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THE OLD PHYSIOLOGY IN ENGLISH LITERATURE

THE OLD PHYSIOLOGY
IN
ENGLISH LITERATURE

A THESIS SUBMITTED TO THE UNIVERSITY OF LONDON FOR THE DEGREE OF D.LIT.

By

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THE OLD PHYSIOLOGY IN ENGLISH LITERATURE

CHAPTER I

THE MEDICAL TRADITION IN ENGLAND

THE history of every science is a path strewn with discarded theories. Science progresses not only by the accumulation of facts, but also by the framing of hypotheses to connect and to interpret the facts observed. It has frequently happened that theories have been erected upon slender foundations of knowledge, and have had to be demolished before the groundwork could be completed. Thus many a hypothesis, though apparently perfect as an interpretation of the order of Nature, has in reality barred the way for a truer explanation. Nowhere is this better exemplified than in the history of physiology. The theories accepted in the Middle Ages held so powerful a sway at the Renaissance

that men doubted their own observation if it conflicted with what they had been taught.

In the study of literature we find many references to outworn systems of thought or to obsolete scientific beliefs. Literature levies contributions from every domain of thought. Whatever will adorn or illustrate the central thought is pressed into the service of the writer's art. In proportion to the learning of the author we expect to find allusions to various fields of thought, whether art or science, history or philosophy, literature or law. And as literature to a great extent reflects the intellectual attitude of its age, we meet in ancient and modern writings many references to theories and modes of thought that have wholly passed away.

Sometimes an erroneous theory long disproved has been preserved in words or phrases which survive with altered meaning. Astrology is recalled by such words as "influence" and "disaster"; alchemy by "elixir" and the phrase "hermetically sealed." Physiology in particular has left its impress both upon language and upon literature. The body is of such consummate importance to the individual that it is for ever

pressing its claims upon the mind. And so the relations between mind and body have naturally exercised human thought and stimulated human imagination from the earliest times. Every operation of the soul has been associated with some function of the bodily organs, and the soul itself has been regarded as residing in various parts of the body. It is, therefore, no matter of surprise that the physiology of the human frame provides literary material to illustrate or to explain the activities of the mind.

A very cursory acquaintance with English literature of the sixteenth and earlier centuries suffices to show that the great medical authority in Western Europe was Galen. Claudius Galenus flourished in the second century of our era, and by the end of the fifth century his medical writings had been accepted as authoritative throughout the Roman Empire.[1] When the barbarian invasions of the fifth and sixth centuries destroyed the political unity and paralyzed the mental activity of the Western Empire, the knowledge of Greek was practically extinguished in Western Europe. The

[1] *Encycl. Brit.*, Art. "Medicine."

knowledge of Galenic medicine was preserved in the Eastern Empire, and was afterwards acquired by the Arabs, who after their first period of conquest became a learned nation. When this virile race conquered Spain and established centres of learning in that country, Arabic versions of Galen were translated into Latin (some by Arabian, some by Jewish scholars), and in this form re-introduced to mediaeval Europe.

Yet Galen's authority was not undivided. During the six centuries that separated him from Hippocrates, the Father of Medicine, several conflicting schools had arisen to divide with the latter the allegiance of medical men. Galen was a whole-hearted follower of Hippocrates, whose doctrines he developed in great detail, and supplemented with the results of his own observation and with his own ingenious theories. But the Arabs were acquainted with other medical writers, both Greek and Latin, and they had also added to their system a vast amount of Eastern lore connecting medicine with astrology and magic. These occult sciences were so much in accord with the temper of

the Middle Ages that they may be said to have swayed medical theory and practice until the revival of learning. Hence Chaucer, in enumerating the qualifications of his Doctor of Physic, puts in the forefront his knowledge of astronomy :

> "With us there was a Doctor of Physic ;
> In all this world ne was there none him like
> To speak of Physic and of surgery ;
> For he was grounded in astronomy.
> He kept his patient a full great deal
> In houres by his magic natural.
> Well could he fortunen the ascendent
> Of his images for his patient."

Englishmen had little knowledge of Greek or Roman medicine before the Norman Conquest. It is noticeable that in his catalogue of books in the library of York, about 800 A.D., Alcuin does not mention the name of a single medical writer.[1] The text-books known in England before the Norman period were those of Byzantine writers, who to some extent followed the Galenic tradition. After the Conquest the influence of the Arabian schools gradually spread over Western Europe and found its

[1] West, *Alcuin* (Heinemann), p. 34.

way to England. From this time until the sixteenth century medical theory and practice were based—in England as well as in Europe—upon the Arabic versions of Galen and Aristotle, and upon the medical treatises of Arabic physicians. Chaucer's list of text-books known to the doctor of physic includes both Greek and Arabic authors :—[1]

> "Well knew he the old Esculapius,
> And Dioscorides, and eke Rufus;
> Old Hippocras, Hali and Gallien;
> Serapion, Rasis and Avicen;
> Averrois, Damascene, and Constantin,
> Bernard and Gatisden and Gilbertin."

Of these Rhazes, Haly, Damascenus, Serapion, Avicenna and Averroes were Arabians who wrote in the ninth, tenth and eleventh centuries. Four were Greek writers of different periods, viz., Hippocrates (c. 430 B.C.), Dioscorides (a naturalist, c. 100 A.D.), Rufus of Ephesus (100 A.D.) and Galen (fl. 163 A.D.). These Greek writers would be known to Chaucer's age only through Latin translations of Arabic versions of the original Greek. Constantinus Afri-

[1] *Prologue*, 431-436.

canus, a native of Carthage, belonged to the medical school of Salerno, and is said to have been the first to translate Arabian writings into Latin (1050 A.D.). The last three in the list, Bernard Gordon, John Gaddesden, and Gilbert were Englishmen of European reputation who wrote at the end of the thirteenth and the beginning of the fourteenth century.

Upon the domain of physiology, however, no new light had been thrown since Galen wrote, and accordingly we find that at the University of Cambridge, in the fourteenth century, the medical students were obliged to attend two full courses of lectures on Galen's commentaries upon Hippocrates.[1] The revival of Greek learning in the fifteenth and sixteenth centuries re-introduced to Western Europe the original writings of Galen and of his great predecessor and master, Hippocrates. The latter flourished in the fifth century before Christ, and was the first among Greek thinkers to separate medicine from general philosophy.[2] He

[1] *Camb. Hist. Engl. Lit.*, vol. ii., c. 15 (1908), p. 364.

[2] Celsus, *Hist. Med.*, I. 3, i. 26 (quoted by Adams, *The Works of Hippocrates*, Intro.).

deprecated premature theories based upon limited observation, and urged the collection of definite facts observed in the treatment of disease. This scientific attitude was the secret of the influence of his writings when they became accessible at the Renaissance. Hitherto they had been known almost entirely through Galen's copious expositions; henceforth they could be studied side by side with Galen's commentaries. The new Galen was introduced to English students by the translations of Linacre, one of the famous group of Oxford men who brought the new learning from Italy to England. He learnt Greek in Florence, and after his return to Oxford translated six of Galen's treatises into Latin. He founded medical lectureships at Oxford and Cambridge, and was the chief founder and first president of the Royal College of Physicians. Galen's teaching was presented in an English form in 1533 by Sir Thomas Elyot in his *Castel of Helthe*. Among other medical writers in the vernacular during the sixteenth century was Thomas Vicary, who was Court physician to Henry VIII., Edward VI., Mary and Elizabeth. His work, entitled *Anatomie*

of the Bodie of Man,[1] was published in 1577 by his colleagues on the staff of St. Bartholomew's Hospital.

The study of Galen was not limited to medical men; his writings were the common feeding-ground of Renaissance scholarship. Melanchthon wrote a treatise, "On the Soul," in which he based the theory of mental processes upon the Galenic physiology. Cardan also wrote on medical topics as on every other branch of learning. But while scholars were interested, medical men were also stimulated to personal investigation. New light was thrown on the structure of the human body by the work of Vesalius, who is honoured as the founder of modern anatomy. He was followed in that century by anatomists of almost equal distinction, such as Servetus (burnt at Geneva as a heretic), Fallopius and Fabricius. Thus, while the Galenic doctrines in the main held their position of authority, yet they were being supplemented and corrected by original observation. On the other hand, the distinctively

[1] E.E.T.S.

Arabian teaching became gradually discredited.[1]

In discussing the appearance of physiological doctrines in English literature, it must be remembered that there was an additional source of information in classical literature. A scholar unacquainted with Galen might glean ideas upon anatomy and physiology from Aristotle or Plato, from Cicero or Celsus. Most writers who figure in English literature during the sixteenth and seventeenth centuries were university men with a knowledge of Greek and Latin classics. Consequently, many allusions to medical doctrine are to be traced, not to Galen, but to the literature of Athens and of Rome. For example, the association of laughter with the spleen occurs in the Roman satirist, Persius, but does not appear to be a Galenic doctrine. It was one of many ideas which were simply part of the literary tradition inherited from classical authors.

If we except poems and books written

[1] Yet Arabian writers are freely quoted in medical treatises of the sixteenth century ; *e.g.*, Bullein, *A Dialogue against the Fever Pestilence*, and Vicary, *Anatomie of the Bodie of Man* (E.E.T.S., 1888); *cf.* Burton, *Anat. Mel., passim.*

with a professed reference to physiology or medicine, such as Fletcher's *Purple Island* in the seventeenth century, and part of Blackmore's *Creation* in the eighteenth, most references to physiology in literature proper reflect only the general knowledge of educated people. In the case of Shakespeare, however, the number and the accuracy of his medical allusions warrant the belief that he had made acquaintance with medical writings at first hand. In fact, his knowledge of physiology and of different branches of medicine has so impressed his admirers that some have gone so far as to ascribe it to "divine inspiration," while saner critics (even Dr. Karl Elze[1]) have regarded it as in advance of his own age. The two questions which Dr. Elze treats in some detail in order to show that Shakespeare anticipated later discoveries, are the circulation of the blood and the treatment of insanity. In neither case is it difficult to disprove the contention. "In the first place," says Dr. Elze, "as is perfectly evident from numerous passages (more particularly in the second part of *Henry IV.*, iv. 3), Shakespeare must have

[1] *William Shakespeare* (Eng. Trans., 1888), pp. 399-404.

known the great physiological fact of the circulation of the blood, although he nowhere, in this connection, makes use of the expression *circulation* or *to circulate*. Whether or not he had a clear idea of the heart's function is another matter. . . . Of the different functions of the arteries and veins, Shakespeare does not seem to have had any knowledge; in fact, this and the heart's action were the actual points of Harvey's discovery."[1] This statement contains its own refutation. It is just because Shakespeare was ignorant of the heart's action, and of the passage of arterial blood through the capillaries to the veins and so back to the heart, that he cannot be said to have had any conception of the "circulation" of the blood in any strict sense of the term. What is known as the "lesser circulation" through the lungs was recognized before the time of Shakespeare,[2] but he does not manifest any knowledge of this. If "circulation" merely means the movement of the blood within the body, it must be remembered that this was

[1] *William Shakespeare* (Eng. Trans., 1888), pp. 399, 400.

[2] Sir M. Foster in *Camb. Mod. Hist.*, v. 726.

known even to Hippocrates two thousand years before. As regards the cure of insanity, although the subject does not properly fall within the scope of the present study, it may be remarked that Dr. Elze rests his case partly on Shakespeare's use of sleep and music as remedies, and states that charms and amulets and other "supernatural means" were the contemporary treatment of mental diseases.[1] This is not quite a fair description of medical thought in the sixteenth century. Reference to Burton's *Anatomy of Melancholy*[2] shows that while undoubtedly a large proportion of writers believed in such cures by "spells, cabalistical words, characters, images, amulets, etc.," yet a considerable number of authorities absolutely rejected them. Both sleep and music are mentioned by Burton as among the recognized means of easing melancholy, even in the extreme form of madness. Of music in particular, he says: "Censorinus *de natali*, cap. 12, reports how Asclepiades, the physician, helped many frantic persons by this means. Jason Pratensis, *cap. de Mania*, hath many examples, how Clinias and

[1] *Op. cit.*, pp. 402, 403.
[2] II. 1, i., ii., iii.; II. 2, vi. 3.

Empedocles cured some desperately melancholy, and some mad, by this our music." Medical science, therefore, was perfectly well aware of the value of music as a means of "helping madmen to their wits." How Shakespeare knew this is another question, but it cannot be maintained that in this particular case he was "a couple of centuries in advance of his day."

Dr. Elze also quotes with approval a statement that "Shakespeare was in advance of both schools" (the Solidists and the Humoralists or Galenists), "and had more especially recognized the great physiological fact that most medicines as well as poisons took effect in the first place by finding their way into the blood." But when we find Lyly, in *Euphues*,[1] saying, "one droppe of poyson disperseth it selfe into everye vaine," how can we claim any originality for Shakespeare? Still more wide of the mark is Dr. Elze's statement: "Shakespeare could not possibly have owed his knowledge of physiological and psychological phenomena to his contemporaries, for there were as yet no scientific

[1] *Ed. Bond* (1902), vol. i. p. 218. *Cf.* Chapman's *Iliad*, ix. 405: "turned like poison in my veins."

works on these subjects." The reader of Burton's *Anatomy of Melancholy* is bewildered by the lists of authors of the sixteenth century on the body and mind in health and disease. He speaks of translations "which some of our industrious countrymen have done in our mother tongue,"[1] and he mentions as written in English[2] the works of Cogan, Eliot, Vauhan, T. Bright and Wright, the Jesuit. To these we may add the works of Vicary and Bullein already mentioned, Batman upon Bartholomè, Paynell's translation of the *Regimen Sanitatis Salerni* (1575), Vigo's *Workes of Chirurgerie* (1543), and Halle's *Worke of Anatomie* (1565).

An examination of Elizabethan literature from our present standpoint makes it seem probable that a knowledge of the main features of Galenic physiology was possessed by most educated people. The frequency of allusions in the dramatists might warrant our going even further and asserting that it was possessed also by the theatre-going population of London. When Chapman translated the *Iliad* he adapted his author to his readers

[1] I. 1, ii., 1. [2] I. 2, ii., 1 and note.

by interpolating many physiological ideas which were not in the original. Where Homer says[1] simply "I care not for thy wrath," Chapman writes, "I weigh not thy displeased spleen." In translating the phrase παραὶ λαπάρην[2] ("along the flank," *i.e.* between ribs and hips), which occurs in several passages, Chapman varies his interpretation; in one place he says "in that low region where the guts in three small parts begin"; and in another, "his manly stomach's mouth." Instead of the base of the skull[3] he says, "the fountain of his nerves," and in a description of the effect of fear, where the Greek is "nor is my heart steadfast,"[4] he says, "my heart, the fount of heat, with his extreme affects made cold." These and many other instances that might be cited afford strong evidence that the many medical allusions in Shakespeare and other Elizabethan dramatists were no particular sign of learning, but that an acquaintance (no doubt superficial) with Galenic physiology was part of the general knowledge of the day.

Popular fancy was attracted not so much

[1] *Il.*, viii. 477.
[2] *Ibid.* iii. 359; vii. 25.
[3] *Ibid.* v. 73.
[4] *Ibid.* x. 94.

by the strictly physiological functions as by the pseudo-psychology which connected the bodily organs with the emotions of the soul. Endless opportunities of word-playing were afforded, for example, by the two meanings of the word "stomach," namely, appetite and courage.

In *King Henry V.* (III. vii. 163-166) the French thus jest about English courage:

> "*Orl.* Ay, but these English are shrewdly out of beef.
> *Con.* Then shall we find to-morrow that they have only stomachs to eat and none to fight."

And even after the original work of the new anatomists of the sixteenth century, crowned as it was by Harvey's discovery of the circulation of the blood, many ideas that were not obviously disproved by advancing science were retained for literary purposes. Thus, while the older idea of the formation of blood in the liver disappears from later seventeenth century literature, yet the tragedy of the Restoration clings to many ideas concerning the blood which have since become equally obsolete. And one branch of Galenic teaching, the

doctrine of animal spirits, even received a new impulse during the seventeenth century. Priestley,[1] writing in 1782, says that it was Malebranche who brought the doctrine of animal spirits into vogue. But Malebranche without doubt built upon the theories of Descartes, who in his *De L'Homme* (1662) explained all operations of the mind and soul by the condition and the movement of animal spirits. This theory, too, died out during the early part of the eighteenth century, and physiology ceased to afford any appreciable literary capital.

[1] *Disquisition on Matter and Spirit* (2nd edn., 1782), i. 259.

CHAPTER II

THE ELEMENTS

In order to understand the medical ideas accepted throughout the Middle Ages, the modern reader must divest himself even of the superficial knowledge of physiology now possessed by the unlearned. The circulation of the blood, the structure and functions of the various organs of the body, the passage of the nutritive fluids from the alimentary canal into the blood-vessels, the use of the air in breathing—these were either unknown or entirely misconceived. We must therefore approach the old physiology not from the side of modern science, but from that of the older theories on which it was based. It was not a mere tentative system hesitatingly embraced for want of fuller knowledge; it was regarded as a complete and final body of doctrine, as authoritative in medicine as the Holy Scriptures were in divinity.

