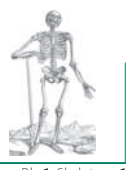

Bk. 1 Ch. 19 Fig. 1

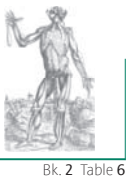

Bk. 1 Ch. 19 Fig. 2


Bk. 1 Skeletons 1


Bk. 2 Table 7


Bk. 2 Table 8


Bk. 5 Fig. 1


Bk. 2 Table 6


Bk. 2 Table 11

WHAT THE THORAX IS; THE CHEST; THE PECTORAL BONE [STERNUM]

VERYTHING contained and circumscribed by the ribs (figs. 1 and 2 show the full array of thoracic bones) we shall call the thorax; we do not include, with Aristotle,[22] the entire trunk of the body (from **O** to **ς** in the skeletons),[23] which we measure from the throat to the pubic area. We shall, for convenience's sake, call the anterior part of the thorax the chest, *pectus*, and for this reason, the wide bone in this location (**g**, **h**, **i** in fig. 1) to which the ribs are articulated will fittingly be called the pectoral or chest bone [sternum], lest we seem negligently to confuse the three words of the Greeks and especially Galen: θώραξ, στῆθος, and στέρνον. Thus, the pectoral bone, ribs, and twelve dorsal vertebrae, which I previously called thoracic, are the bones of the thorax.

THE DILIGENCE OF THE MAKER OF THINGS IN CREATING THE THORAX[24]

The industry of the supreme Maker of things, by which the thorax as a whole is neither bony nor fleshy but bone alternating by turns with flesh (the 7th and 8th tables of muscles illustrate this),[25] is admirable. The skull, by contrast, is entirely bony, while the abdomen is constructed chiefly of muscles. These should be considered not in a sketchy or casual way, but exactly and with special care. For since there are three vital organs[26] that regulate a person, bone that is rigid and interrupted by no muscles is placed around the first, while muscles surround the third. But something intermediate, made of bones and muscles, is constructed around the second. Now the brain had no need for muscles, since no part of the skull requires dilation or compression. Therefore the skull is rightly placed about the brain like a helmet or rigid wall. But if there had been some such barrier placed around the organs that serve the liver, such as the stomach, the intestines, and the bladder (the first figures of Bk. V illustrate these), and finally if the uterus[27] itself were so constrained, where would the stomach put food and drink? In what direction would the swelling of things gestating in excrement be set aside in fruitful labor? Could assistance here? need most of all for t altogether if the thora other hand, it were fashioned solely from muscles that create motion, these would impinge upon the lungs and the heart even without the pressure of something external. So, in order to have some inner thoracic capacity, and for the thorax to be moved voluntarily, muscles (**S**, **T**, **V**, **X** in the 6th table of muscles,[29] and **T T**, **V** in the 11th[30]) are placed alternately between the ribs. This immediately contributes in no small way to the security of the heart and lungs, for they are now better protected than if the thorax had been constructed solely of muscles. What is more, the bony mass of the thorax contributes admirably to strengthening and supporting the scapulae and thence the arms as well; for we shall explain that the scapulae rest upon the ribs only, and the clavicles are supported by no bone except the pectoral bone and the scapulae, to which in turn are attached the humerus, the forearm, and the hand in a series (these are **Q**, **R**, **S**, **T**, **V**, **Z**, **Γ**, **Δ** in the skeletal figures)[31]. If the thorax were constructed with no bones, there would be no place from which muscles could originate for the scapula, the humerus, the abdomen, and certain other members, nor would muscles attach to or be situated on any foundations. And, surely, turtles instruct us perfectly regarding this necessity of the thoracic bone, if anything does, to the supreme credit of our Creator: these turtles are walled about with such a safe house, yet in the lateral surfaces of the chest and thorax they show the most elegant and beautiful structure of bones, created with astonishing craft for the sole purpose that the forward limbs might rest upon it, and so that the muscles moving the turtle's arms might conveniently originate from it.

WHY THE ABDOMEN IS NOT ALSO BONY[32]

But perhaps someone might interject: 'Why should not the abdomen also be made bony, like the thorax? For if such a bony mass formed in alternation with muscles were placed around the belly, it would not interfere with its contraction

Medical Terminology
For the first time, *Nomina Anatomica* and *Terminologia Anatomica* are included, clearly aligning Vesalius' 16th-century descriptions with the appropriate modern medical terminology.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Notes
Differing colors allow easy identification of notes specifically relevant to the 1543 or 1555 edition.

