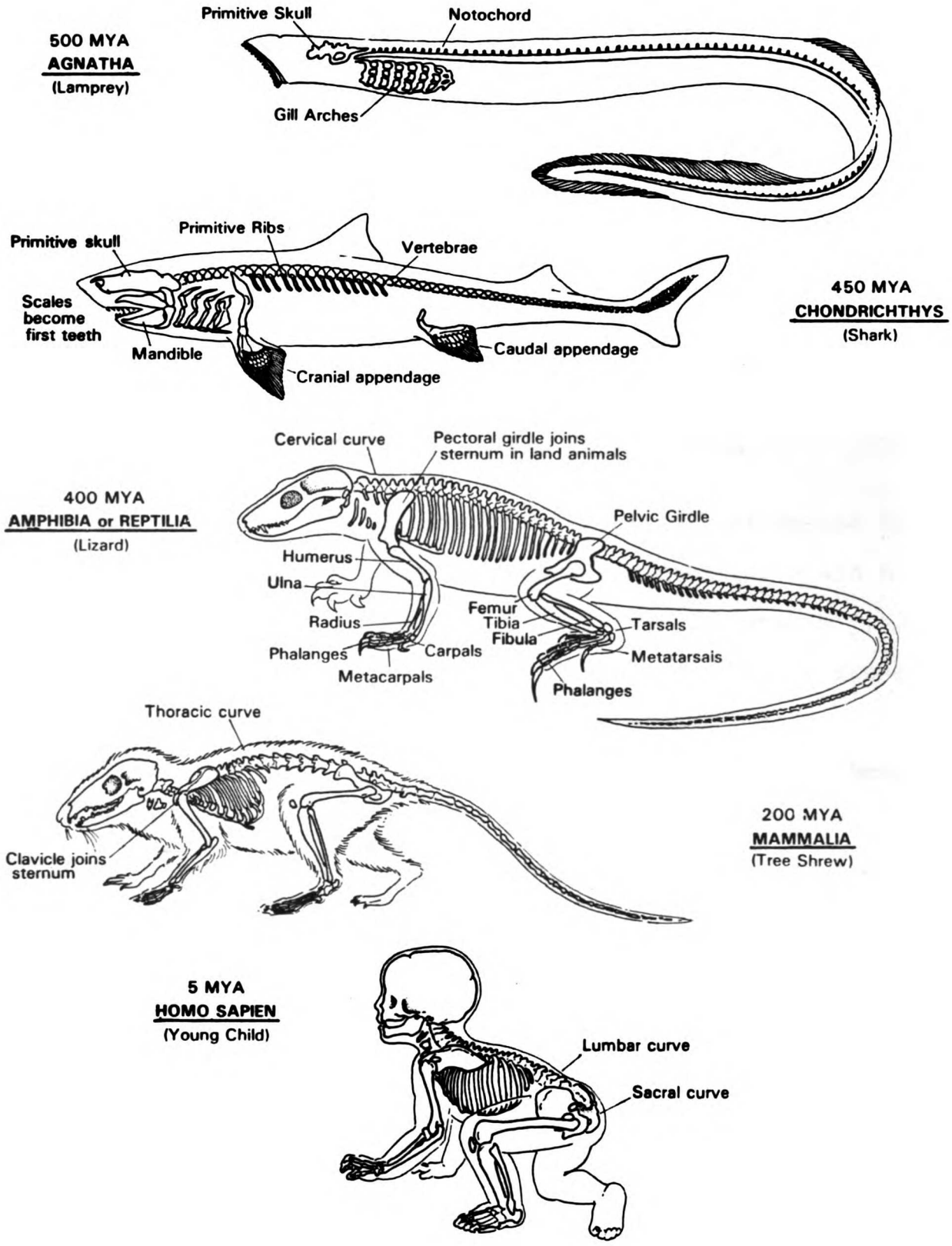


Figure 2.1 Five Stages in the Evolution of the Axial and Appendicular Skeletons.

The Evolution of the Visceral Skeleton (Figure 2.2)

The bones of the visceral skeleton, which in the human includes the mandible, tympanic ring, ear ossicles, larynx, hyoid bone, and the styloid process, are derived from cartilaginous arches that supported the gills of primitive fish. The term visceral is used because the gills are a part of the walls of the digestive track. The structural changes which occur in the visceral skeleton during the five developmental stages are important to know about because they support the Theory of Evolution.