Chaucer[1] has given us a description of the Doctor of Physic, enumerating the chief of his qualifications. The first is a knowledge of astronomy, or, as we now call it, astrology, with especial reference to the influence of the celestial bodies upon the physical constitution of man. Though this does not fall within the scope of the present inquiry, it may not be irrelevant, in passing, to mention that certain parts of the body were supposed to be especially affected by the signs of the Zodiac. Chaucer mentions some of these in the *Astrolabe*:[2] "And everich of those twelve signes hath respecte to a certein parcelle of the body of a man, and hath it in governance; as Aries hath thyn heved (head), and Taurus thy nekke and thy throte, Gemini thyn armholes and thyn armes, and so forth." We may complete the list from Stubbs' *Anatomy of Abuses* (1583): "Leo, the hart and back; Cancer, breast, stomake and lungs; Libra, raines (kidneys) and loines; Virgo, guts and bellie; Scorpio, privie parts and bladder; Sagittarius, the thighes; Capricornus, the

[1] *Prologue*, 413-436. [2] I. 2, 21.

knees; Aquarius, the legs; Pisces, the feet."[1] Thus in *Twelfth Night* Sir Toby and Sir Andrew are equally out in their astrology :—

"*Sir And.* Shall we set about some revels?
Sir To. What shall we do else? Were we not born under Taurus?
Sir And. Taurus! That's sides and heart.
Sir To. No, sir; it is legs and thighs. Let me see thee caper."[2]

In addition to astrology, Chaucer's doctor knew the causes of diseases :—

"He knew the cause of every malady,
Were it of cold or hot or moist or dry,
And where engendered and of what humour,
He was a very perfect practisour."

This passage brings us face to face with theories dating back to the beginnings of Greek Philosophy. Greek medicine in its earliest stages was of course partly empirical, but on its theoretical side it was an offshoot from the general philosophy of nature.

[1] *See* also W. Lilly, *Introduction to Astrology*, ed. Zadkiel, 1852.

[2] I. iii. 144-150. *See* Dryden, *Hind and Panther*, ed. W. H. Williams, for other examples, and add Marston, *Works* (ed. Bullen), iii. 428.

The constitution of the human body was part of the larger question of the ultimate constitution of matter. Thus the conclusions of philosophers with regard to the first principles of the material world applied equally to the matter of which the human body was composed. On the other hand the comparison of the world to a living creature was a favourite idea in early speculation.[1]

The problem that presented itself was to find some principle of unity in the multiplicity of phenomena, and so to account for the development of the universe as we know it. There must be, it was thought, some one form of matter from which all others were evolved. The first theories were that this primal element (ἀρχή) was water or air. A later doctrine (of the fifth century B.C.) ascribed the origin of all things to fire. The first to postulate four elements was Empedocles (*fl.* 470 B.C.), who specified air, earth, fire and water. To these Plato[2] gave the name στοιχεῖα, which Latin writers afterwards translated *elementa*

[1] Zeller, *Pre-Socr. Phil.* (Eng. Tr. 1865); *cf.* Seneca, *N.Q.*, iii. *xv.* 1-7.

[2] Zeller, iii. 126.

The names of these elements were used in a wider sense than their ordinary use would suggest. Thus "earth" included everything solid, water everything liquid, air any vapour, fire any kind or amount of heat. Aristotle[1] added a fifth element (represented by our word "quintessence," of late Latin origin), of which the stars and the souls of individuals were composed.

Literature is full of allusions to the four elements. In Milton's description of Chaos they were mentioned as not actually existent, but potentially contained in primordial matter[2]:—

> ". . . this wild abyss,
> The womb of Nature and perhaps her grave,
> Of neither *sea*, nor *shore*, nor *air*, nor *fire*.
> But all these in their pregnant causes mixt
> Confus'dly, and which thus must ever fight
> Unless the Almighty Maker them ordain
> His dark materials to create more worlds."

And when Uriel gives Satan an account of the Creation,[3] he thus describes the forma-

[1] *De Mundo*, c. 2, p. 465, *C*; *Cic. Acad.*, i. 6, 7.
[2] *P.L.*, ii. 910-916.
[3] *P.L.*, iii. 710-719. *Cf.* Earl of Surrey, *Psalm* viii., and in Latin Poetry, *Verg. Ecl.* vi., 31-33, *Manil.* i. 120-148.

tion of the four elements and the "quintessence" :—

"Confusion heard his voice, and wild uproar
Stood rul'd; stood vast Infinitude confin'd;
Till at his second bidding darkness fled,
Light shon, and order from disorder sprung;
Swift to their several quarters hasted then
The cumbrous elements, *earth*, *flood*, *air*, *fire*;
And this ethereal *quintessence* of heav'n
Flew upward, spirited with various forms,
That roll'd orbicular, and turn'd to stars
Numberless, as thou seest, and how they move."

In this passage the four elements are characterized as "cumbrous" in contrast with the "ethereal quintessence."

Massinger's *Fatal Dowry* (III. i.) has a somewhat bombastic reference to the elements :

"Had I just cause
Thou know'st I durst pursue such injury
Through fire, air, water, earth, nay, were they all
Shuffled again to chaos; but there's none."

The quintessence as composing the soul is alluded to by Milton in the *Areopagitica* when he pleads against the killing of a good book : "If it extend to the whole impression, a kind of massacre (may be thus committed) whereof the execution ends not in the slaying of an elemental life, but strikes at that

ethereal and fifth essense, the breath of reason itself, slays an immortality rather than a life."

Another ancient idea, which dates from the dawn of Greek Philosophy, and which was a commonplace of Greek and Latin poets, was that the elements supplied nourishment to one another, and that the heavenly bodies fed upon sea and air. Milton makes the angel Raphael expound the doctrine to Adam and Eve (*P.L.*, v. 414-426) :—

"For know, whatever was created needs
To be sustained and fed ; of elements
The grosser feeds the purer, earth the sea,
Earth and the sea feed air, the air those fires
Ethereal, and as lowest first the moon ;
Whence in her visage round those spots, unpurged
Vapours not yet into her substance turn'd.
Nor doth the moon no nourishment exhale
From her moist continent to higher orbs.
The sun that light imparts to all, receives
From all his alimental recompense
In humid exhalations, and at even
Sups with the ocean."

The same idea underlies a passage in

Shakespeare's *Timon of Athens* (IV. iii. 438-445) :—[1]

"I'll example you with thievery :
The sun's a thief, and with his great attraction
Robs the vast sea : the moon's an arrant thief,
And her pale fire she snatches from the sun :
The sea's a thief, whose liquid surge resolves
The moon into salt tears : the earth's a thief,
That feeds and breeds by a composture stolen
From general excrement : each thing's a thief."

The human body, as a form of matter, was said to be composed of the four elements. Plato[2] in his account of the creation of man makes the Demiurgus assign the immortal souls to the created gods to be combined with particles derived from the four elements ; and he describes[3] flesh as "a kind of ferment made with fire and water and earth, containing an acid and saline admixture." He seems to have owed this theory to Hippocrates.[4] Cicero thus states[5] the doctrine :—"If anyone should ask the source from which we have moisture and heat which is diffused throughout the body,

[1] For Greek and Latin parallels see *Mayor on Cic. N.D.*, ii., § 40.
[2] *Timaeus*, 42. [3] *Ibid.*, 72 D.
[4] Galen, *Hipp. et Plat.*, vol. v. p. 665 K.
[5] *N.D.*, ii. 18.

and even the earthy firmness of the flesh, and lastly the air we breathe, it is clear that we have taken one from the earth, another from liquid, another from fire, and another from the air which we inhale by breathing."

This theory is the subject of frequent allusion in English literature. Sir Toby in *Twelfth Night*[1] asks in his airy way: "Does not our life consist of the four elements?" The Dauphin in *Henry V.*[2] in his extravagant eulogy of his horse describes him as if he were human: "he is pure air and fire, and the dull elements of earth and water never appear in him, but only in patient stillness while his rider mounts him." With this we may compare Cleopatra's description of herself just before applying the asp:—[3]

> "I am fire and air: my other elements
> I give to baser life."

Similarly Drayton, paying a tribute to Marlowe, says[4] that "his raptures were all air and fire."

Thus lofty aspiration and soaring imagina-

[1] II. iii. 10.
[2] III. vii. 23.
[3] *Ant. and Cl.*, V. ii. 292.
[4] *Of Poets and Poesie*, 107.

tion were held to be due to the lighter and swifter elements. Shakespeare, in the Sonnets (xliv., xlv.), presents the same idea; after mentioning earth and water he continues :—

"The other two, slight air and purging fire,
Are both with thee, wherever I abide;
The first my thought, the other my desire,
These present absent with swift motion slide.
For when these quicker elements are gone
In tender embassy of love to thee,
My life, being made of four, with two alone
Sinks down to death, oppress'd with melancholy."[1]

A perfect man was one in whom the elements were mixed in due proportion, as we may see in Antony's noble tribute to Brutus in *Julius Caesar* (V. v. 73-75) :—

"His life was gentle, and the elements
So mix'd in him that Nature might stand up
And say to all the world, 'This was a man!'"

Here Nature is regarded as the conscious Creator of a man out of the elements, and as one who has reason to be proud of her work. A very similar passage occurs in

[1] *Cf.* Spenser, Sonnet 55; Benj. Hoadly, *The Suspicious Husband*, Act II. :—"These (viz., air and fire) are the only elements in love's world."

Drayton's *Barons' Wars*[1] in a description of Mortimer :—

"In whom so mix'd the elements all lay,
That none to one could sov'reignty impute,
As all did govern, yet all did obey :
He of a temper (mixture) was so absolute
(perfect)
As that it seemed, when Nature him began,
She meant to show all that might be in man."

Another striking parallel is afforded by Ben Jonson's description of "the true critic" in *Cynthia's Revels* :—"A creature of a most perfect and divine temper, one in whom the humours and elements are peaceably met without emulation of precedency. He is neither too fantastically melancholy, too slowly phlegmatic, too lightly sanguine, nor too rashly choleric ; but is all so composed and ordered as it is clear Nature went about some full work, she did more than make a man when she made him." These three passages are so remarkably alike that they cannot have been composed independently. Judging from internal evidence (as the chronological evidence is uncertain) we should probably conclude that the original passage was that of

[1] III. 40 ; *cf.* I. 21.

Drayton, upon which Shakespeare improved and which Jonson endeavoured to surpass.

The elements were represented as in mutual conflict in man as well as in Nature. Marlowe[1] thus introduces the idea in tragedy :—

"Nature, that framed us of four elements
Warring within our breasts for regiment,
Doth teach us all to have aspiring minds."

With this we may compare a passage in Middleton :—[2]

"That Providence that hath made every poison
Good for some use, and sets four warring elements
At peace in man, can make a harmony
In things that are most strange to human reason."

The same idea is used by Pope[3] to illustrate the passions :—

"Passions, like elements, tho' born to fight,
Yet, mix'd and soften'd, in his work unite ;
These 'tis enough to temper and employ ;
But what composes Man, can Man destroy ?"

The dissolution of the body at death

[1] *Tamburlaine*, Part I. Act ii. Sc. 7.

[2] *Women beware Women*, I. ii.

[3] *Essay on Man*, II. 111-114. *Cf.* also Oldham, *Upon the Works of Ben Jonson*, st. 4.

dispersed the elements of which it was composed, and these rejoined the kindred constituents of Nature. This is the meaning of Antony's serio-comic description of the crocodile in *Antony and Cleopatra* (II. vii. 50): "it lives by that which nourishes it; and the elements once out of it, it transmigrates." Webster[1] explicitly states the same thought when someone threatened with death exclaims :—

> "Whether I resolve to fire, earth, water, air,
> Or all the elements by scruples, I know not,
> Nor greatly care."

So also Marvell[2] in describing the death of Cromwell :—

> "Such tortures all the elements unfixed,
> Troubled to part where so exactly mixed."

It was recognised by the earliest (the Ionic) school of Greek philosophers that the four elements were not stable and mutually exclusive substances. A liquid under the influence of heat became aerial, and on the application of cold (for heat and cold were thought to be distinct) became solid; that is to say, water was transformed at one time

[1] *White Devil*, V. vi.
[2] *On the Death of the Lord Protector*, 129-132.

to air, at another time to earth. The transmutability of the elements became a commonplace[1] of philosophy and poetry. The theory has been expounded at length by Prior[2] in English verse :—

"Of those materials which have been confessed
The pristine springs and parents of the rest,
Each becomes other. Water stopped gives birth
To grass and plants, and thickens in the earth ;
Diffused, it rises in a higher sphere,
Dilates its drops and softens into air.
Those finer parts of air again aspire,
Move into warmth and brighten into fire ;
That fire once more by thicker air o'ercome,
And downward forced, in earth's capricious womb
Alters its particles, is fire no more,
But lies resplendent dust and shining ore,
Or running through the mighty mother's veins,
Changes its shape, puts off its old remains ;
With watery parts its lessened force divides,
Flows into waves, and rises into tides."

The transmutability of the elements formed one objection to their being regarded as the original forms of matter. Another objection was that they were not severally pure and unmixed. Pythagoras was credited by a

[1] *Arist. De Gen. et. Corr. II.*, iv. p. 402 c ; *de Cælo III.*, vii. p. 375 ; *Cic. N.D.*, ii. 84, 100.

[2] *Solomon on the Vanity of the World*, i. 353-368. *Cf.* Dryden, *Translation of Ovid, Metamorph.*, bk. xv.

biographer of a subsequent age with the statement that none of the elements were pure, since earth contains fire, and fire air, and water air, and so on. Hence philosophers looked for principles which were earlier than these and from which these were themselves derived.

Side by side with the development of the doctrine of elements there was a gradual recognition of certain characteristics of matter. The hot and the cold, the dense and the rare, the moist and the dry, and other antitheses afforded a kind of classification of forms of matter. These oppositions were called ἐναντιότητες, oppositions, contrarieties, by Anaximander, who made most use in his cosmology of the opposition of the warm and the cold. Plato and Aristotle selected the hot and the cold, the moist and the dry, as the primordial opposites which by combination in pairs produced the four elements, earth, air, fire and water. Thus earth was cold and dry, water cold and moist, air hot and moist, fire hot and dry. These opposites, sometimes referred to as the "elementary contraries" or the "elementary qualities" were not as yet conceived as

abstract. Thus it was not the qualities of heat and dryness that combined to produce fire, but rather the hot and the dry varieties of unorganized matter. Further, when the abstract qualities of heat and cold, moisture and dryness were conceived apart from the substances possessing them, they were thought to be four distinct properties, cold for example being not merely the absence of heat, but a separate and contrary quality. We find this as late as Bacon's *Novum Organum*.[1] Hence arose a theory of the origin of the world which may be stated as follows:—There existed originally a substance which was conceived as a kind of formless, indeterminate matter, not yet developed into the forms of material existence known to us, but containing in itself the potentiality of such determinate forms. From this first matter were separated the elementary contraries, hot, cold, moist and dry, which by combination produced the four elements.[2] Hence, in poetical accounts of the creation, the elementary contraries

[1] II. 12 (ed. Fowler, pp. 368, 374), 20 (p. 400), 47 (p. 532).

[2] Mayor, *Sketch of Ancient Philosophy*, 1885, p. 3; *Mayor on Cic. N.D.*, ii. 26.

played an important part.[1] In English poetry we have Dryden's cosmogony in the *Song for St. Cecilia's Day*, 1687 :—

"From harmony, from heavenly harmony
This universal frame began ;
When nature underneath a heap
Of jarring atoms lay,
And could not heave her head,
The tuneful voice was heard on high,
Arise, ye more than dead!
Then cold and hot and moist and dry
In order to their stations leap
And Music's power obey."

Milton also adopts these conceptions in his wonderful description of Chaos :—[2]

"Where eldest Night
And Chaos, ancestors of Nature, hold
Eternal Anarchy, amidst the noise
Of endless wars, and by confusion stand.
For hot, cold, moist and dry, four champions fierce,
Strive here for mast'ry, and to battle bring
Their embryon atoms."

In Andrew Marvell's poem, *On the Victory obtained by Admiral Blake* (ll. 34-38), we have a description of the four contraries

[1] Ovid, *Metam.*, i. 19, 20 ; *Manil.*, i. 141.
[2] *P. L.*, ii. 894-900.

combining in harmony to produce the perfect climate of the Canary Islands :—

"The jarring elements no discord know,
Fuel and *rain* together kindly grow;
And *coolness* there with *heat* does never fight,—
This only rules by day, and that by night."

In this passage "fuel" represents the dry, and "rain" the moist.

Beaumont and Fletcher use the idea to adorn the drunkard's rhapsody in *The Coxcomb*, where Ricardo grows enthusiastic over his Gargantuan thirst :—

"We will not give unto the poor a drop
Of all this drink : but, when we see them weep,
We'll run to them, and drink their tears off too :
We'll never leave while there is *heat* or *moisture*
In this large globe, but suck it *cold* and *dry*,
Till we have made it elemental earth,
Merely by drinking."