22 In the margin, Vesalius cites Ch. 7 of the 1st book of *Historia animalium*, where Aristotle defines the external parts of the body as head, neck, thorax, two arms, and two legs. Michael Scot's Latin version, made in the early 13th century from an Arabic translation of earlier manuscripts, adds: "the bulk from the neck to the genitals is called the thorax." (491a30). This seems to have been the version known to Vesalius.

23 See the figure of the 1st skeleton on p. 163 of the 1543 *Fabrica*. **O** = *manubrium sterni*; **ς** = *crista pubica*.

24 This section and the one that follows are paraphrased from Galen, *De usu partium* 3.599.4ff. See May, 1968, p. 379.

25 *Musculi thoracis*, *fascia thoracica*.

26 Lat. *principia*, translating Galen's ἀρχαί (3.599.10), the vital organs of the body: brain, heart, and liver.

27 1555 adds: "surely not the least instrument of generation."

28 *Diaphragma thoracoabdominale*, *musculi abdominis*, *diaphragma pelvis*, *d. urogenitale*.

29 Labeled by Vesalius as **S** for *os costale*, **T** for *cartilago costalis*, **V** for *musculus intercostalis externus*, and **X** for *m. intercostalis internus*.

30 **V** = *musculus intercostalis externus*; **T** = *os costale*.

31 **Q** = *clavicula*; **R** = *scapula*; **S** = *humerus*; **T** = *articulatio humeroradialis*; **V** = *processus styloideus radii*; **Z** = *ossa metacarpi*; **Δ** = *ossa digitorum*.

32 This section, omitted from the 1555 edition, continues Vesalius' paraphrase of *De usu partium* 3.600.16ff.; see May, 1968, p. 380. Siraisi (1997, p. 11) points out that causal explanations of this kind diminish as one moves through the 1543 edition, and many, including the present instance, were systematically removed from the second edition.

Summaries
Adding clarity to the complex work, summaries originally placed in the margins are now incorporated into the main text as section headings.

Cross-Referencing
Vesalius' marginalia are now integrated into the text and in thumbnails for straightforward reference.

Mapping Vesalius
The complex Renaissance work is made accessible by easy-to-use running heads.

and dilation, gained for the should be taught that the contents of the belly could not always be expanded and compressed as much as sometimes happens if they were fenced with bone on the outside. If such were the case, women would not be able to conceive, nor would it be possible for a person to eat one's fill at one time: he would need to eat continually, just as one needs to breathe continually. But it is not at all absurd that one is in constant need of breath, for one spends one's time in the air, and lives in it. But if we had the same need for food and drink, we should conduct our life quite apart from philosophy and the Muses: forever occupied with eating, we would never pay attention to the finest and most beautiful things.[33] Again, if the bulk of a bony abdomen were as great as women require in the last months of pregnancy, what would be more awkward than such a bulk if, after the fetus was expelled, she continued to swell so unpleasantly? And, at the same time, when filled with no other thing which is useful to the human fabric, what would be more awkward than if it did not subside so as properly to embrace the stomach and intestines, and were not placed next to them like a pad or for the sake of heating[34]? We shall pursue these matters at greater length in the fifth book,[35] and we shall show as well that in the fabric of the belly, Nature's cleverness was so great that she protected organs of the belly that do not require alternating dilation and compression, either placing them beneath other parts, or sheltering them no less than the lungs; for the liver and the spleen are walled in by the ribs, and the kidneys also lie beneath so many other organs, particularly toward the back, because none of these must be expanded, while – with the remarkable foresight that we have noted – Nature wished the remaining organs of the belly to be in no way impeded from their functions by a bony structure.

WHAT NATURE PAID SPECIAL ATTENTION TO IN CONSTRUCTING THE THORAX

Since neither respiration nor speech can occur without the thorax, and since the heart first and the lung as well need to be protected by the thorax, it was necessary for the Maker of things to attend to four goals, as it were, in the fabric of the thorax: voice, respiration, and the size of the heart and the lung. The thorax, which has a more or less oval shape, is as large as the size of the lung warranted (figs. 12 and 13, Bk. VI). At the same time, the lung follows the shape of the thorax, not the opposite. In my account of the lung, I shall show with no great difficulty that like the liver, the spleen, or – to a degree – the brain, it required no particular shape.