Begin by coloring the first five gill arches of the lamprey. Use a contrasting color for sections a and b of arches 1 and 2, and different colors for arches 3,4, and 5. Next, using this same color scheme, color the arches in each of the four remaining evolutionary stages.

In the shar, notice that arches 1 and 2 have abandoned their function as gill supports. Arch 1 has been adapted as a pair of jaws and arch 2a now becomes part of the primitive ear.

In the lizard (reptiles), the gills have disappeared. The bones of the skull take over the function of upper jaw while arch 1a diminishes in size.

In the opossum (mammals), you can see that a part of arch 1b now joins with arch 1a and 2a to complete the tympanic ring and the ossicles of the ear (malleus, incus, and stapes respectively). Arch 2b has joined with arch

3 to form the hyoid bone and styloid process. Arches 4 and 5 have come together to form the larynx.

Finally, in the young child the mammalian structural relationships have been retained with some changes in the relative size and position of the bones. Most notably, the mandible has decreased in size and the structures of the neck are vertically aligned due to the upright posture of man.

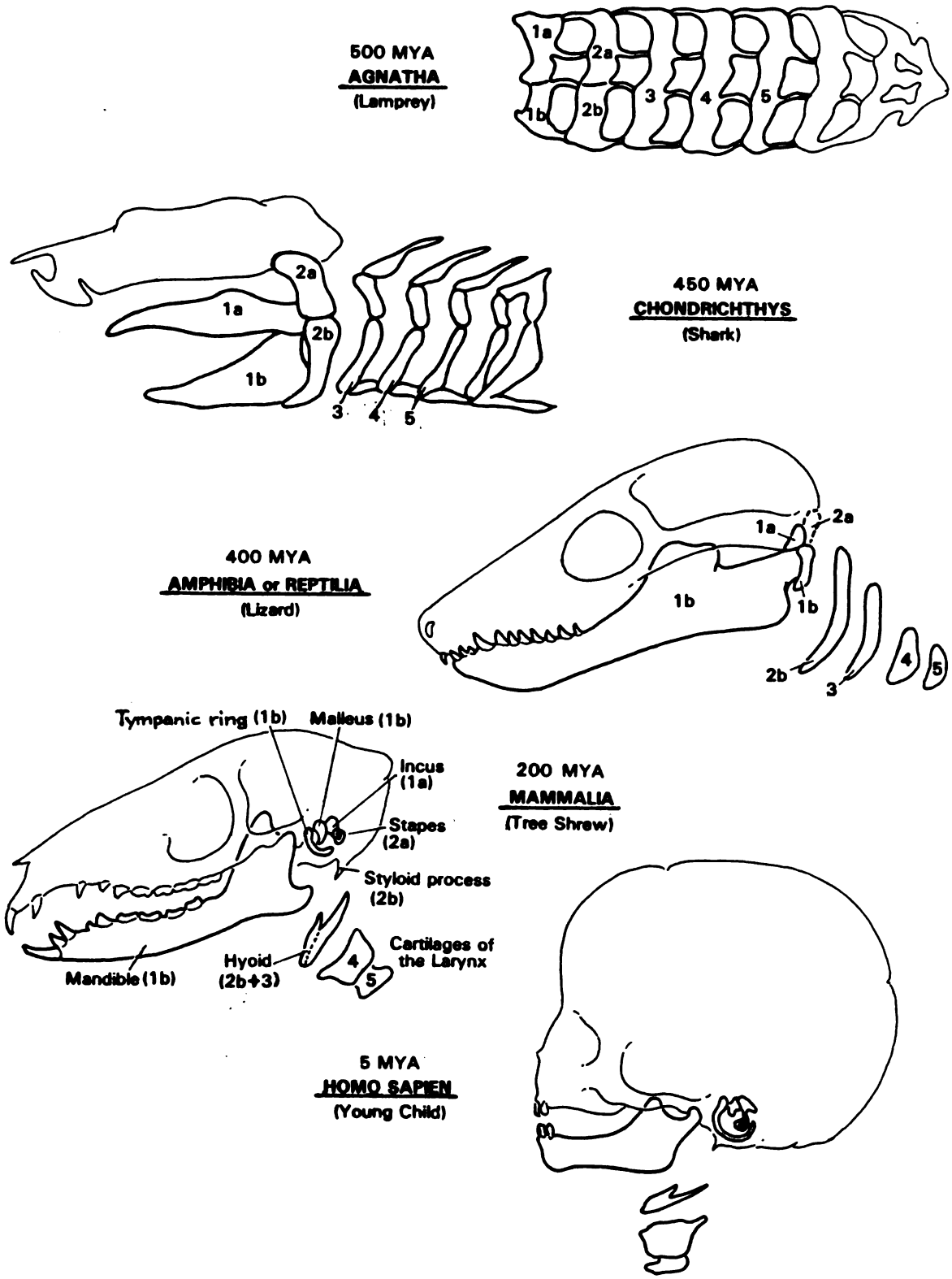


Figure 2.2 Five Stages in the Evolution of the Visceral Skeleton.

CULTURAL

STORY: The Descendents of Yazdegerd, the Glory of Mazda

Long ago, perhaps before 5000 B.C., somewhere in Eastern Europe and Western Asia, there lived people who are little known except for parts of their language. Perhaps they had only a few hundred words in their speech and if only one word survived to this day it would be remarkable. Strangely, they left many words with us that can be recognized from France to Greece through Russia and on into Iran and India. These words, together with a tender thread of behavior that emerges in sagas, epics and vedas tell us of the ancient Indo-Europeans, the Indo-Aryans.

These light-skinned people encountered and replaced the ancestors of the Basques and left only a fragment of the original language high in the Pyrenees. They met the Semites in the Near East and, far off in India, they mingled with the dark-skinned Dravidians leaving here again small outposts of aboriginal speech, like Santali and Munda in the hills of Bihar where, also, rare species of animals and plants remain as relicts from the changes on the plains.

Over all the years and the vast separations, the mother language changed. In India it became Sanskrit and Sanskrit in turn gave birth to many modern languages such as Hindi, Gujarati, Bengali, Punjabi and dozens of others. Today