As constituents of the elements, these elementary contraries combined in the formation of the human body. This was the foundation of the celebrated doctrine of humours, which Galen[1] attributes to Hippocrates. We shall consider this in detail

[1] *Hipp. et Plat.*, p. 688 K. ; *De Elem. Secundum Hipp.*, ii. c. 1.

in a later chapter, but here it is necessary to say that the four humours of the body (like the four elements) were composed of the contraries taken two at a time. Thus blood (like air) was hot and moist, phlegm (like water) was cold and moist, yellow bile (like fire) was hot and dry, and black bile (like earth) was cold and dry. The same parallelism was extended to the seasons of the year and to the ages of man : thus Galen says : "Blood, air and spring are hot and moist, though others[1] differ as regards the air. Yellow bile, summer and fire are hot and dry. Melancholy humour, earth and autumn are dry and cold. Phlegm, water and winter are cold and moist. . . . In youth there is an abundance of blood, in early manhood of yellow bile, in middle or declining age, of black bile, in old age of phlegm. Youth is hot and moist ; early manhood, hot and dry ; middle age, cold and dry ; old age, cold and moist."[2]

The bodily constitution was thought to vary according to the proportion in which

[1] He refers to the Stoics, who assigned to air the quality of cold. See *Mayor on Cic. N. D.*, ii. 26.

[2] *De Humoribus*, c. i. ; *Def. Med.*, civ. ; *Hipp. et Plat.*, viii. c. 6.

these qualities were mixed, and the particular constitution was accordingly called the mixture (κρᾶσις) or (in words adopted by us from Latin equivalents of the Greek word) "complexion," "temperament." This is sufficient to explain two passages in Gower's *Confessio Amantis*. In the first (Prologue, ll. 974-978) he illustrates a statement that division is the greatest cause of corruption and decay in the world by reference to the body: death is the natural result of the diversity of its constituent parts.

"It may first proeve upon a man;
The which for his complexioun
Is mad upon divisioun
Of cold, of hot, of moist, of drye,
He mot by verray kynde (nature) dye."

In the second (bk. vii. 441 *sqq.*) he is describing the physiology of the human body:—

"After the kinde of thelement
Thus stant (stands) a mannes kinde went
(natural bent)
As touchend his complexioun
Upon sondry divisioun
Of dry, of moist, of chele, of hete,
And eche of hem his owne sete
Appropred hath within a man."

Milton[1] describes old age as cold and dry (not cold and moist, as says Galen). The archangel Michael informs Adam of the change that must befal his natural powers if he lives to a ripe old age :

> "And for the air of youth
> Hopeful and cheerful, in thy blood will reign
> A melancholy damp of cold and dry
> To weigh thy spirits down."

If we remember that air, youth and blood were all thought to be hot and moist, while melancholy (black bile) and old age were (in Milton's view) cold and dry, we see that this passage is full of physiological significance. Milton's description of old age as cold and dry is supported by Burton,[2] who says : "The first of these (secondary causes of melancholy) which is natural to all, and which no man living can avoid, is old age, which being cold and dry, and of the same quality as melancholy is, must needs cause it, by diminution of spirits and substance, and increasing of adust humours."

Another reference to the contraries as at

[1] *P.L.*, xi. 542-545.

[2] *Anat. Mel.*, I. 2, i. 5 (quoted by R. C. Browne on the passage in Milton ; though he states wrongly that Burton calls old age "the first cause of melancholy").

strife in the body is found in Prior's *Alma : or the Progress of the Mind* (ii. 1228-9), when he is speaking of the brain :—

> "Where hot and cold, and dry and wet
> Strive each the other's place to get."

The elements (earth, air, etc.) were regarded as the causes of health and disease,[1] but this was by virtue of the contrary qualities of which they were composed. Even before the time of Hippocrates it had become the recognized hypothesis among medical men that disease was due to the excess or defect of the elementary contraries, hot, cold, moist and dry. Hippocrates, who takes a wider view, thus opens his treatise, *On Ancient Medicine* :[2] "Whoever having undertaken to speak or write on medicine have first laid down for themselves some hypothesis to their argument, such as hot or cold, or moist or dry, or whatever else they choose (thus reducing their subject within a narrow compass and supposing only one or two original causes of disease or of death among mankind) are clearly mistaken in much that

[1] Galen, v. 449 *sq.*, 666 *sq.* ; xvii. A., 97 K. *Cf. Cic. Tusc.*, iv. 13, § 30.

[2] Adams, *The Works of Hippocrates* (1849).

they say." He here condemns the current method of theorizing upon an assumed hypothesis, which could not possibly be exhaustive, and afterwards advocates the method of actual observation. Galen gives alternative definitions of disease: "A distemperature of the humours which are within us; or a distemperature of the original condition, in which dry or cold or hot or moist predominates."[1] These descriptions are practically identical, because the humours were thought to affect health by virtue of the qualities (hot, dry, etc.) which they possessed. In spite of the protest of Hippocrates the theory remained predominant and we see it in Chaucer's description of the Doctor of Phisik:—

"He knew the cause of everich maladie,
Were it of hoot or cold or moyste or drye."

Ben Jonson makes Volpone, posing as a quack, thus refer to the causes of disease:—

"*Volp.* No, no, 'tis this blessed unguento, this rare extraction, that hath only power to disperse all malignant humours, that proceed either of *hot*, *cold*, *moist* or windy causes. . . .
Per. I would he had put in *dry* too."[2]

[1] *Def. Med.*, cxxxiii.
[2] *Volpone*, II. i.; *cf.* Marston, *The Mountebank's Masque* (Works, ed. Bullen, iii. p. 421).

Molière[1] ridicules the application of this theory by physicians of his own day, when he makes a doctor examine de Pourceaugnac as follows :—

"1*st Doctor.* Do you eat well, sir ?
Pourc. Yes, and drink still better.
1*st Doctor.* So much the worse ! This great craving for cold and moist is an indication of heat and dryness within."

Many passages might be quoted from Burton's *Anatomy of Melancholy* to show the application of these ideas to the study of pathology. He states,[2] for instance, that most writers believe that in melancholy the part affected is the brain, "in a cold, dry distemperature of it in his substance, which is corrupt and become too cold or too dry, or else too hot, as in madmen or such as are inclined to it."

Lastly we may see the elements mentioned as the causes of the four humours in *Microcosmus*, a masque produced by Thomas Nabbes in 1637. The four humours enter and are asked to give an account of themselves. They say they are sent by their parents, the four elements, and they suc-

[1] *Mons. de Pourceaugnac*, I. xi. [2] *I.* 1, iii. 2.

cessively state their parentage. Choler says, "I was begot by fire"; Blood, "Air is my father"; Phlegm, "Water was my mother"; and Melancholy, "I was begotten on the earth after a great drought in the time of barrenness." The last obviously refers to the theory that melancholy was cold and dry.

The term "elements" was applied by ancient medical writers to the elementary contraries and to the humours as well as to earth, air, fire and water. Galen, in his *Medical Definitions* (xxxi.), says:— "The elements of medicine, as some of the ancients thought, are hot and cold, moist and dry." And again (xxxiii.): "Of what are our passive bodies composed? Of four things: blood, phlegm, bile and melancholy humour, which some call also passive elements. Or (putting the question in another way) of what things do our material bodies consist? Of the four elements—fire, air, earth and water." And in one of his commentaries on the works ascribed to Hippocrates he writes: "Hippocrates, having shoen hot, cold, dry and moist to be the

elements (στοιχεῖα) common to all existing things, next passes to a different class of elements, no longer primary or common, but peculiar to red-blooded animals, for blood, phlegm and yellow and black bile are the elements of the composition of all red-blooded animals, not of man alone."[1] We see then that the term "elements" was used by ancient writers in three different senses. The popular use from that day to the present has always had reference to earth, air, fire and water, but we find the term occasionally used in literature for the elementary contraries, and even for the humours. In Marvell's description of the Canary Islands (quoted above) the elementary contraries are spoken of as the elements. Ben Jonson, in *The Alchemist*,[2] writes :—

> "Shifting, sir, your elements,
> Dry into cold, cold into moist, moist into hot,
> Hot into dry."

And as regards the humours, we find Shakespeare[3] referring to the "melancholy

[1] *De Elem. Secundum Hipp.*, II. i. *Cf.* also *Def. Med.*, lxv.

[2] Act ii.

[3] *Much Ado*, II. i. 357.

element" as one of the constituents of the body.

Modern physiology has travelled far from the original standpoint, and the student of to-day sees no connection between the "elements" and the phenomena of disease. But the old physiology cannot be understood without knowledge of the theories upon which it was based. This is stated explicitly in a medical dialogue of the sixteenth century,[1] in which a physician, after speaking of the four elements and of the influence of the stars upon men's bodies, is met by the inquiry, "What doe the knowledge of these things profite to Physicke?" He replies: "Most chiefly, for whereas the Philosopher doth leave, there the Phisition doth begin; that is, he must be first a good natural philosopher, he must have the knowledge of tymes and seasons, and be acquainted with complexions of men, observing the nature of thynges, and the climates under heaven, with the course of the Sunne, Moone and Starres, ayre and diet, etc."

[1] Bullein, *A Dialogue against the Fever Pestilence.* (E. E. T. S.), p. 31.

CHAPTER III

PARTS OF THE BODY

FROM the time of Hippocrates down to the sixteenth century the various parts of the body were gradually classified into a complete system. The first division, into parts contained and parts containing, is attributed to Hippocrates.[1] Parts contained were humours and spirits, of which we shall speak in detail in later chapters. The parts containing were divided by Aristotle into similar and dissimilar, a division corresponding to the modern distinction between tissues and organs. Similar parts included flesh, bones, nerves, veins, skin, fat, etc. The dissimilar parts were first distinguished into inward and outward, the latter comprising the distinctive features of the body viewed from outside.

The inward parts were subdivided into

[1] Galen (ed. Kühn), vii. 278, 597 ; xiv. 697.

noble and ignoble. The noble inward organs were three, each with subordinate organs in dependence upon it, viz., the brain, the heart with the lungs, and the liver with the digestive organs. The above classification is from Burton's *Anatomy of Melancholy*,[1] and represents the most widely-accepted scheme, though he expressly says that many other divisions had been proposed.

The seat of the soul was the subject of much controversy between Greek philosophers.[2] As the body was composed of the four elements, it was thought that the soul formed a conception of each element in nature by means of the corresponding element in the body. Hence, as the part of the body where the elements were most completely mingled was the blood, Empedocles (*cir.* 470 B.C.) and others believed that thought or consciousness had its chief seat in the blood, especially in that of the heart.[3] Democritus (*cir.* 430 B.C.) thought that the various faculties of the soul resided chiefly in particular organs of the body: thought

[1] Pt. 1, sec. 1, memb. 2.

[2] *See* Cic., *Tusc. Disp.* i. 18-22; Montaigne, ii. 12.

[3] Zeller, *Pre-Socratic Philosophy* (Eng. Trans.), 1881, vol. ii. p. 167.

in the brain, anger in the heart, desire in the liver.[1] Plato (428-347 B.C.) affirmed the existence of a triple soul with three distinct faculties, each having its seat in one of the three chief organs, the vegetal faculty in the liver, the sensible in the brain, the rational in the heart.[2] Aristotle (385-322 B.C.) "acknowledged only one soul lodged in the heart, but with distinct co-existent powers."[3] The Stoics in the following century followed Aristotle in assigning the heart as the seat of the ruling principle (*τὸ ἡγεμονικόν*, principatus), giving as one of the reasons that the voice (which they regarded as one of the seven faculties of the soul) came from the heart.[4] Galen discusses these various opinions, and asserts that the brain is the seat of the rational faculty which is the ruling principle.[5] Against the Stoics he urges that the ruling principle must be in the organ whence the nerves take their rise, that is (not the

[1] Zeller, *Pre-Socratic Philosophy* (Eng. Trans.), 1881, vol. iii. 258.

[2] *Timaeus*, 44d; Cic., *Tusc. Disp.*, i. 20.

[3] Grote, *Plato* (1865), iii. 277.

[4] *Mayor on Cic. N.D.*, ii. 149.

[5] Galen, *Hipp. et Plat.*, v. 521; vi. 73 K.

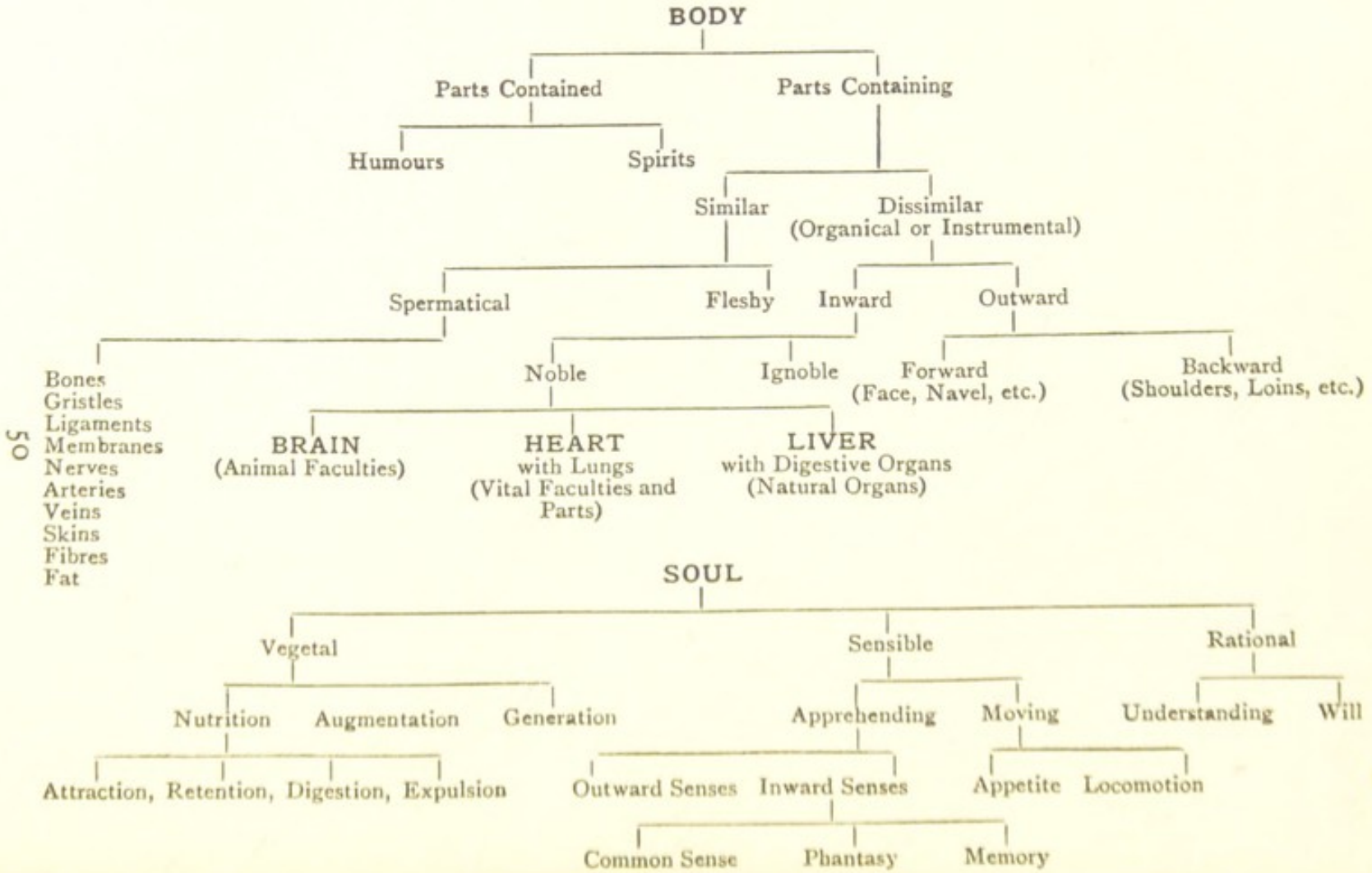
heart, as Aristotle[1] said), but the brain.[2] With this exception he accepts the triple division of Plato, assigning the vegetal soul to the liver, the irascible or spirited to the heart, the rational to the brain.

Various theories about the seat of the soul are alluded to by Davies in the Introduction to his poem on *The Soul of Man* (1599) :—

"In judgment of her substance thus they vary ;
And thus they vary in judgment of her seat ;
For some her chair up to the brain do carry,
Some thrust it down into the stomach's heat.
Some place it in the root of life, the heart ;
Some in the liver, fountain of the veins."[3]

Burton's classification of the parts of body and soul may be represented in tabular form as shown on the following page.

[1] H. A., iii. 5, p. 515.
[2] *Hipp. et Plat.*, v. 655 K.
[3] *Cf.* Oldham, *A Dithyrambic*, st. 2 ; Milton, *S.A.*, 166.


BODY
Parts Contained
Parts Containing
Humours
Spirits
Similar
Dissimilar
(Organical or Instrumental)
Spermatical
Fleshy
Inward
Outward
Bones
Gristles
Ligaments
Membranes
Nerves
Arteries
Veins
Skins
Fibres
Fat
Noble
Ignoble
Forward
(Face, Navel, etc.)
Backward
(Shoulders, Loins, etc.)
BRAIN
(Animal Faculties)
HEART
with Lungs
(Vital Faculties and Parts)
LIVER
with Digestive Organs
(Natural Organs)
SOUL
Vegetal
Sensible
Rational
Nutrition
Augmentation
Generation
Apprehending
Moving
Understanding
Will
Attraction, Retention, Digestion, Expulsion
Outward Senses
Inward Senses
Appetite
Locomotion
Common Sense
Phantasy
Memory

The three principal organs of the body were the brain, the heart and the liver.[1] Each of these was regarded as the seat of one of the faculties of the soul; each was the centre from which the various parts of the body were supplied with something essential to life or nourishment or sensation. This explains a passage in *Cymbeline* (V. v. 14). The King of Britain, having been rescued after capture in battle by three men, addresses them gratefully as "the liver, heart and brain of Britain, by whom I grant she lives!" And in *Twelfth Night* (I. i. 37) these three organs are mentioned as together governing the whole nature of a human being. The Duke, having been denied an interview by Olivia on the ground of her grief at her brother's supposed death, speaks admiringly of her affectionate nature which shows such grief for a mere brother, and adds :—

"How will she love when the rich golden shaft
Hath killed the flock of all affections else
That live in her; when liver, brain and heart,
Those sovereign thrones, are all supplied, and
fill'd
Her sweet perfections with one self king!"