THE NUMBER OF RIBS

It will now be timely to describe the bones of the thorax in order and, since we have already described its vertebrae (C to D in the figure for Ch. 14, and the figures in Ch. 17 [16]), to begin our account with the ribs. Men and women have twelve ribs on either side (1–12 in figs. 1 and 2); occasionally, there are only eleven, though sometimes we have even observed thirteen.[36] We reported above that thirteen thoracic vertebrae occur more often than only eleven. Each thoracic vertebra is articulated to a single rib on each side.

MEN AND WOMEN HAVE THE SAME NUMBER OF RIBS

It is commonly believed that men lack a rib on one side, and that men have one rib fewer than women. This is plainly absurd, even if Moses did say in the second chapter of Genesis that Eve was created by God out of Adam's rib. Granted that perhaps Adam's bones, had someone articulated them into a skeleton, might have lacked a rib on one side, it does not necessarily follow on that account that all men are lacking a rib as well. Aristotle attributed only eight ribs to humans, and was ready to allow that certain members of the race of the Turduli[37] were born with only seven ribs on each side, provided he established this on the actual testimony of some suitable authority. But as in the latter instance Aristotle was willing to support his opinion only with the testimony of others, it is also not unlikely that in the former instance he ascribed eight ribs to man on hearsay evidence, and in this manner wrongly handed down to us something he had not seen. For if we discover that he was suppositious so many times concerning the fabric of man, what judgement shall we make about the rest of his research into animals?[38]


Bk. 6 Heart Fig. 12


Bk. 6 Heart Fig. 13


Bk. 1 Ch. 14 Fig. 1

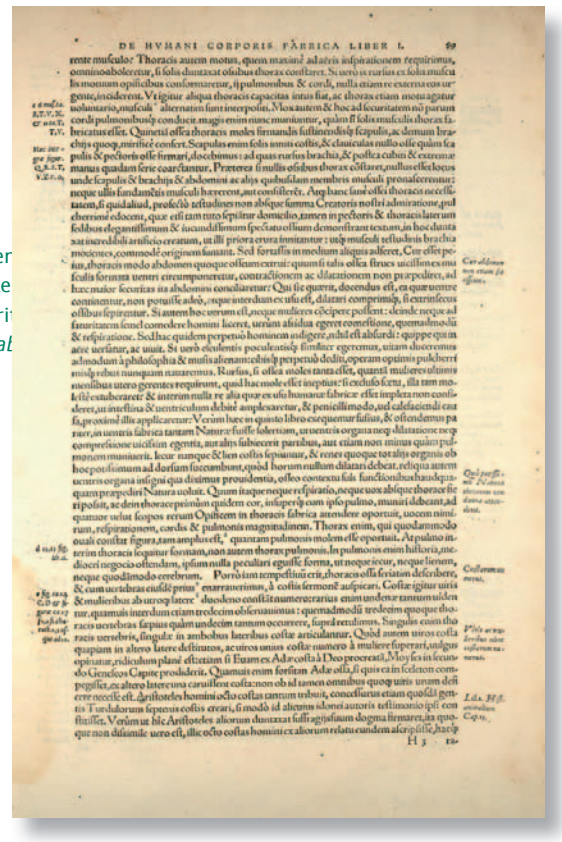

Bk. 1 Ch. 16 Fig. 1


Bk. 1 Ch. 19 Fig. 1


Bk. 1 Ch. 19 Fig. 2

33 Siraisi (1997, p. 10) traces this idea to Plato, *Timaeus* 73a.
34 As in the concoction or *pepsis* of digestion.
35 Which describes the abdominal viscera and organs of reproduction.
36 A 13th or "cervical rib" occurs in 1% of humans and is clinically important because it may give rise to neural and vascular symptoms. It articulates with the transverse process of the 7th cervical vertebra and the 1st thoracic rib; if short, the cervical rib will terminate freely (Gray, 1985, p. 157).
37 Ligurians; Vesalius cites *Historia animalium* 1.15 in the margin: "Common to the upper and lower trunk are the ribs, eight on each side. (We have received evidence about the alleged seven-ribbed Ligurians.)" (493b15; Loeb tr. by A.L. Peck, p. 51). The qualification added in Vesalius' account may be derived from Michael Scot's 13th-century translation from the Arabic. See n. 21 above.
38 This ser
eral ske
authori
1555 *Fab*

Highlighting Vesalius' 1543 Pagination
A Vesalius figure signals that the text can be matched to the beginning of the corresponding page in the original *Fabrica*. The larger Vesalius figure in the margin indicates the correlating page number.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