in Hindi the word for stone is "putr" while in old Sanskrit it was "putar." If you go to the eastern Mediterranean, in Jordan, there is an ancient city carved out of rock. It is called "Petra." The Greeks gave the chief disciple of Christ the name "Peter," the rock on which the Church was built. It is words such as this with a commonality across huge distances that identify the ancient Indo-Europeans. The word "petr" spread through the Romance languages with Latin, but somewhere in the filter of Saxon and Old English, perhaps from Scandanavian invaders, the old word was conquered by "ston." But we still have petrify, petroleum (oil of stone), saltpeter (salt rock) and the petrous portion of the temporal bone, the hardest bone of the body that contains the vibrating fluids of the ear.

The religion of these Indo-Europeans changed but they maintained some central beliefs. For example, the Hindus with their many gods still recognize Indra, the Indo-European god of fire and Mithra the god of lthe day. The Persians also maintained these deities but they were influenced by an early prophet, Zoroaster or Zarathustra who believed that the fire of the sun, Ahura Mazda was a manifestation of a central deity. Fire and earth were sacred to Zoroaster and his priests were known as Magi. These ancient priest scholars became the great astronomer-astrologers who predicted the seasons for planting and harvest and the motions of the sun, moon and stars. Our

present word "magician" recalls their work and they were the "kings" who appeared in Bethlehem following a new star. For these ancient people the festivals of Spring at the time of the equinox was originated to give us Easter and the midwinter festival became Christmas. A whole gamut of Christian customs grew out of their foundations and we still call the holy day of the week, the day of Mazda, sunday.

A variant of Zoroasterianism developed around Mithra, the god of the day who was born from a rock and his birth was witnessed by adoring shephers. A fter Mithra's work on earth was done he ascended to the sky to join Mazda as his consort but his earthly experience allowed him to enter the spirit of living men. This sect of Mithraism became particularly popular with Roman soldiers and it spread through the Empire. It appeared as though it would replace the old Roman gods but somehow it failed and Christianity, a sort of dark horse in the race for Roman approval, won out. It is said that Mithraism failed because it was a religion that was confined to men, that women could not participate, whereas Christianity, although it barred women from priesthood, still permitted women to belong to the church and function in religious activities. Indeed, the comparative liberality of Christianity in regard to women is rather striking when compared with other major religions and this may well have been Christianty's strong point.