[1] Galen, *Hipp. et Plat.*, vi. 1 (vol. v. p. 506 K).

As the seat of the rational soul, the brain was sometimes spoken of as a king ruling the other faculties. Plato[1] speaks of the head as the acropolis of the body, in which the sovereign reason has its seat. And so Shakespeare[2] speaks of "the kingly-crowned head, the counsellor heart!" On the other hand, the supremacy of the heart (according to Aristotle and the Stoics) is accepted by other writers. Gower says:—

> "For as a King in his empire
> Above all other is lorde and sire,
> So is the Herte principall
> To whom Reason in speciall
> Is yove (given) as for the governaunce."

So also Vicary in the sixteenth century in a medical treatise[3] says of the heart:—"He is set in the middest of the brest severally by him selfe, as Lord and King of al members." Burton affirms that in the chest "the heart as King keeps his court"; in the head the brain "is as it were a privy counsellor and chancellor to the heart," and

[1] *Timaeus*, 70 A; Cic., *Tusc. Disp.*, i. 20.
[2] *Coriol.*, I. i. 108, 109.
[3] *Anatomie of the Bodie of Man* (E. E. T. S., 1888), ed. 1577, p. 56.

in the lower region "the liver resides as a *legat a latere.*" [1] And Shakespeare seems to mean the same thing when he refers to the heart as "the court" in a passage [2] following closely on that just cited. The anatomy of the brain was investigated with much success by Greek surgeons, and many of their terms descriptive of its parts have been preserved by modern anatomy. But in judging of cerebral physiology the ancients regarded the cavities or ventricles of the brain, and not the substance, as playing the most important part. The term "ventricle" (Greek, κοιλία) meant originally "stomach," and was afterwards applied by analogy to the cavities of the heart, and also to the cavities or cells of the brain. By analogy also it was assumed that, just as in the cavities of the stomach and the heart important physiological changes took place, so it was in the cavities of the brain that the chief cerebral functions were discharged. We shall see later on [3] that the chief instrument of the soul was said to be the "animal spirit," which was formed in the

[1] *Anat. Mel.*, I. 1, ii. 4. [2] *Coriol.*, I. i. 140.
[3] Chap. vi.

brain and stored in these ventricles, and by means of which the soul performed its operations in imagination, reasoning and memory. Greek doctors knew the four cavities of the brain, the two anterior (lateral) ventricles, the third (the central), and the fourth (within the medulla oblongata).[1] Mediaeval physicians regarded the two anterior ventricles (which lead into one another) as one, and thus recognized only three. In these three cavities they localized the three chief functions of the rational soul, placing the imagination in the front ventricle, reason in the central, and memory in the hindmost. Chaucer in *The Knightes Tale* (518) refers to the front part of the head as the seat of imagination. He describes Arcite's condition as not merely like the lover's malady,

> "but rather lyk manye
> Engendred of humour malencolyk,
> Biforen, in his celle fantastyk,"

that is, like *mania* engendered of melancholy humour, in front, in the cell of imagination.[2]

[1] Galen, *De Usu Partium*, VIII. x. (vol. iii. 663-667 K).

[2] Professor Skeat (*ad loc.*) quotes *Batman upon Bartholomè*, vii. 6, and *Vincent of Beauvais*, xxviii. 41. Burton (*Anat. Mel.*, I. 1, ii. 4) makes the double

And the two other parts of the brain, the seats of reason and memory respectively, are alluded to by Shakespeare in *Macbeth* (I. vii. 63-67) :—

> "his two chamberlains
> Will I with wine and wassail so convince
> That memory, the warder of the brain,
> Shall be a fume, and the receipt of reason
> A limbeck only."

The fumes of wine ascending to the brain shall fill the ventricles, so that memory shall be confused, and the middle cell, the receipt or receptacle of reason, shall be like a crucible, full of vapour.

The brain was regarded by Aristotle as serving chiefly to cool the region of the heart,[1] but Galen expressly controverts this idea.[2] Galen taught that the brain was the seat of the rational soul,[3] and of the "animal" faculty,[4] and the source of "animal" spirit.[5] To these latter ideas we shall refer in detail in a later chapter.

ventricle in front the seat of the "common sense," the middle one that of *imagination* and *cogitation*, and the hindmost that of *memory*. *Cf.* also *Rabelais*, bk. iii. c. 31 ; Fletcher, *Purple Island*, canto v.

[1] *De Part. Anim.*, II. vii. 652 A, 24.
[2] *De Usu Partium*, VIII. ii. and iii.
[3] *Ibid.*, IX. iv.
[4] *Ibid.*, *Def. Med.*, cdlxvii.
[5] *De Usu Partium*, VIII. x. ; IX. iv.

The substance of the brain was supposed to be naturally moist and cold, and therefore heat and dryness were morbid conditions. A hot brain was thought to induce abnormal mental activity culminating in madness or inclining to melancholy. Thus in *A Winter's Tale* (IV. iv. 699) Autolycus, observing the entrance of the clown and the shepherd, exclaims :—

"Aside, aside; here is more matter for a hot brain,"

that is, here is more material for an inventive fancy to profit by. In *A Midsummer Night's Dream* (V. i. 4) we have :—

"Lovers and madmen have such seething brains,
Such shaping fantasies, that apprehend
More than cool reason ever comprehends."

A suggestion of morbid activity is contained in the following from *A Winter's Tale* (III. iii. 64) :—"Would any but these boiled brains of nineteen and two-and-twenty hunt this weather?"[1]

A similar expression in *The Tempest* (V. i. 60) refers to a state of complete mental aberration. Prospero's magic has

[1] Cf. *Macbeth*, II. i., 39.

brought about the unhinging of Antonio's mind, and the latter is now to be restored to sanity. Prospero thus addresses him :—

"A solemn air and the best comforter
To an unsettled fancy cure thy brains
Now boiled within thy skull!"

So when Laertes (*Hamlet*, IV. v. 154), distracted by the violent death of his father and the madness of his sister, wishes that he were himself mad, he exclaims :—"O heat, dry up my brains!"

A dry brain was thought to be barren and sluggish, as in *Troilus and Cressida* (I. iii. 329) :—

"But that Achilles, were his brain as barren
As banks of Libya—though, Apollo knows,
'Tis dry enough—will with great speed of judgment,
Ay, with celerity, find Hector's purpose
Pointing on him";

and in *As You Like It* (II. vii. 39) :—

"and in his brain,
Which is as dry as the remainder biscuit
After a voyage, he hath strange places crammed
With observation, the which he vents
In mangled forms."[1]

[1] *Cf.* also Marston, *Antonio and Mellida*, Prol.; Shirley, *The Witty Fair One*, IV. ii. 8; Webster, *Westward Ho!*, III. ii. : "My husband hath a hand as dry as his brains."

According to Galen,[1] a dry brain is the cause of phantasms in the dreams of melancholy people. Spenser, in the *Faerie Queene* (I. i. 42, 7), alludes to this belief :—

"As one then in a dreame whose dryer braine
Is tost with troubled sights and fancies weake."

Similarly James I. of England in his *Counterblaste to Tobacco*,[2] combating the theory that, "the braines of all men being naturally colde and wet, all dry and hote things should be good for them," says that such treatment would tend to produce insanity through sleeplessness, as it is the coldness and moisture of the brain that procure sleep and rest.

The excess as well as the defect of the proper qualities might cause distemperature. If the brain were too cold it was thought by some to cause melancholy ;[3] if it were too moist, to cause coma and excessive somnolence.[4]

The heart is thus described by Galen in his book of Definitions :[5] "A muscular part which has the shape of a cone and two ventricles in which native heat and vital spirit

[1] xvi. 525 K. [2] Ed. Arber, pp. 102, 103.
[3] Burton, *Anat. Mel.*, I. 2, v. 3.
[4] Galen, xvi. 525 K. [5] *Def. Med.*, xlix.

are generated ; from which the arteries proceed and the veins take their rise, through which vital moisture and innate heat are supplied to the whole body." As regards the structure of the heart, the most important difference between ancient and modern knowledge was that the septum or wall separating the right and left ventricles was believed by anatomists until the seventeenth century to be pierced by a number of invisible pores through which blood passed from the right to the left ventricle.[1] It was this stubborn belief that so long hindered the discovery of the circulation of the blood. Even after Harvey's convincing demonstration the belief persisted for some time. Phineas Fletcher, in his *Purple Island*,[2] describes how the particles of blood, flowing from the right ventricle to the left,

> "As through a wall with hidden passage slide,
> Where many secret gates (gates hardly spy'd)
> With safe convoy, give passage to the other side,"

and gravely adds the following note :

"This fleshly partition severs the right side from the left ; at first it seems thick,

[1] Galen, *De Usu Partium*, VI. xvii. [2] Canto iv.

but if it be well viewed we shall see it full of many pores or passages." As a matter of fact, no such pores or passages exist.

Another doctrine of the old physiology, now obsolete, was that the heat of the body had its seat and source in the heart, which imparted heat to the blood and so to all the tissues. The heat of the heart would become excessive if it were not tempered by the breath drawn into the heart from the lungs.[2] These ideas are thus versified by Fletcher :—

"Within this city is the palace fram'd
Where life, and life's companion, heat, abideth,
And their attendants, passions untam'd ;
(Oft very Hell in this straight room resideth)
And did not neighbouring hills [*i.e.*, the lungs],
cold airs inspiring,
Allay their rage and mutinous conspiring,
Heat, all (itself and all) would burn with quenchless firing."

There are frequent references in our literature to "heart-strings!" Aristotle[3] thought that the heart was attached to the windpipe

[1] Galen, *De Temperamentis*, i. 51 (68); *Def. Medicae*, xlix ; *De Usu Partium*, VI. vii.

[2] Aristotle, *Hist. An.*, I. xvi. 594 B ; Galen, iv. 511 ; v. 525 K.

[3] *Hist. An.*, I. xvi. 594 B.

(τῇ ἀρτηρίᾳ) by cartilaginous strings. Vicary in his *Anatomie of the Bodie of Man* says: "Also the hart is bounde with certayne ligamentes to the backe part of the brest, but these lygamentes touche not the substance of the hart, but in the overpart they spring foorth of him, and is fastened as aforesayde." It was thought that violent emotion might rupture the heart-strings.[1]

"*Clear your brows,*
And though my heartstrings crack for 't, I will be
To all a free example of delight."
Massinger, *Duke of Milan*, III. iii.

"*Steph.* *Take up his body*
And call for his physicians.
Sfor. *Oh! my heartstrings!*"
Ibid., IV. iii.

In ancient and modern literatures the heart is referred to (1) as the seat of the blood and of life; (2) as the seat of feeling, desire, impulse and passion; and (3) as the seat of the faculty of thought. As the source of courage it is the subject of innumerable allusions which need no illustration.

Annexed to the heart are the lungs, and

[1] *Cf.* Shakespeare, *Lucr.*, 1141; *Two Gent.* IV. ii. 62; *Henry V.*, IV. i. 47; *Rich. III.*, IV. iv. 365; *Oth.*, III. iii. 261; Jonson, *Poetaster*, I. i. *ad. fin.*; Dekker, *Sun's Darling*, Act ii. l. 132.

their uses were said to be :—(1) to form a soft cushion for the protection of the heart ; (2) to be the instrument of voice and of respiration ; (3) to cool the heart by sending air into it ;[1] (4) to exhale the fumes engendered in the blood brought to the heart.[2] In literature the chief references to the lungs describe them as the seat of merry laughter. In *As You Like It* (II. vii. 30) Jacques describes his own fit of laughter at the moralizing of Touchstone :—

"My lungs began to crow like Chanticleer . . .
And I did laugh sans intermission
An hour by his dial."

Gonzalo in *The Tempest* (II. i. 174) dryly alludes to the mocking courtiers as "these gentlemen who are of such sensible and nimble lungs that they always use to laugh at nothing." And again, in *Coriolanus* (I. i.

[1] Galen (*Hipp. et Plat.*, VII. ix.) : "In his discourse on the use of respiration, Plato seems to imitate Hippocrates, who maintains that inspiration takes place for the purpose of cooling the native heat, and expiration in order that fuliginous superfluities may be discharged and breathed out." *Cf.* Aristotle, *Hist. An.*, I. xvi. ; Galen, ii. 884, iii. 412, 617 K. Spenser, *F.Q.*, II. ix. 267.

[2] Galen, *De Usu Partium*, VII. viii. ; also vol. iv. pp. 492 *sq* ; vii. 766 K.

112), Menenius Agrippa, recounting the Fable of the Belly and the Members speaks of the belly as replying "with a kind of smile which ne'er came from the lungs," that is, which was not due to good-humoured mirth.[1]

Laughter was also associated with the diaphragm or midriff.

Burton[2] says: "Amongst other uses it (the diaphragm) hath, (it) is the instrument of laughing"; and P. Fletcher[3] writes:—

"Here sportful laughter dwells, here ever sitting
Defies all lumpish griefs and wrinkled care."

Shakespeare speaks of the diaphragm as the "rim" (*Henry V.*, IV. iv. 14):—"Or I will fetch thy rim out at thy throat in drops of crimson blood." This term was more commonly used of the peritoneum or of the mesentery, but as Burton[4] uses "midriff" as a synonym of "mesentery" as well as of "diaphragm," it is probable that both "rim" and "midriff" were somewhat

[1] *Cf.* also *Cymb.*, I. vi. 68; *L.L.L.*, III. i. 77; *Hamlet*, II. ii. 337.

[2] *Anat. Mel.*, I. 1, ii. 4.

[3] *Purple Island*, canto iv. Elsewhere he speaks of it as "the merry diazome."

[4] I. 1, ii. 4.

loosely employed for any of these. There is a humorous use of the term "midriff" in Dekker's *Shoemaker's Holiday* (I. i.), where Eyre says to his wife: "Peace, midriff, peace!"

Of the organs contained in the abdominal cavity the most important, according to the old physiology, was the liver. The functions ascribed to the liver will be described in a later chapter. As to what may be called the psychology of the liver, we find references to this organ in Greek tragedy[1] as the seat of the passions such as anger or fear, and in Theocritus[2] as the seat of love. It is as the cause of love,[3] especially of libidinous desire, that modern literature alludes frequently to the liver. Thus Gower in the *Confessio Amantis* (bk. vii. 470) says:—

"The liver maketh him for to love."

In *Love's Labour's Lost* (IV. iii. 70) Biron thus comments on Longaville's love-sick poetry:

"This is the liver-vein, which makes flesh a deity,
A green goose a goddess: pure, pure idolatry."

[1] E.q. Aesch., *Ag.* 432, 792; Soph., *Aj.* 937.

[2] xiii. 71.

[3] Prior makes fun of this conceit. See *Alma, or the Progress of the Mind*, i. 70-75.

In this passage "vein" is used metaphorically, and "liver-vein" means the disposition which is due to the liver. With this we may compare a remark in Ben Jonson's *Poetaster* (IV. iii.):

"Wine and good livers make true lovers."

Shakespeare refers several times to this organ as the seat of innocent love, as in *Much Ado about Nothing* (IV. i. 233):

"Then shall he mourn,
If ever love had interest in his liver";

and in *As You Like It* (III. ii. 443):—

"And thus I cured him; and this way will I take upon me to wash your liver as clean as a sound sheep's heart, that there shall be not one spot of love in 't." In a less innocent sense we have it in *Merry Wives of Windsor* (II. i. 121):—

"*Ford.* Love my wife!
Pistol. With liver burning hot."[1]

And so when Fabian tells Sir Andrew (*Twelfth Night*, III. ii. 22) that Olivia showed favour to another in order to put

[1] *Cf. Temp.*, IV. i. 56; *Twelfth Night*, II. iv. 101; v. 106; *Winter's Tale*, I. ii. 304; 2 *Hen. IV.*, I. ii. 198; *Lucr.*, 47; R. Brome, *City Wit*, III. i.; Quarles, *Emblems*, No. 8, ll. 7, 8.

brimstone in his liver, he means that her purpose was to add fuel to his love. One of the characters in Webster's *Duchess of Malfi* (I. ii.) says of those who will wed twice :—

> "Their livers are more spotted
> Than Laban's sheep."