In the early seventh century the religion of Mohammed, the prophet of Islam, came into being. It was a determined religion that fit the desert tribes of Arabia and soon captured the enthusiasm of the varied nationalities of the Near East. By the middle part of the seventh century Islam crossed the Persian Gulf and contacted Zoroastrianism. Wars followed and finally, about 651 A.D., the last Zoroastrian king, Yazdegerd, the Glory of Mazda, was killed. There followed a period of repression, but soon the remnant groups of Pers people who refused the dominance of Islam, got together on ships and and sailed eastward across the Arabian Sea and in 706 A.D. founded a new colony of freedom near Bombay on the coast of India.

In this new environment the immigrants were not easily accepted. The Hindus had developed elaborate levels of caste and considered the new people, who they called Parsis (Parsees) as outcastes. The Parsis responded by binding their laws of intermarriage even stronger, their diet and behavior even more rigid. Nevertheless, they penetrated Hindu society and, analogous to the Jews in Europe, they took to money lending and starting peripheral businesses among the Hindu majority. Ultimately, the Parsis were enormously successful. They became the finest businessmen of India and among the richest.

One curious aspect of Zoroastrain doctrine concerned the fate of the dead. They could not be buried for that would contaminate the holy soil and they could not be

burned for that would desecrate the purity of fire. In Persia and especially in India the problem was solved by the valid ecological expedient of vultures and so it was that in Bombay, the Parsis erected large towers, the Towers of Silence, with metal grids and the bodies of the dead were placed high on these platforms to be consumed by scavenging birds. The bones fell away and were disposed of so as to not contaminate the earth. In Bombay, the vulture populations of many species are the largest in India.

This was alright as long as the Parsis lived near Bombay, but soon they spread all over India and various places where vultures consumed bodies had to be established. The problem was the disposal of the bones, so they were shipped back to Bombay. And so it was that early in this century, a biologist in India saw a train go by with a full car load of beautiful, white, clean human bones. Remember, the Parsis are excellent businessmen, sagacious commercial enterprisers, and soon an arrangement was made. For money, the bones could be shipped to biological supply houses instead of Bombay and from there, for more money, to universities and classrooms. The descendents of Yazdegerd are among you!

The source of these bones is not talked about because it may shake the consciences of fundamentalists, the true believers of Zoroaster, and the market may close. It seems, however, that students of anatomy should know that those

perfect skulls and bones have never been buried and have lost noe of their strength from excessive bacterial action. The slight prognathism of the maxillae and mandibles speaks of an ancient heritage (their younger ancestors were the Three kings of Orient) with considerable inbreeding and the teeth withouth caries point to inherited resistance and to the restricted diet of Zoroaster. Nevertheless, it is interesting to note that some skulls, especially those of younger males, do carry traces of betelnut stain and, chewing betelnut (pan) in India, is strictly forbidden among Parsis. Can you, with a sociological intuition, imagine that far from the mother churc in Bombay, in Allahabad or Rampurhat or Siliguri, there are those who are rebelling and throwing off the prohibitions of their ancient religion?

And so it is that skulls and dry bones tell stores. There are many more. Perhaps the moral of all this is that anatomy wanders far afield and prys into those things called "cultural" and drags the people who love bones and bloodvessels and bowels far beyond their embalmed bodies.

Quiz

NAMES OF BONES

1 _____
2 _____
3 _____
4 _____
5 _____
6 _____
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11 _____
12 _____
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14 _____
15 _____
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20 _____
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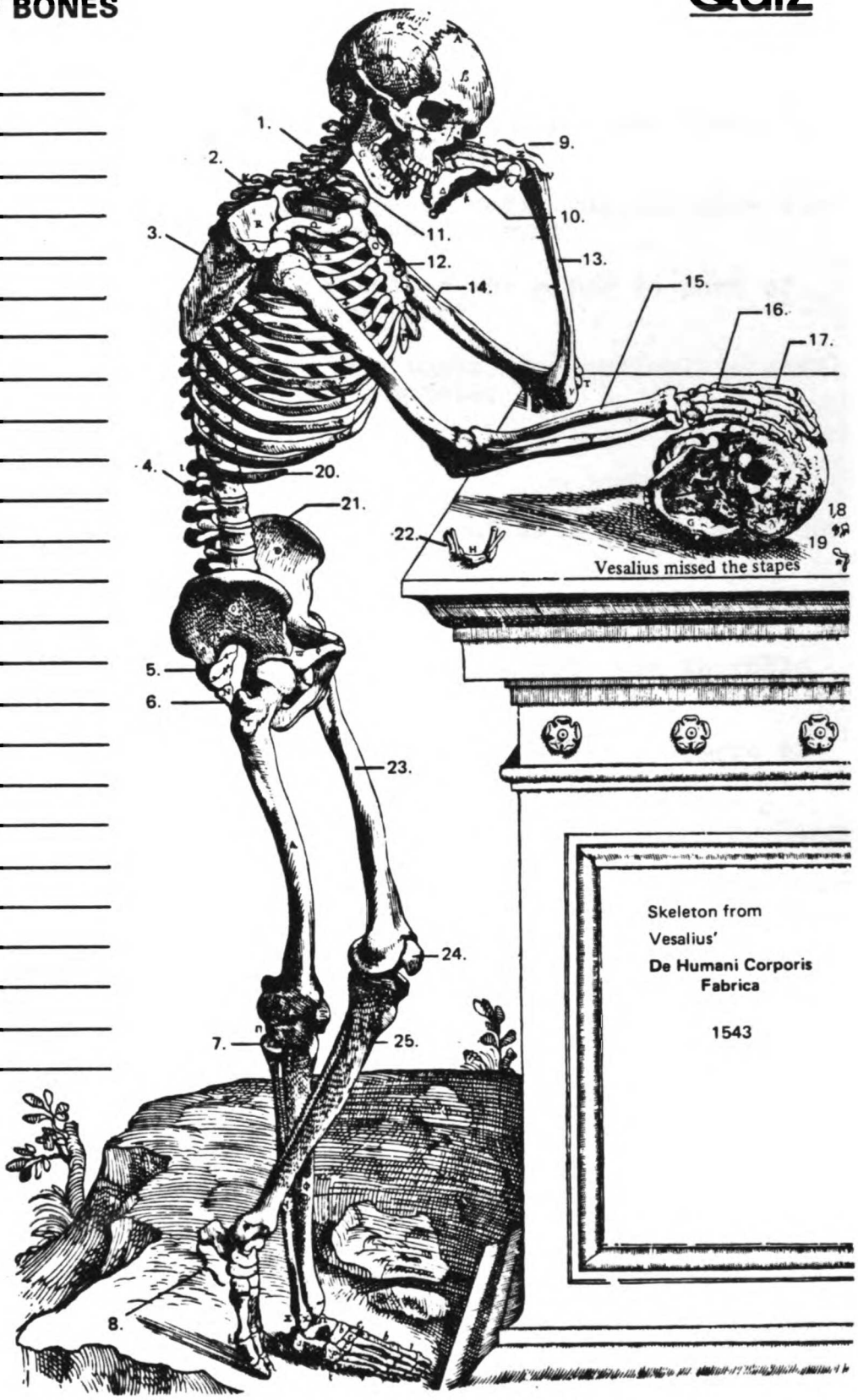
25 _____



QUIZ

Names, Numbers and Position of Bones

1. _____ How many tarsal bones are there in one appendage?

2. _____ What type of vertebrae lie directly above the sacrum?

3. _____ The point of the elbow is part of which bone?

4. _____ Name two bones that articulate with the clavicle.

5. _____

6. _____ Can you name one bone of the axial skeleton that articulates with the femur?

7. _____ How many true vertebrae are there?

8. _____ How many flating ribs are there in the normal male?

9. _____ Ribs articulate with which type of vertebrae?

10. _____ The pollex contains how many phalanges?

11. _____ The prominent projection on the outer part of the ankle is part of which bone?

12. _____ Which bone of the middle ear is derived from the single bone in the ear of reptiles?