The absence of blood from the liver was thought to be a cause of cowardice; and hence the cowardly were called "white-livered." This physiological explanation is given in *Twelfth Night* (III. ii. 66), when the courage of Sir Andrew is called in question :—

"For Andrew, if he were opened, and you find so much blood in his liver as will clog the foot of a flea, I'll eat the rest of the anatomy."[1]

Gauged by the number of allusions in literature, the organ next in importance was the spleen. As it is only within the last half century that the true office of the spleen has been discovered, it is not surprising that there is considerable variety in the functions ascribed to it in ancient and

[1] Cf. *Merch. Ven.*, III. ii. 86; 2 *Hen. IV.*, IV. iii. 113; *Troil. and Cress.*, II. ii. 50; *Hen. V.*, III. ii. 29.

modern literature. Medical men regarded it as helping to purify the blood manufactured by the liver by secreting the thick and melancholic juices.[1] This melancholy humour or black bile was thought to cause not only melancholy, but anger and ill-temper. Spenser (*F. Q.*, I. iv. 35), describing the allegorical figure of Wrath, says :—

"All these, and many evils moe haunt ire,
The swelling splene, and frenzy raging rife."

Shakespeare frequently utilizes the same idea, as for example in *Julius Cæsar* (IV. iii. 47), where Brutus resents the anger of Cassius :—

"You shall digest the venom of your spleen,
Though it do split you."[2]

Elizabethan drama is fertile in allusions to the spleen as the seat of bitter anger and resentment. One example may be given from Ford's *Perkin Warbeck* (I. iii.) :—

"*K. Hen.* Some Irish heads work in this mine of treason ;
Speak 'em.
Clif. Not any of the best ; your fortune
Hath dulled their spleens."

[1] Galen, *De Usu Partium*, IV. xv. ; *De Atra Bile*, vi.

[2] *Cf.* also *Rich. III.*, V. iii. 350 ; *Coriol.*, IV. v. 97 ; *Tit. Andro.*, II. iii. 191 ; *Hamlet*, V. i. 284 ; *1 Hen. IV.*, V. ii. 19 ; *Hen. VIII.*, III. ii. 99 ; Pope, *Rape of the Lock*, iv. 16-88.

Almost as frequently we find the spleen described as the seat of laughter. The Roman satirist, Persius,[1] refers to himself as "a laugher with saucy spleen" (*petulanti splene cachinno*).

Ben Jonson alludes to this passage in *The Penates* :—

"Were he a King, and his mistress a queen,
This draught shall make him a *petulant spleen.*
But, trow, is he loose or costive of laughter?"

Gower, describing the chief bodily organs, says :—

"The splen doth him to laugh and play
Whan all unclennesse is away."[2]

In *Troilus and Cressida* (I. iii. 178) Ulysses describes Achilles as laughing immoderately at the mimicries of Patroclus and crying out :—

"O, enough, Patroclus;
Or give me ribs of steel! I shall split all
In pleasure of my spleen."

Ben Jonson, in *Every Man out of his Humour*, (V. ii. *ad. fin.*) has :—

"My spleen is great with laughter."

These passages suggest the explanation of a

[1] *Sat.*, i. 12. [2] *Conf. Am.*, vii.

remark in Tourneur's *Revenger's Tragedy* (II. iv.): "Your grace doth please to speak *beside your spleen.*" That this means "in laughing mood," "in jest" is shown by the use of the phrase in Ford's *Love's Sacrifice* (I. ii.): "Thou hast made me laugh *beside my spleen.*"

Butler, in one of his *Characters* ("A Choleric Man"), alludes to both ideas connected with this organ when he says: "His spleen makes others laugh at him, and as soon as his anger is over with others he begins to be angry with himself and sorry."

Hence Sterne,[1] satirizing this literary convention, writes:—

"In mentioning the word *gay* (as in the close of the last chapter) it puts one (*i.e.*, an author) in mind of the word *spleen.*" Other allusions may be relegated to a foot-note.[2]

Extreme haste was also attributed to the influence of the spleen, perhaps as a corollary to its effects upon anger. In the ballad of

[1] *Trist. Shan.*, bk. viii. ch. 19.

[2] Shakespeare, *Meas.* for *Meas.* II. ii. 123; *Tw. Night*, III. ii. 72; Drayton, *Nymphidia;* Marston, *Antonio and Mellida*, Act iii. l. 327; R. Brome, *A Jovial Crew*, Act ii. (Pearson, 1873, vol. iii. p. 385); Fletcher, *Purple Island*, canto ii.; Jonson, *Sejanus*, III. i. 112.

the *Nut Brown Maid* (stanza 28) we find :— "When men wyl breke promyse, they speke the wordis on the splene." Twice in Shakespeare the word occurs in the sense of extreme haste (*King John*, II. i. 448 ; V. vii. 50), while the same meaning underlies a passage in *A Midsummer Night's Dream* (I. i. 146) :—

"Brief as the lightning in the collied night,
That in a spleen unfolds both heaven and earth."[1]

The swelling of the spleen was supposed to be at the expense of the rest of the body. Galen[2] attributes to Hippocrates the statement that wherever the body flourishes the spleen dwindles or wastes away. Howell, in his *Instructions for Forraine Travell* (sec. 13) says :—"It is a very laudable cours, not to suffer one place to swallow the wealth and traffique of the whole, like the spleene in the naturall body, whose swelling makes all the rest of the members languish." Hence John Cleveland, a Royalist, writing after the Restoration, makes effective use of this idea

[1] *Cf.* also *Ven. and Ad.*, 907 ; Cary's Dante, *Paradise*, xxxiii. ad fin.

[2] *De Nat. Fac.*, II. ix. (ed. Kühn ii. 132 ; *cf.* also 177-202).

in describing a type which was familiar in the Commonwealth period ("*The Character of a Country Committeeman with the ear-mark of a sequestrator*") :—"He is the spleen of the body politic that swells itself to the consumption of the whole." Fletcher[1] thus describes the spleen :—

"If that black town in over-growth increases,
With too much strength his neighbours overbearing,
The Hepar (liver) daily and whole isle (the body) decreases,
Like ghastly shade or ashie ghost appearing ;
But when it pines, th' isle thrives, its curse, her blessing ;
So when a tyrant raves, his subjects pressing,
His gaining is their loss, his treasure their distressing."

Upon this, Fletcher adds an interesting note : "Where the spleen flourishes, all the body decays and withers, and where the spleen is kept down, the body flourishes. Hence Stratonicus merrily said, that in Crete dead men walked, because they were so splenetic and pale coloured. Trajan compared the spleen to his exchequer because as his coffers being full drained his subjects' purses, so the full spleen makes the body sapless."

[1] *Purple Island*, canto ii.

This is possibly the underlying meaning of a passage in Dekker's *Shoemaker's Holiday* (I. iii.) :

"But princes, whose high spleens for empery swell,
Are not with easy art made parallel."

In the following line from Dunbar (*The Merle and the Nightingale*, 170) :

"God bade eke love thy neighbour from the spleen,"

the reference is probably to the spleen merely as one of the viscera, the seat of the emotions in general, and the phrase "from the spleen" is equivalent to "from the heart."

The stomach, being the seat of appetite, was used by Latin writers to denote taste or liking, and more frequently in the contrary sense of dislike, passing easily to the meaning of irritation, vexation, chagrin. The verb *stomachari* was used only in the sense of "to be vexed, angry, out of humour." This use appears occasionally in English literature, as for instance in Marlowe's *Edward II.*, where reference is

made to the unpopularity of the favourite Gaveston :—

"*Elder Mortimer.* Doth no man take exceptions at the slave?
Lancaster. All stomach him, but none dare speak a word."

And again in the same play, where Gaveston says of himself :—

"I know, my Lord, many will stomach me;
But I respect neither their love nor hate."

From this meaning of anger it was an easy transition to "courage to display irritation," and hence "courage" in a general sense. Thus in Ben Jonson's *Every Man in his Humour* (III. i.), we have the following :—

"*Step.* Coney-catching rascal! I could eat the very hilts for anger.
E. Know. A sign of good digestion; you have an ostrich stomach, cousin.
Step. A stomach! would I had him here, you should see an I had a stomach."

Shakespeare plays on the word in a similar way in *Henry V.* (III. vii. 163) :—

"*Orl.* Ay, but these English are shrewdly out of beef.
Con. Then shall we find to-morrow they have only stomachs to eat and none to fight."

And in the same play (IV. iii. 35) uses it simply as equivalent to "courage" :—

> "And he that hath no stomach for the fight,
> Let him depart."

The same meaning is implied in a passage in Butler's *Hudibras* (I. iii. 834) :—

> "Honour despite revenge and shame
> At once into his stomach came."

That is, the courage to defend his honour at once inspired him.

The gall-bladder with the bile that it contained was from a very early period used as the type of everything bitter. (The word "gall" was used both for the fluid and for its receptacle.) Hence it is often synonymous with "bitterness of spirit," "rancour," and examples are so frequent in literature that little illustration is needed. *Henry V.* (II. ii. 30) :

> "Those that were your father's enemies
> Have steeped their galls in honey and do serve you
> With hearts create of duty and of zeal."

Compare Butler's *Character of a Choleric Man :* "All his parts are irascible and his gall is too big for his liver."

The dove was supposed to possess no gall.[1] Hence we read in Ford's *The Lover's Melancholy* (II. ii) :—

"Thy sister, my Eroclea, was so gentle,
That turtles in their down do feed more gall
Then her spleen mixed with."

The gall is sometimes used to typify courage or spirit to resent injury and insult. Gower (*Conf. Am.*, i. 303), says :

"And if it fal . . . .
A man to lese so his galle
Him aught . . . .
The name bere of pacient."

So Shakespeare, *Othello* (IV. iii. 93) :—"We have galles; and though we have some grace, yet have we some revenge."[2]

[1] Galen, *De Atra Bile*, c. 9; T. Browne, *Pseud. Epid.*, Bk. III. c. 3.

[2] Murray, N.E.D. s.v. Gall. *Cf.* also Shakespeare, *Hamlet*, II. ii. 559; *T. and C.*, I. iii. 237.

CHAPTER IV

DIGESTION : THE HUMOURS

ANCIENT medical writers held different theories of digestion. Some thought it to be effected by trituration or pounding, others by putrescence or decomposition, others by concoction or cooking by natural heat, while some said that the crude material was distributed unaltered to all parts of the body.[1] Galen seems to have preferred the theory of concoction. He says: "That which is assimilated in every part is nourishment, and to assimilation nothing contributes more than good concoction in the stomach. The second concoction is in the liver and the veins, and the third in each part that is nourished, and for the sake of this concoction we need the previous two.[2] There were thus recognised three concoctions. The first, in the stomach and intestines, turned

[1] *Celsus de Medicina*, Preface.
[2] *In Hippocr. Lib. de Alim. Comm.*, ii. 2.

food into chylus; the second, in the liver, with the subordinate gall and spleen, turned the chylus into blood,[1] expelling impurities; the third, in the tissues, assimilated the nourishment, giving off excrementitious humours such as sweat and tears. The hair and the nails were regarded as excrements.

The office of the stomach is thus described by Gower:[2]

"In time of recreation
Nature hath in creation
The stomach for a comun coke (cook)
Ordeined so, as saith the boke:
The stomach coke is for the hall
And boileth mete for hem all
To make hem mighty for to serve
The Herte, that he shall nought sterve."

And similarly Fletcher in the *Purple Island*:

"Below dwells in this city's market-place
The island's common cook, concoction."

Milton, in his *Tractate of Education*, advises the use of music immediately after a meal to promote the first process of digestion: "the like would not be unexpedient after meat to

[1] Galen, *De Usu Partium*, iv. 12.

[2] *Conf. Am.*, bk. vii. 477 *sqq.* *Cf.* Spenser, *F.Q.* II. ix. 276.

assist and cherish Nature in her first concoction."

The functions of the liver, as conceived by early physiologists, are thus described by Sir Michael Foster:[1] "By the help of this substance (the soft substance of the liver) a concoction was effected, a sort of fermentation was carried out. In some such way as the crude juice of the grape is fermented into wine, with the separation on one hand of the heavier faex which settles to the bottom, and of the lighter foam which rises to the top, so the crude, gross blood of the *vena portæ* was purified by the hepatic substance into the purer blood which made its way by the *vena cava* into the heart, through the separation of two impurities. Of these, the one, the lighter one, corresponding to the foam or yeast or fermenting must, escaped as *yellow bile* into the minute beginning of the biliary duct, and was thence carried to the gall-bladder, from which it from time to time escaped into the duodenum. The other, the heavy, muddy impurity, passed back as *black bile* . . . to the spleen, being carried thither by the veins."

[1] *History of Physiology, Sixteenth to Eighteenth Century.*

Thus the functions of the liver were three: (1) the manufacture of blood, (2) the straining off of impurities, (3) the despatch of blood through the veins to nourish all parts of the body.

Prior, in his poem, *Alma: or the Progress of the Mind*,[1] after ridiculing the poetic notion that the liver was the seat of love, goes on to describe its physiological functions:

> "But let your friends in verse suppose
> What ne'er shall be allowed in prose;
> Anatomists can make it clear
> The liver minds his own affair;
> Kindly supplies our public uses,
> And parts and strains the vital juices;
> Still lays some useful bile aside
> To tinge the chyle's insipid tide;
> Else we should want both bile and satire,
> And all be burst with pure good nature."

In order that the process of digestion might be perfect, it was, of course, necessary that each part should perform its proper function. If the stomach did not concoct the food properly into chyle, bad humours were the result; as Samuel Butler says, in his *Character of an Ungrateful Man*: "His ill-

[1] Book i. ll. 435-44.

nature is like an ill stomach, that turns its nourishment into bad humours." If there were any obstruction in the veins that conveyed nourishment from the alimentary canal to the liver, if the liver were weak or obstructed, if the spleen drew too much or too little from the liver, then indigestion or crudity was the result. The food thus imperfectly digested was thought to give off fumes which were carried by the veins to the heart, and thence sent to the brain. This may be illustrated from Molière, who, in *Monsieur de Pourceaugnac*,[1] puts into the mouth of a doctor a description of the three kinds of melancholy: "the third, called hypochondriac, which proceeds from some part of the intestines and of the lower region, but particularly of the spleen, whose heat and inflammation carries to our patient's brain many thick and gross mists, whose black and malign vapour causes depravation of the functions of the ruling faculty." The effect of these fumes was to confuse and dull the brain. Hence Butler, in his *Character of a Melancholy Man*, says: "The fumes and vapours that rise from his spleen and

[1] Act I. sc. xi. *Cf.* also *Médecin malgré lui*, ii. 6.

hypochondrias have so smutched and sullied his brain (like a room that smokes) that his understanding is blear-eyed and has no right perception of anything." In Shakespeare's *Antony and Cleopatra*[1] Pompey wishes that Antony may have his mental faculties blunted by continual feasting:

"Tie up the libertine in a field of feasts,
Keep his brain fuming. . . .
That sleep and feeding may prorogue his honour
Even till a Lethe'd dullness."

One of the virtues claimed by Falstaff[2] for sherris-sack was that it dispersed these dyspeptic fumes: "It ascends me into the brain, dries me there all the foolish and dull and crudy vapours which environ it." Milton[3] refers to the same theory in describing the physical effects upon Adam and Eve of eating the forbidden fruit:

"Soon as the force of that fallacious fruit
That with exhilarating vapour bland
About their spirits had play'd, and inmost powers
Made err, was now exhal'd; and grosser sleep
Bred of unkindly fumes, with conscious dreams
Encumber'd, now had left them, up they rose."

The following passage from *Macbeth*[4] de-

[1] II. i. 24.
[2] 2 *Henry IV.*, IV. iii. 106.
[3] *P. L.*, ix. 1046 *sqq.*
[4] I. vii. 66.

scribes the effect of wine in sending fumes to the brain :

> " His two Chamberlains
> Will I with wine and wassail so convince
> That memory, the warder of the brain,
> Shall be a fume, and the receipt of reason
> A limbeck only."

And the effect of fumes is suggested by the two following passages from Shakespeare, in the one in causing fantastic dreams, in the other in dethroning reason :

> " *Imogen.* I hope I dream :
> For so I thought I was a cave-keeper,
> And cook to honest creatures : but 'tis not so ;
> 'Twas but a bolt of nothing, shot at nothing,
> Which the brain makes of fumes." [1]

> " The charm dissolves apace,
> And as the morning steals upon the night,
> Melting the darkness, so their rising senses
> Begin to chase the ignorant fumes that mantle
> Their clearer reason." [2]

In the process of digestion, as we have seen, yellow bile (choler) and black bile (melancholy) were said to be strained off from the blood and lodged in the gall-bladder and the spleen respectively. These fluids, together with blood and phlegm, constituted

[1] *Cymbeline*, IV. ii. 301. [2] *Tempest*, V. i. 67.

the four humours which played so important a part in ancient physiological theories. Other humours were recognized, such as serum, sweat, tears;[1] but the four above-mentioned were the humours *par excellence*. These humours were not of simple and uniform composition; Galen recognized six kinds of yellow bile, four of black bile and three of phlegm,[2] while blood showed two varieties, the venous and the arterial. Further, these humours sometimes underwent a change, so that one was converted into another. For example, Burton[3] quotes with approval a statement that serious humours "being thickened become phlegm, and phlegm degenerates into choler, choler adust becomes melancholy." And Galen,[4] in distinguishing four kinds of black bile, states that besides the elementary kind there is one that arises from the overheating of the bile, another from putrefied phlegm, and a third from feculent blood.

These four humours were thought to vary in quantity at different stages of human

[1] Burton, *Anat Mel.*, I. 1, ii. 2.
[2] *Def. Med.*, lxx.
[3] I. 1, iii. 3.
[4] *Def. Med.*, lxx. *Cf.* also *De Humoribus*, i.

life: in youth there was an exuberance of blood, in early manhood of yellow bile, in middle and declining age of black bile, and in old age of phlegm.[1]

While each of these had its proper seat, the blood carried with it at ordinary times a certain quantity of each of these,[2] and on special occasions a larger quantity of one or the other as required.

Gower[3] thus describes the seats allotted to the humours:—

"The spleen is to Malencoly
Assigned for herbergery (lodging).
The moiste Fleume (phlegm) with the colde
Hath in the lunges for his holde
Ordeined him a proper stede (place)
To dwelle there as he is bede.
To the sanguine complexion
Nature of his inspection
A propre hous hath in the Liver
For his dwellinge made deliver (readily).
The drier Coler with his hete
By wey of kinde (nature) his propre sete
Hath in the Galle, where he dwelleth,
So as the philosophre telleth."

Ben Jonson introduces the Humours as Masquers in his *Hymenaei*, accompanied by

[1] Galen, *Def. Med.*, civ.
[2] Galen, *De Atra Bile*, c.5.
[3] *Conf. Am.*, bk. vii. 449.

the "Four Affections," by which he probably means the corresponding "complexions." Cotgrave gives as part of the meaning of "complexion" "the disposition, affection, humors, or inclination of the mind."

In a state of perfect health the humours were mixed in due proportions, each possessing the normal amount of the elementary "qualities" belonging to it. Thus choler was hot and dry, melancholy cold and dry, phlegm cold and moist, blood hot and moist. The humours varied in amount in different persons, and the particular mixture in a man's body determined its "complexion" or constitution.[1] Some one humour usually predominated, and accordingly one constitution was choleric, another sanguine, another phlegmatic, and a fourth melancholic. Dekker plays on two senses of the word "complexion" in *The Honest Whore*, Part I. (II. i.):—

"*Bellafront.* Is my glass there? and my boxes of complexion?

Roger. Yes, forsooth . . . here's your two complexions, and if I had all the four complexions I should ne'er set a good face upon 't."

[1] Galen, *Hipp. et Plat.*, p. 665, 672 K; *Mayor on Cic. N.D.*, II. 18.

Chaucer in his *Prologue* thus describes the Franklin (l. 333) :—

"Of his complexioun he was sanguyn."

Overbury in his *Character of a Prisoner* says : "Whatsoever his complexion was before, it turns in this place (the prison) to choler or deep melancholy." It was a matter of professional conscience for a physician, before prescribing treatment, to determine to which of these four classes his patient's constitution belonged, and accordingly Bacon[1] objects against "empiric physicians," or quacks, that they "know neither the causes of disease nor the complexions of patients."

The health of the body depended to a great extent upon the state of the humours. Sickness and disease resulted if the proper "qualities" were either excessive or deficient ; if, for instance, the blood, which is naturally hot, became either cold or too hot. Disease was also caused by an excess or a deficiency in the quantity of any one of the humours.[2]

[1] *Adv. of Learning*, i. 2, 3. *Cf.* also Shakespeare, *Hamlet*, I. iv. 27.

[2] This was the doctrine of Hippocrates. Galen, *De Atra Bile*, p. 120 K.

Chaucer[1] credits the Doctor of Physic with knowing

"the cause of every malady
Were it of cold or hot or moist or dry,
And where engendered and of what humour."

As the normal admixture of these was thus altered, the body was said to be "distempered," and if the distemper were not "qualified" or cured, it might develop to a dangerous disease. The distinction between distemper and disease is shown in 2 *Henry IV.* (III. i. 38-43):—

"*King.* Then you perceive the body of our kingdom
How foul it is; what rank diseases grow,
And with what danger, near the heart of it.
Warwick. It is but as a body yet distempered:
Which to his former strength may be restored
With good advice and little medicine."

And also in *King John* (V. i. 12-16):—

"This inundation of mistemper'd humour
Rests by you only to be qualified;
Then pause not; for the present time's so sick,
That present medicine must be ministered,
Or overthrow incurable ensues."

Each of the principal organs of the body might be distempered; this distemperature

[1] *Prologue*, 421-23.

was "simple" if one of the four "qualities" was in excess or defect, and "compound" if two of these were disordered at the same time. If any obstruction checked the free distribution of any one of the humours, this became hot and parched or "adust." Bacon begins his essay *Of Ambition* thus:—"Ambition is like choler, which is a humour that maketh men active, earnest, full of activity, and stirring, if it be not stopped; but if it be stopped, and cannot have his way, it becometh adust, and thereby malign and venomous"; and in the essay *Of Seditions and Troubles* he says:—"As for discontentments, they are in the politic body like to humours in the natural, which are apt to gather preternatural heat and to inflame." In the masque *Microcosmus*, by Thomas Nabbes (1637), where the four complexions appear in dialogue, Choler says: "Provoke me no more: I am adust with rage, and will make you an odd number."

Many causes of corrupt humours were recognized, as for example gluttony, certain kinds of food, bad air, exercise after meals, idleness, insomnia.[1] When these corrupt

[1] *See* Burton, *Anat. Mel.*, I. 2, ii. *passim*.

or gross humours were under treatment by the physicians, it was the teaching of Hippocrates that "in the course of a disorder that was proceeding favourably these humours underwent a certain change in quality (or coction) which was the sign of returning health, as preparing the way for the 'crisis' or expulsion of the morbid matter," [1] and that these crises had a tendency to occur at certain stated periods which were called "critical days." This is what Dryden alluded to in the following lines :—

"Wise leeches will not vain receipts obtrude,
While growing pains pronounce the humours crude;
Deaf to complaints they wait upon the ill
Till some safe crisis authorize their skill." [2]

Marlowe, in Part II. of *Tamburlaine the Great*, (V. iii.) makes a physician say to Tamburlaine in his last illness :—

"Besides, my lord, this day is critical,
Dangerous to those whose crisis is as yours";

and in *The Jew of Malta* (II. iii.) makes metaphorical use of the same idea :—

"The sessions day is critical to thieves,
And few or none 'scape but by being purged."

[1] Smith, *Classical Dict.*, *s.v.* Hippocrates. *Cf.* Littré, *Oeuvres d'Hippocrate*, Intro. c. 13.

[2] Quoted by Johnson in his *Life of Dryden*.

Corrupt or excessive humours were either "digested" or expelled. "Digestion" in the strict sense is to be distinguished from concoction. Though it was frequently used as a mere synonym for concoction, yet as a technical term it meant the dissolving or absorption of superfluous or morbid humours. Shakespeare uses the term in the strict sense in *Julius Cæsar* (IV. iii. 47):—

> "You shall digest the venom of your spleen
> Though it do split you."

That is, you shall not vent it upon me but disperse it within your own system. With this compare 1 *Henry VI.* (IV. i. 168):—

> "Go cheerfully together and digest
> Your angry choler on your enemies."

Carlyle[1] aptly uses the same metaphor in describing a futile military movement:— "The fourth thousand . . . have to retire elsewhither, and digest their spleen or reabsorb it into the blood."

In therapeutic treatment a distinction was made between "chronic" or settled, and "acute" or violent distemper. For chronic

[1] *French Revol.*, II. 2, vi. *See* other illustrations in *N.E.D.*, s.v. *Digest.*

or for slight maladies the medicines employed were "alteratives," defined by Burton [1] to be "such as correct, strengthen nature, alter, any way hinder or resist the disease." The change in the diseased humours when the disorder was proceeding favourably was technically called "alteration" (ἀλλοίωσις). This theory is alluded to in *Pericles* (IV. vi. 112):—

> "Had I brought hither a corrupted mind,
> Thy speech had *alter'd* mine";

and it probably underlies the choice of words in the following from the *Comedy of Errors* (II. ii. 7): "Is your merry *humour alter'd?*" [2] Dryden says: "Ill habits of the mind are, like chronical diseases, to be corrected by degrees and cured by alteratives"; and Crabbe, in his poem, *The Library* (l. 59), writes:—

> "Here alt'ratives by slow degrees controul
> The chronic habits of the sickly soul."

"Acute" diseases required more violent remedies. For the expulsion of corrupt humours a very common remedy was blood-

[1] *Anat. Mel.*, II. 4, i. 2.

[2] Perhaps also in *Winter's Tale*, IV. iv. 586; *Othello*, III. iv. 125.

letting or phlebotomy, though many authorities restricted this to cases where the blood was disordered or excessive.[1] Shakespeare refers to this practice in *Troilus and Cressida* (II. iii. 222), where Ajax, resenting the arrogance of Achilles, cries, "I'll let his humours blood." Excess of blood or plethora was wrongly called "plurisy" in Shakespeare's time, once by Shakespeare[2] himself. Massinger, in *The Picture* (IV. ii.), in using the word, refers to the practice of blood-letting :—

> "A plurisy of ill-blood you must let out
> By labour";

and a similar allusion occurs in *The Two Noble Kinsmen* (V. i.) :—

> "That heal'st with blood
> The earth when it is sick, and cur'st the world
> O' the plurisy of people."

The usual cure for acute distemper of the humours was by purging, either upwards (by emetics) or downwards (by cathartics). But before this drastic remedy was applied it was usual to administer "preparatives."

[1] For example, Vicary, *Anatomie of the Bodie of Man* (E.E.T.S.), p. 40.

[2] *Hamlet*, IV. vii. 116. (*See* Aldis Wright's note.)

Burton[1] says: "After blood-letting we must proceed to other medicines; first prepare and then purge." Butler, in his *Characters*, humorously applies this idea to the actions of "A Mountebank":—"He administers physic with a farce, and gives his patients a preparative of dancing on the rope, to stir the humours and prepare them for evacuation." In the *Nonne Prestes Tale* Dame Pertelote uses the term "digestives" instead of "preparatives":—

> "I conseille yow the beste, I wol not lye,
> That bothe of colere and of malencolye
> Ye purgė yow. . . .
> A day or two ye shul have digestyves
> Of wormės, er ye take youre laxatyves."

Various purgatives were specific for the different humours. Thus aloes was said to purge choler, and hellebore was proverbial amongst the Greeks and Romans as a remedy for melancholy and madness. Lord Herbert of Cherbury, in his *Autobiography*, giving his views on the education of a gentleman, says:—"It will become him also to know not only the ingredients, but doses of certain cathartic or purging, emetic or vomitive

[1] II. 5, i. 3.

medicines, specific for choleric, melancholic or phlegmatic constitutions, phlebotomy being only necessary for those that abound in blood." References to purgative remedies are very frequent.[1] For example, Webster, *Appius and Virginia* (II. ii.) :—

> "Slaves and cowards!
> What, are you choleric now? By the gods
> The way to purge it is to let you blood."

Shirley in *The Traitor* (I. ii.) has :

> "*Duke.* Most ingrateful man!
> Turn rebel! I have worn him in my blood!
> *Alonzo.* 'Tis time to purge the humour."

Molière in *Mons. de Pourceaugnac* (I. ix.) ridicules the medical practice of his day. The doctor, after hearing that the patient has been bled fifteen times in twenty days without benefit, says :—"It is evident that the malady is not in the blood. We will have him purged as many times, to see if it is not in the humours; and if we have no success, we will send him to the baths."

Aristotle's famous description of the emotional effects of tragedy was founded on this

[1] *Cf.* Shakespeare, *W.T.*, II. iii. 38; IV. iv. 790; *Rich. II.*, I. i. 153; 2 *Hen. IV.*, IV. i. 65; *Macb.*, V. ii. 38; iii. 52.

medical doctrine. "Tragedy" he says, "is the imitation of a serious course of action . . . which by means of pity and terror accomplishes the purging of such passions." He conceives the soul as becoming surcharged with pent-up feeling which like superabundant humours required relief; tragic representations afforded a vent for the superfluous emotion and so restored the normal state of emotional health. Dryden in his *Discourse on Epic Poetry* elaborates this metaphor in contrasting epic poetry and tragedy and their effect upon the mind. "It must be acknowledged," he says, "that the epic poem is more for the manners, and tragedy for the passions. The passions, as I have said, are violent; and acute distempers require medicines of a strong and speedy operation. Ill habits of the mind are, like chronical diseases, to be corrected by degrees and cured by alteratives; wherein, though purges are sometimes necessary, yet diet, good air and moderate exercise have the greatest part."

The corruption or putrefaction of humours resulted in fever, or in abscesses or "imposthumes." Vicary tells us in his

Anatomie of Man that the humours "go with the blood, and sometimes they putrifie and make fevers, and some be put out to the skin and be resolved by sweat or by skab, by pushes or by impostumes." (Pushes are pimples or boils.) Bacon in his *Life of Henry VII.*, in a description of a "pestilent fever," says that it was apparently "not seated in the veins or humours, for that there followed no carbuncle, no purple or livid spots or the like."[1] Elizabethan dramatists use the word "imposthume" figuratively to illustrate a corrupt state of the body politic. Thus Shakespeare in *Hamlet* (IV. iv. 27) :—

"This is the imposthume of much wealth and peace,
That inward breaks and shows no cause without
Why the man dies."

Shirley applies it in a similar way in *The Traitor* (II. i. 93-94) :—

"*Sci.* But I have thought a cure for this great Imposthume.
Lor. What?
Sci. To lance it; is't not ripe?"[2]

[1] *Cf.* Webster, *Duchess of Malfi*, IV. ii. 40-44.

[2] *Cf.* Marston, *Antonio and Mellida*, Act III. (ed. Keltie, 1879, p. 355); Jonson, *Cynthia's Revels*, V., iii.

Browning[1] also has availed himself of this strong metaphor :—

" . . . the imposthume
I prick to relieve thee of—Vanity."

The mutual influence of body and mind was fully recognized by the old physiology. The humours were supposed to be affected by all perturbations of the mind, such as fear, anger or sorrow. Burton,[2] in explaining how the passions affect the body, says that the imagination, becoming aware of some object and misconceiving or amplifying it, communicates it at once to the heart, "which immediately bends itself to prosecute or avoid it, and withal draweth with it other humours to help it ; in sadness, much melancholy blood, in ire, choler." This will illustrate Pope's lines in the *Essay on Man* (ii. 139-144) :

"So cast and mingled with his very frame,
The mind's disease, it's Ruling Passion came ;
Each vital humour which should feed the whole
Soon flows to this, in body and in soul ;
Whatever warms the heart or fills the head,
As the mind opens and its functions spread,

[1] *Pacchiarotto*, xxii. [2] I. 2, iii. 1.

Imagination plies her dangerous art
And pours it all upon the peccant part."

Phlegm is described by Galen as "cold and moist, applied by nature to the swallowing of food and the movements of the limbs."[1] The terms included the mucus of the organs of respiration, saliva, and the lubricating fluid of the joints. It was a waste product of the blood, and served to temper the heat of the choler and the blood. Pope, describing the effect of excessive eating, speaks of the stomach [2] as

"A tomb of boil'd and roast, and flesh and fish,
Where bile and wind and phlegm and acid jar,
And all the man is one intestine war."

Clarendon in his *History of the Rebellion* [3] says that it was curdled by fear: "Being now awakened by their alarm . . . and his flegm a little curdled, he began to think himself in danger." Blackmore,[4] giving a physiological explanation of genius, says that it varies in different persons "as its active fire is blended and allayed by different proportions of phlegm."

[1] *Def. Med.*, lxvii.
[2] *Imitations of Horace*, Sat. II. ii. 71.
[3] xvi. (1704), iii. 559 (quoted in *N.E.D.*).
[4] *Essays* (quoted by Johnson, *Lives of the Poets*).

Choler, or yellow bile, separated from the blood by the liver and stored in the gall-bladder, was known to be very bitter, and hence "gall" became synonymous with "bitterness." "Gall" is used in its physiological meaning in Dekker's *Honest Whore* (Part I.) :—[1]

"*Viola.* You ha' cast off your old swaggering humours?

Fustigo. I had not sailed a league in that great fish-pond, the sea, but I cast up my very gall."

Shakespeare has frequent references to choler and to purging as the usual remedy for it. For example,[2] when Guildenstern tells Hamlet that the King is "distempered," Hamlet asks, With drink?

"*Guild.* No, my lord, rather with choler.

Ham. Your wisdom should show itself more richer to signify this to his doctor; for, for me to put him to his purgation would perhaps plunge him into far more choler."

And Richard II.,[3] endeavouring to reconcile two quarrelling nobles, says, "Let's purge this choler without letting blood." With

[1] Act. I. sc. ii.

[2] *Hamlet*, III. ii. 310-319. *Cf.* 1 *Hen. IV.*, I. iii. 129.

[3] *Rich. II.*, I. i. 153.

this we may compare Webster, *The White Devil* (V. i.) :—"Are you choleric? I'll purge't with rhubarb."[1] Choler together with the other humours was supposed to affect the brain and produce hallucinations. Burton[2] quotes a statement that "by reason of inward vapours and humours from blood, choler, etc., diversely mixed, they apprehend and see outwardly, as they suppose, divers images, which indeed are not. . . . As he that looketh through a piece of red glass judgeth everything he sees to be red; corrupt vapours mounting from the body to the head and distilling again from thence to the eyes . . . make all things to appear of the same colour which remains in the humour that overspreads our sight, as to melancholy men all is black, to phlegmatic all white, etc." So Chaucer in the *Nonne Prestes Tale* (ii. 4111-4147) makes Dame Pertelote give the following explanation of her husband's dream of the great red beast :—

"Allas! and konne ye been agast of swevenys (dreams)?
No thyng, God woot, but vanitee in swevene is.