13. _____ Which bone of the forearm articulates with the carpals?

14. _____ The humerus articulates with which three bones? (in any order)

15. _____

16. _____

17. _____ When you place your hand on your hip which bone do you feel? Give three names for this bone.

18. _____

19. _____

20. _____ Name five bones that articulate with the femur of a child. (in any order)

21. _____

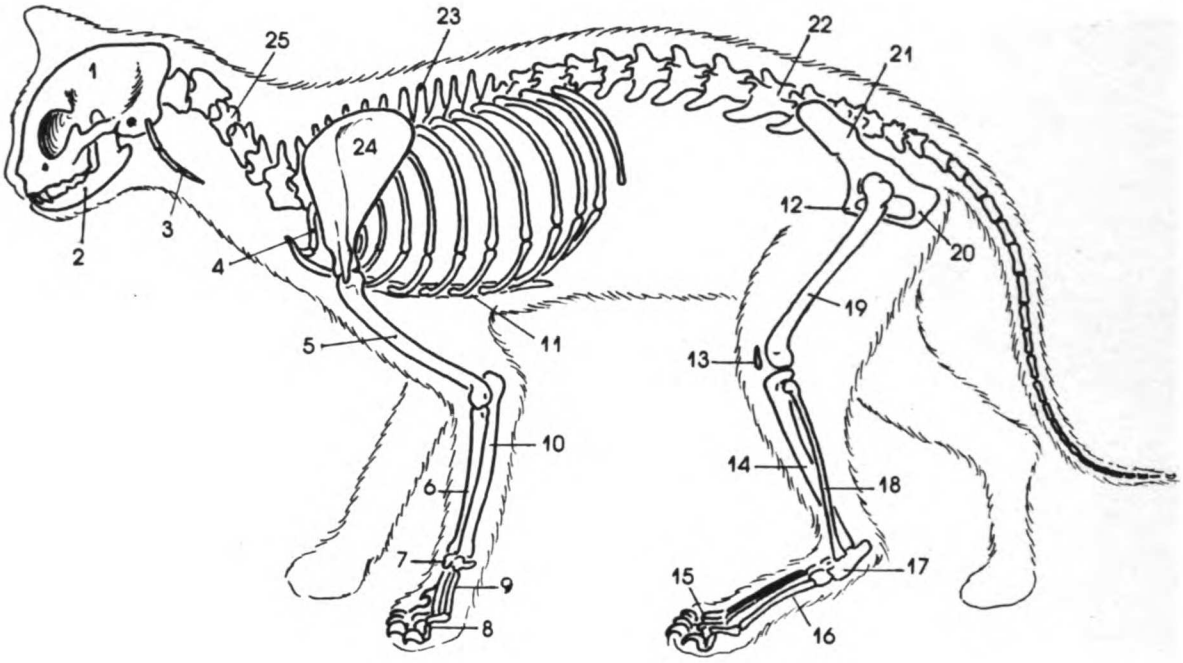
22. _____

23. _____

24. _____

25. _____ What bone forms the outermost and uppermost part of the shoulder?

Quiz



NAME THE BONES OF THE CAT

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
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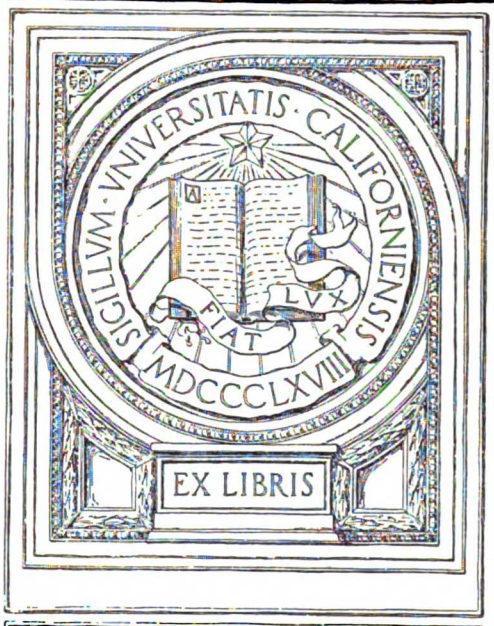

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