[1] *Cf.* Webster, *Duchess of Malfi*, II. v. 14. [2] I. 3. iii.

Swevenes engendren of repleccioun
And oft of fume, and of complecciouns,
When humours been to habundant in a wight.
Certés this dreem, which ye han met to nyght,
Cometh of the grete superfluytee
Of youre rede colera, pardee,
Which causeth folk to dreden in hir dremes
Of arwes, and of fyre with rede lemes,
Of rede beestes, that they wol hem byte,
Of contekes and of whelpes, grete and lyte;
Right as the humour of malencolie,
Causeth ful many a man in sleepe to crie,
For feere of blake beres, or bolès blake,
Or elles blake develes wole hem take.
Of othere humours koude I telle also
That werken many a man in sleepe ful wo;
But I wol passe as lightly as I kan.

. . . . . .

Ye been ful coleryk of complecciouN.
Ware the sonne in his ascencioun
Ne fynde yow not repleet of humours hoote." [1]

Black bile, or Melancholy, is described by Burton thus: [2] "Melancholy, cold and dry, thick, black and sour, begotten of the more feculent part of nourishment and purged from the spleen, is a bridle to the other two hot humours, blood and choler, preserving

[1] *See* Pollard's edition (Macmillan, 1907), Appendix A, by Dr. J. F. Payne; also Skeat *ad loc.*

[2] *Anat. Mel.*, I. 1, ii. 2.

them in the blood, and nourishing the bones." This "natural" or "material" melancholy is to be distinguished from the immaterial melancholy, which was a settled habit of body and mind, arising from any one or more of the humours "adust." The latter was variously called "immaterial," adventitious, acquisite, redundant, unnatural, artificial ;[1] in contradistinction to the natural or material black bile. Upon this humour Burton's *Anatomy of Melancholy* is a store-house of information. Shakespeare, in *King John*,[2] refers to it wrongly as a "spirit."

> "Or if that surly spirit, melancholy,
> Had baked thy blood and made it heavy-thick";

and in *The Winter's Tale*[3] speaks of purging it by seasickness :

"The King is not at the palace ; he is gone aboard a new ship to purge melancholy." He refers to it elsewhere as the "melancholy element"[4] ; using "element" in one of its early applications.

The symptoms of melancholy in the body

[1] *Anat. Mel.* I. 1, iii. 3. [2] III. iii. 42.
[3] IV. iv. 790. [4] *Much Ado*, II. i. 357.

were many and various.[1] Shakespeare speaks of a "green and yellow melancholy."[2] Webster, in *The Devil's Law Case*, thus refers to the sign of it in the face:

"Woman, you're mad, I'll swear 't, and have more need
Of a physician than a lawyer.
The melancholy humour flows in your face."[3]

The effects of an abundance of black bile in causing fearful dreams are referred to by Chaucer in the passage quoted above from the *Nonne Prestes Tale*.[4]

Thus far we have spoken of the humours as affecting the bodily constitution. Corresponding to the four bodily complexions were four mental dispositions, also called "complexions" or "temperaments." Galen states[5] that "blood makes one cheerful; yellow bile makes one irascible, bold or truculent; phlegm, slow and stupid; black bile, fierce and shameless." Gower[6] gives a full description of these four complexions, associating each with its corresponding element and elementary qualities:—

"Of therthè which is colde and dry,
The kinde of man Maléncoly

---

[1] Burton, I. 3, i. 1.
[2] *T. N.*, II. iv. 116.
[3] Act IV. sc. i.
[4] *Cf.* Burton, I. 1, ii. 7.
[5] *De Humoribus.*
[6] *Conf. Am.*, vii. 401 *sqq.*

Is cleped and that is the firste,
The most ungoodlich and the werste.
What man hath that complexion
Full of ymagination
Of dredes and of wrathfull thought,
He fret him selven all to nought.
  The water which is moist and colde
Maketh Fleume which is manifolde,
Forgetel, slow and wery sone
Of everything whiche is to done.
  What man that taketh his kind of thair,
He shall be light, he shall be fair,
For his complexion is blood,
Of alle there is none so good,
Where as he hath love undertake,
Wronge is it, if that he forsake.
  The first of his condicion
Appropreth the complexion
Whose propretes ben drie and hote.
Which in a man is coler hote,
It maketh a man ben enginous
And swifte of fote and eke irous.
Of conteke and fool hastifnesse
He hath a right great businesse."

Ben Jonson gives the following description of "The True Critic" in *Cynthia's Revels*: "A creature of a most perfect and divine temper: one in whom the humours and elements are peaceably met, without emulation of precedency. He is neither too fantastically melancholy, too slowly phlegmatic, too lightly sanguine, nor too rashly

choleric ; but is all so composed and ordered as it is clear Nature went about some full work, she did more than make a man when she made him." [1] Bacon in his essay *Of Ambition* speaks of choler as "a humour that maketh men active, earnest, full of alacrity and stirring." For the effect of phlegm in making one dull and stupid we may quote Massinger, *The Fatal Dowry* (Act III. sc. i.) :—

"Why stand you silent thus? What cold, dull phlegm,
As if you had no drop of choler mixed
In your whole constitution, thus prevails,
To fix you now thus stupid, hearing this?"

As the predominance of any one of these humours resulted in a particular cast of mind the word "humour" came to be used for any peculiarity of disposition without any definite reference to the physiological cause. Ben Jonson in the Induction to *Every Man out of his Humour* supplies the *locus classicus* for this transition of meaning :—

"Why humour, as 'tis *ens*, we thus define it,
To be a quality of air or water,

[1] With this passage *cf.* Drayton, *Barons' Wars*, i. 21 ; iii. 40 ; and Shakespeare, *J. C.*, V. v. 73-75.

And in itself holds these two properties,
Moisture and fluxure ; as, for demonstration,
Pour water on this floor, 'twill wet and run :
Likewise the air, forced through a horn or trumpet,
Flows instantly away, and leaves behind
A kind of dew ; and hence we do conclude
That whatsoe'er hath fluxure and humidity
As wanting power to contain itself,
Is humour. So in every human body
The choler, melancholy, phlegm and blood,
By reason that they flow continually
In some one part, and are not continent[1]
Receive the name of Humours. Now thus far
It may by metaphor apply itself
Unto the general disposition :
As when some one peculiar quality
Doth so possess a man that it doth draw
All his affects, his spirits and his powers
In their confluctions, all to run one way,
This may be truly said to be a Humour."

Thus, in Elizabethan and Jacobean comedy humour was often used as equivalent to eccentricity.

[1] *I.e.*, staying in one place.

CHAPTER V

THE BLOOD AND ITS DISTRIBUTION

THE most important of the four humours was the blood, which (as we have seen) was supposed to be manufactured by the liver from the chylus conveyed by the *vena portæ*. Of all kinds of nutriment, wine was thought to contribute most to the formation of blood.[1] Thus Marlowe, in the second part of *Tamburlaine the Great* (III. ii.), has :—

"Filling their empty veins with airy wine,
That being concocted turns to crimson blood."

Chapman, in the passage[2] where Odysseus describes his obligations to Nausicaa, translates thus :—

"Yet she in all abundance did bestow
Both wine that makes the blood in humans grow,
And food."

---

[1] Galen, *Hipp. de Acut. Morb. Victu. Comm.*, iv. 93. *Cf.* Galen, iv. 778; vi. 337, 744 K. *Cf.* Gower, *Conf. Am.*, vii. Lyly, *Alexander and Campaspe*, V. iii. 16. Jonson, *Volpone*, V. i. 17.

[2] *Odyssey*, bk. vii. *ad fin.*

And Massinger refers to the same belief in *The Duke of Milan* (III. i.) :—

> "We enter towns by force, and carve ourselves,
> Pleasure with pillage, and the richest wines
> Open our shrunk-up veins, and pour into them
> New blood and fervour."

The distribution of the blood was not understood until the seventeenth century, when Harvey demonstrated the real method of its circulation. The Greeks knew that blood was conveyed to the heart from the liver and lower viscera by a large vein, the *vena cava* or hollow vein.[1] They knew also that the arteries conveying blood away from the heart differed from the veins by having stouter walls, and by containing brighter and purer blood. They could not suppose that it was the same blood flowing round and round the body. They believed that part of the crude venous blood was purified so as to become arterial blood, but did not imagine that the latter could again collect impurities and become venous blood. And so it was agreed that there were two systems of blood-distribution, the liver dispensing it through the veins, and the heart through

[1] Hom., *Il.*, xiii. 546.

the arteries. Along each artery and vein there was a regular ebb and flow, the blood rushing backward and forward along the same channel.

Sir Michael Foster thus describes the Galenic physiology of the heart and blood-vessels: "The parts of the blood absorbed from the alimentary canal are carried by the portal vein to the liver, and by the influence of that great organ converted into blood. The blood thus enriched by the food is by the same great organ endued with the nutritive properties summed up in the phrase, 'natural spirits.' But blood thus endowed with 'natural spirits' is still crude blood, unfitted for the higher purposes of the blood in the body. Carried from the liver by the *vena cava* to the right side of the heart, some of it passes from the right ventricle through innumerable invisible pores in the septum[1] to the left ventricle. As the heart expands it draws from the lungs through the vein-like artery (or, as we now call it, the pulmonary vein),

[1] This delusion was the chief obstacle to the true explanation of the circulation; it persisted until the seventeenth century. *Cf.* Fletcher, *Purple Island.*

air into the left ventricle. And in that left cavity the blood which has come through the septum is mixed with the air thus drawn in, and by the help of that heat which is innate in the heart, which was placed there as the source of the heat of the body by God in the beginning of life, and which remains there until death, is imbued with further qualities, is laden with 'vital spirits,' and so fitted for its higher duties. The air thus drawn into the left heart by the pulmonary vein, at the same time tempers the innate heat of the heart and prevents it from becoming excessive.

"Thus from the right side of the heart there is sent to the body generally along the great veins, and to the lungs along the artery-like vein (the pulmonary artery), a flow, followed by an ebb, of crude blood endued with natural spirits only, blood serving the lower stages of nutrition. Blood flows through the artery-like vein (the pulmonary artery) to the lungs for the nourishment of the lungs, just as it flows through the other veins for the nourishment of the rest of the body; in both cases there is an ebb as well as a flow

along the same channel. From the left side (of the heart), on the other hand, there takes place along the arteries to all parts of the body a flow, followed also by an ebb, of blood endued with vital spirits, and so capable of giving power to the several tissues to exercise their vital functions. As this blood passes from the left heart along the vein-like artery (the pulmonary vein) to the lungs, it carries with it the various fuliginous vapours which, in the fermenting activity giving rise to the vital spirits, have been extracted from the crude blood, and discharges these vapours into the pulmonary passages.

"Arterial blood, *i.e.*, blood laden with vital spirits, reaching the brain, there generates the 'animal spirits' which, pure and unmixed with blood, existing apart from blood, are carried along the nerves to bring about movements and to carry on the higher functions of the body."[1]

Summing up, we may say that the liver, having manufactured blood, sends it forth *via* the heart enriched with natural spirits

[1] *History of Physiology from Sixteenth to Eighteenth Century*, Lect. 1.

to nourish the various tissues of the body. Of the blood conveyed to the right side of the heart, part went without alteration to provide nutriment for the lungs and other parts of the body ; the remainder passed (as was wrongly supposed) through the dividing wall or septum to the left side of the heart, and after being there purified by air brought from the lungs and endowed with vital spirits, was conveyed by arteries to all tissues of the body, giving power to perform all vital functions. That portion of the blood which carried the vital spirits to the brain was strained through the delicate tissues of that organ, and the spirits were still further refined, so as to become animal spirits. These were separated from the blood and partly stored in a central reservoir in the brain, and partly sent along the nerves (without blood) to give the powers of sensation and movement to all parts of the body.

The distinction between arteries and veins is said to have been first noticed by the Greek physician, Praxagoras (*fl.* 300 B.C.). In the genuine works of Aristotle the word "veins" (φλέβες) is applied to all blood-

vessels.[1] The word "artery" (*ἀρτηρία*) was originally confined to the windpipe, and was transferred to the thick-walled blood-vessels because the latter were thought to be air-tubes. Erasistratus (*fl.* 280 B.C.) called the windpipe the "rough artery" (*ἀρτηρία τραχεῖα*), and gave the name "smooth artery" (*ἀρτηρία λεία*) to what we now call simply an artery.[2] He and others, judging from the fact that the arteries of a man who had bled to death were always found empty, thought that these vessels contained only air, but Galen thought that they contained blood as well as air.[3]

The difference between arteries and veins is thus described by an English anatomist of the sixteenth century: "There is no more difference between these two vessels of blood, but that the artere is a vessel of blood spiritual or vytal. And the veyne is a vessel of blood nutrimental, of the which veynes is noted two most principal, of the which one is called *vena porta*, the other is called *venacelis*."[4] The latter is the *vena*

[1] *Mayor on Cic. N.D.*, ii. 138. [2] *Ibid.*, 136.
[3] Galen, iv., 703-4 K.
[4] Vicary, *Anatomie of the Bodie of Man* (E. E. T. S., 1888), p. 21.

cava or hollow vein (φλέψ κοιλή), the word "celis" (spelt elsewhere by Vicary "kelis") being evidently a corruption of the Greek adjective. (This vein is now known as the "inferior vena cava," the main trunk-vein which conveys the blood from the lower part of the body to the right auricle of the heart.) The quotation from Vicary explains a passage in Middleton's play, *The Fair Quarrel* (Act IV. sc. ii) :—[1]

"*Col's Sister.* What hope is there?
Surgeon. Hope? Chilis was 'scaped miraculously, lady.
Col's Sister. What's that, sir?
Surgeon. Cava vena."

Chapman mentions the same blood-channel in his *Iliad* (bk. x. 111) :—

"Let fly, and cut the hollow vein, that runs up to his neck
Along his back part, quite in twain."

The *vena porta*, or strictly *vena portæ*, "gate vein," or, as it is now called, "portal vein," collects the blood circulating in the stomach, spleen and intestines, and conveys it to the liver. As the lacteals, which convey

[1] Dyce (*ad loc.*) quotes the use of "chilis" in Vigon's *Workes of Chirurgerie*, 1571. It occurs in Mundinus (*De Anatome*, 1315); vide Encycl. Brit. XIth ed. Art. *Anatomy*.

part of the nutriment from the stomach and intestines to be afterwards poured into the venous system at the root of the neck, were not discovered until 1622, it was anciently supposed that the *vena portæ* carried all the nourishment prepared by the alimentary canal to the liver. Hence Bacon, in his essay *Of Empire*, uses it as an illustration of the importance of merchants to a state in supplying wealth to the community: "For their merchants, they are *vena porta*; and if they flourish not, a kingdome may have good limmes, but will have empty veines and nourish little."[1] And he employs the same metaphor in his *Life of Henry VII.*: "But that that moved him most was that, being a king that loved wealth and treasure, he could not endure to have trade sick, nor any obstruction to continue in the *gate vein* which disperseth that blood."

The liver was regarded by Hippocrates[2] as the origin of the veins and the place of manufacture of the blood. Plato[3] and Aristotle[4] maintained that the heart made

[1] *Cf.* also *Of Usury*.

[2] Galen, *Hipp. et Plat.*, p. 200 K. [3] *Timaeus*, 70.

[4] *Part. An.*, II. 9 and II. 1, § 22; *Mayor on Cic. N.D.*, ii. 137.

and distributed the blood, but Galen[1] supported the position taken by Hippocrates, arguing that the heart merely helped to distribute the blood manufactured in the liver. It is Galen's view that we find reflected in English literature up to the seventeenth century. Marlowe, in the Second Part of *Tamburlaine the Great* (III. iv. 6), writes :—

> "I feel my liver pierced, and all my veins,
> That there begin and nourish every part,
> Mangl'd and torn";

and in Donne's poem, *The Progress of the Soul* (ll. 495-500), where he is describing the formation of the human body, we find the following account :—

> "And part did become
> A spungy liver, that did richly allow,
> Like a free conduit on a high hill's brow,
> Life-keeping moisture unto every part."

James I. in his *Counterblaste to Tobacco* calls the liver "the fountain of blood"; and Burton[2] describes it as "the shop of blood, like in colour to congealed blood." It was thought by some that the substance of the

[1] *Hipp. et Plat.*, p. 531 K.
[2] *Anat. Mel.*, I. 1, ii. 4.

liver was partly composed of congealed blood. Vicary, Court surgeon to Queen Elizabeth and her three predecessors, writes thus (1577):[1] "And because it was little in quantitie, nature hath added to it cruded (curded, congealed) blood to the accomplishment of sufficient quantity, and is lapped in a senowy (sinewy) pannicle. And why the Lyver is cruded is because the chile which cometh from the stomache to the Lyver should be turned into the colour of blood." This explains a passage in Chapman's *Iliad*:[2] "with his dart struck Duke Apisaon even to the concrete blood that makes the liver" . . . . a phrase varied in another passage, "that congealed blood that forms the liver."

A detailed description of the blood-distribution according to the Galenic tradition is given by Rabelais in one of his chapters on *Borrowers and Lenders* (bk. iii. c. 4), and in verse by Phineas Fletcher (*Purple Island*, canto iv.), and also by Blackmore (*Creation*, bk. vi.). Shakespeare in *Coriolanus*[3] makes Menenius amplify the fable of

[1] *Anatomie of the Bodie of Man* (E.E.T.S.), p. 68.
[2] Bk. xi. 507; xvii. 300.
[3] I. i. 139-144.

the Belly and the Members by emphasizing the distribution of food through the veins :—

"I send it through the rivers of your blood
Even to the court, the heart, the seat o' the brain,
And through the cranks and offices of man,
The strongest nerves and small inferior veins
From me receive that natural competency
Whereby they live."

Marlowe's *Tamburlaine the Great*, pt. ii., contains several passages referring to the distribution of the blood. In one, just quoted, he mentions the liver as the origin of the veins. In another (V. iii.) he refers to the arteries as conveying vital spirits from the heart :—

"Your artiers, which alongst the veins convey
The lively spirits which the heart engenders,
Are parched and void of spirits, that the soul
Wanting those organons by which it moves
Cannot endure, by argument of art."

In this passage I take the expression "alongst the veins" to mean "alongside the veins," because the heart was supposed to send blood along the veins from the right ventricle and vital spirits along the arteries from the left ventricle to all parts of the body. Consequently the arteries might be

said to run to the various parts "alongside the veins."

The ebb and flow of the blood along each vein is alluded to by Shakespeare in *King John* (III. iii. 44) :—

"Or if that surly spirit, melancholy,
Had baked thy blood and made it heavy-thick,
Which else runs tickling up and down the veins."

While choler was hot and dry, blood was hot and moist. As any excess or defect of these qualities caused a "distemperature," the blood was in an unhealthy state if it was either too hot or cold or thick. Hence, for example, the approach of death is recognized by a physician in Marlowe's play[1] just mentioned, by the loss of both heat and moisture :—

"Your veins are full of accidental heat,
Whereby *the moisture of your blood is dried* ;
The *humidum* and *calor*, which some hold
Is not a parcel of the elements,
But of a substance more divine and pure,
Is almost clean extinguished and spent ;
Which, being the cause of life, imports your death."

Similarly the dying Warwick, in the third

[1] Act V. sc. iii.

part of *King Henry VI.* (V. ii. 37), describes his symptoms :—

"Thou lovest me not: for, brother, if thou didst,
Thy tears would wash this *cold congealed blood*
That glues my lips and will not let me speak."

And the apparently dead Juliet is thus described by her distracted father :[1]

"Ha! let me see her: out, alas! she's *cold;*
Her *blood is settled*, and her joints are stiff."

Hot blood is frequently referred to in literature as the cause (or effect) of passion,[2] and therefore as incapacitating the judgment. It is associated with anger in *Troilus and Cressida* (II. ii. 115) :—

"Is your blood
So madly hot that no discourse of reason
Nor fear of bad success in a bad cause
Can qualify the same?"

And again in the same scene (*l.* 169), where Hector speaks of the "hot passion of distempered blood." In the quarrel scene in *Julius Caesar* (IV. iii. 115) Cassius excuses his outburst as due to "blood ill-tempered."

More frequently we find hot blood con-

[1] *Rom. and Jul.*, IV. v. 26.

[2] *Cf.* Horace, *Odes*, III. xiv. 27, *calidus juventa.*

nected with the passion of love. Prospero warns Ferdinand against its influence :[1]

> "The strongest oaths are straw
> To the fire i' the blood";

and the love-sick Dumain in *Love's Labour's Lost* (IV. iii. 96) exclaims :—

> "I would forget her : but a fever she
> Reigns in my blood and will remembered be."

This is the meaning of Bassanio's reference, in reply to the tender words of Portia :—

> "Madam, you have bereft me of all words,
> Only my blood speaks to you in my veins."[2]

The blood was said to be heated by wine, and on the other hand cooled by thin potations. For these ideas the *locus classicus* is the second part of *King Henry IV.* (IV. iii. 92 *sqq.*), where Falstaff rhapsodizes over "a good sherris-sack." In the course of his speech he says :—"There's never none of these demure boys come to any proof ; for thin drink doth so *over-cool their blood*, and making many fish meals, that they fall into a kind of male green-sickness" ; and later,

[1] *Tempest*, IV. i. 53.
[2] *Merch. of Ven.*, III. ii. 178. *Cf. Troil. and Cress.*, III. i. 140-145.

"The second property of your excellent sherris is the warming of the blood; which, before cold and settled, left the liver white and pale, which is the badge of pusillanimity and cowardice; but the sherris warms it and makes it course from the inwards to the parts extreme. . . . Hereof comes it that Prince Harry is valiant; for the cold blood he did naturally inherit of his father, he hath, like lean, sterile and bare land, manured, husbanded and tilled with excellent endeavour of drinking good and good store of fertile sherris, that he is become very hot and valiant." In *Henry V.* also we have the same ideas expressed by the Constable of France, who cannot account for the valour of the English :—[1]

"Can sodden water,
A drench for sur-rein'd jades, their barley broth,
Decoct their cold blood to such valiant heat?
And shall our quick blood, spirited with wine,
Seem frosty?"

The cooling of the blood was effected also by blood-letting. Hence Achilles in *Troilus and Cressida*[2] exclaims :—

"I'll heat his blood with Greekish wine to-night,
Which with my scimitar I'll cool to-morrow";

[1] III. v. 20.

[2] V. i. 1, 2. *Cf.* also *Rom. and Jul.*, I. i. 91, 92.

and the same meaning underlies the line in *King Richard II.* (I. i. 51) :—

"The blood is hot that must be cool'd for this."

Various articles of diet were thought to reduce the temperature of the blood. In the passage quoted above, Falstaff speaks of "fish meals" as having this effect, and Dryden [1] ascribes the same property to a salad :

"Meantime she quenched her fury at the flood
And with a lenten salad cooled her blood."

As hot blood indicated passion, so cold blood denoted the absence of passion, being sometimes the symbol of chastity, sometimes of calm judgment, but more often of lack of spirit and generous feeling. As referring to the passion of love we find it several times in Shakespeare. When Benedick, in the beginning of *Much Ado about Nothing* [2] says he loves no one, Beatrice retorts that she also is heart-whole :—"I thank God and my cold blood, I am of your humour for that." In *Measure for Measure*,[3] the lovers Claudio and Juliet cannot hope for the

[1] *Hind and Panther*, iii. 26.
[2] I. i. 131. [3] I. iv. 57.

sympathy of Lord Angelo because he is

"A man *whose blood*
Is very snow-broth; one who never feels
The wanton stings and motions of the sense."

Cleopatra[1] refers to her younger days as comparatively free from passion:—

"My salad days,
When I was green in judgment: *cold in blood*,
To say as I said then."

Lack of spirit is attributed to coldness of blood by Henry IV. who says[2]:—

"My *blood* hath been too *cold* and temperate,
Unapt to stir at these indignities";

and Falstaff (as we have seen[3]) marks this absence of passion as characteristic of that king. The weak Henry VI. is scornfully addressed by Warwick[4] as one who lacks all manly feeling:—

"Farewell, faint-hearted and degenerate king,
In whose *cold blood* no spark of honour lies";

and in the same play Richard of Gloucester speaks of dyeing the white rose in "the *lukewarm blood* of Henry's heart."

[1] *Ant. and Cleop.* I. v. 74; *cf.* III. 13, 158-160.
[2] 1 *Hen. IV.*, I. iii. 1. [3] 2 *Hen. IV.*, IV. iii. 128.
[4] 3 *Hen. VI.*, I. i. 184. *Cf. Hen. V.*, III. v. 20.

Cold blood is sometimes also the symbol of "calm of mind, all passion spent," as for example in *Timon of Athens* (III. v. 53):—

"Who cannot condemn rashness in cold blood?"

And in *Cymbeline* (V. v. 77):—

"Consider, sir, the chance of war: the day
Was yours by accident; had it gone with us,
We should not, when the blood was cool, have threaten'd
Our prisoners with the sword."

The blood was thought to grow cold with advancing years. In *The Comedy of Errors*[1] the old Ægeon thus speaks of himself:—

"Though now this grained face of mine be hid
In sap-consuming winter's drizzled snow
And all the conduits of my blood froze up,
Yet hath my night of life some memory."

Timon of Athens[2] thus describes old men:—

"These old fellows
Have their ingratitude in them hereditary:
Their blood is caked, 'tis cold, it seldom flows:
'Tis lack of kindly warmth they are not kind;
And nature, as it grows again toward earth,
Is fashion'd for the journey, dull and heavy."

---

[1] V. i. 313.

[2] *Tim. of Athens*, II. ii. 225. *Cf.* Milton, *P. L.*, xi. 543-544.

That is, as they approach the time when they shall be committed to the grave they become cold and heavy as the elemental earth.

Distemperature of the blood was caused not only by loss of heat, but also by loss of moisture or fluidity. This might be due to physical or to emotional causes. In the ordinary course of life, as age advanced, the blood was said to become thick and dry and to flow more sluggishly in the veins. This may be seen in the passage just quoted from *Timon of Athens* :—

"Their blood is caked, 'tis cold, it seldom flows";

and in *Much Ado about Nothing* (IV. i. 195) :—

"Time hath not yet so dried this blood of mine."

A similar thickening of the blood was thought to be the effect of poison. In *Hamlet*[1] the Ghost thus describes the operation of poison upon the blood :—

"Whose effect
Holds such an enmity with blood of man
That quick as quicksilver it courses through
The natural gates and alleys of the body,
And with a sudden vigour it doth posset
And curd, like eager droppings into milk,
The thin and wholesome blood."

[1] I. v. 65-70.

The same meaning probably underlies a passage in *The Winter's Tale* (I. ii. 417), where Polixenes repels a monstrous imputation :—

> "O then my best blood turn
> To an infected jelly."

If he were capable of such vileness he could wish that his blood, the seat of passion, might be curdled as with poison.

Certain violent emotions were believed to curdle the blood. As fear also rendered the blood cold, the state of the blood under the influence of terror is sometimes described as "congealed" or "frozen." Thus we have in Beaumont and Fletcher, *A King and no King* (I. i) :—

> "See now *my blood cruddles* at this!"

Dekker in *The Honest Whore*, pt. 1 (I. iii.), has :—

> "Of this the bad report before did strike
> So coldly to my heart that *the swift currents*
> *Of life were all frozen up.*"

So also in *Hamlet* (I. v. 16) :—

> "I could a tale unfold whose lightest word
> Would harrow up thy soul, *freeze thy young blood.*"

The same effect was thought to be produced

by sorrow[1] and sadness. Marston in *Antonio and Mellida* (IV. *sub. fin.*) has :—

"Son, heat thy blood, be not froze up with grief";

and in the sequel, *Antonio's Revenge* (I. iii.), Antonio says :—

"My spirit's heavy, and the juice of life
Creeps slowly through my stiffened arteries,"

proceeding to describe a fearful dream.

With these passages we may compare *All's Well that ends Well* (I. iii. 155) :—

"God's mercy, maiden! does it curd thy blood
To say I am thy mother?"

and *The Winter's Tale* (I. ii. 171) :—

"And with his varying childness cures in me
Thoughts that would thick my blood."

In *King John* (III. iii. 43) Shakespeare speaks of melancholy as having "baked thy blood and made it heavy-thick," and in *The Taming of the Shrew* (Ind. ii. 134) writes :—

"Seeing too much sadness hath congealed thy blood."

[1] Burton (*Anat. Mel.*, I. 2, iii. 4), giving sorrow as a cause of melancholy, quotes Fernelius : "It thickens the blood"

In one passage[1] Marston makes this the effect of rage :—

> " O how impatience cruddles thick my blood
> With boiling rage ! "

And lastly Lady Macbeth,[2] at the sight of the opportunity for an ambitious crime, wishes that her blood may be thickened by remorseless cruelty, so that she may be incapable of healthy human feeling :—

> " Unsex me here,
> And fill me from the crown to the toe top-full
> Of direst cruelty ! make thick my blood ;
> Stop up the access and passage to remorse ! "

Another old belief was that the quantity of blood in the body was diminished by various emotions as well as by the advance of old age. The last is referred to by Lady Macbeth in the sleep-walking scene,[3] when her mind is dwelling on the murder of Duncan :—" Yet who would have thought the old man to have had so much blood in him ? " The paleness of lovers is a commonplace in Latin and English poetry, and was said to be caused by loss of blood. Burton[4]

[1] *Antonio and Mellida*, Act II.
[2] *Macbeth*, I. v. 42-45.
[3] V. i. 44.
[4] *Anat. Mel.*, III. ii. 3.

quotes a physiological explanation of this :— "because of the distraction of the spirits the liver doth not perform his part, nor turns the aliment into blood as it ought." So we read in *Much Ado about Nothing* (I. i. 249-254) :—

> "*D. Pedro.* I shall see thee, ere I die, look pale with love.
>
> "*Benedict.* With anger, with sickness, or with hunger, my Lord, not with love: prove that ever I lose more blood with love than I will get again with drinking, pick out mine eyes with a balladmaker's pen and hang me up . . . . for the sign of blind Cupid."

The loss of blood through sorrow is frequently mentioned in English literature. Thus in *Romeo and Juliet* (III. v. 59) :—

> "*Jul.* Either my eyesight fails or thou look'st pale.
>
> *Rom.* And trust me, love, in my eyes so do you :
> Dry sorrow drinks our blood."

In the first part of *Henry VI.* (IV. vi. 43) the younger Talbot, whose father, expecting death on the battlefield, urges him to save his own life by flight, exclaims :—

> "These words of yours draw life-blood from my heart";

and in *Pericles* (IV. i. 23) we have :—

"Do not
Consume your blood with sorrowing : you have
A nurse of me. Lord, how your favour's changed
With this unprofitable woe !"

The same effect was sometimes attributed to a guilty conscience, as in Ben Jonson's *Catiline* (IV. ii. 112-115) :—

"Dost thou not blush, pernicious Catiline,
Or hath the paleness of thy guilt drunk up
Thy blood, and drawn thy veins as dry of that
As is thy heart of truth, thy breast of virtue ?"

The blood thus spoken of as "consumed" or "drunk up" was thought to be drained from the heart, which in normal conditions contained a plentiful supply. Just as sorrow tended to exhaust this supply, so every sigh and groan drew from the heart a drop of blood. Heywood in *A Woman killed with Kindness* makes this suffered vicariously :—

"Sigh not, sweet saint !
For every sigh you breathe draws from my heart
A drop of blood."

So also Otway in *The Orphan* (IV. ii.) :—

"*Nonimia.* I feel him in my breast, he tears my heart,
And at each sigh he drinks the gushing blood."

In the same play (V. i.) a similar effect is produced by tears :—

"*Chamont.* Nonimia, young lord, weeps in this heart;
And all the tears thy injuries have drawn
From her poor eyes are drops of blood from hence."

Shakespeare has several allusions to the same belief, *e.g.*, in *A Midsummer Night's Dream* (III. ii. 97) :—[1]

"All fancy-sick she is, and pale of cheer,
With sighs of love which costs the fresh blood dear."

This explains the expression, "the heart bleeds," which is of frequent occurrence in literature and survives in popular speech. It is usually descriptive of sorrow, as in 2 *Henry IV.* (II. ii. 51) :—"My heart bleeds inwardly that my father is so sick," and in *The Tempest* (I. ii. 63) :—

"Oh, my heart bleeds
To think o' the teen that I have turn'd you to."[2]

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[1] *Cf.* 2 *Henry VI.*, III. ii. 59-64; 3 *Henry VI.*, IV. iv. 22; *Merch. Ven.*, I. i. 81.

[2] *Cf. Wint. Tale*, V. ii. 97; 2 *Henry IV.*, IV. iv. 58.

In *Venus and Adonis* (669) it expresses the effect of fear :—

"The thought of it doth make my faint heart bleed,
And fear doth teach it divination."

When sorrow had drained the heart of blood, a sudden transport of joy might make the blood return with a rush. We see this in Addison's *Cato* (IV. iii. 83-88) :—

"*Juba.* My joy! my best beloved! my only wish!
How shall I speak the transport of my soul?
Marcia. Lucia, thy arm! Oh let me rest upon it!—
The vital blood, that had forsook my heart,
Returns again in such tumultuous tide,
It quite o'ercomes me."

Fear was supposed to drive the blood inwards from the surface of the body to the heart. Galen[1] says :—"Fear draws and collects within at the source both spirit and blood, at the same time making the surface-parts cold." Thus we read in Chaucer's *Book of the Duchesse* (490) :—

"The blood was fled, for pure drede,
Down to his herte, to make him warm."

[1] *De Sympt. Causis*, II. c. 5.

Beaumont and Fletcher in *A King and no King* (I. i.) make a similar allusion in describing the effect of terrifying news :—

"*1st Gent.* The King starts back.
Mardonius. His blood goes back as fast";

and the same authors in *Philaster* (IV. iii. 10) describe thus the effect of fright :—

"See the lively red
Is gone to guard her heart! I fear she faints."

Under the influence of fear the heart was supposed to summon the blood to itself to guard the citadel and so preserve life. Thus Shirley in *The Cardinal* (II. ii.) makes the Duchess describe the effect upon her heart of a sudden feeling of fear followed by joy :

"Ha!
My heart, that called my blood and spirits to
Defend it from the invasion of my fears,
Must keep a guard about it still, lest this
Strange and too mighty joy crush it to nothing."

So also in Ben Jonson's *Cynthia's Revels* (II. i. *ad. fin.*) :—"As you enter at the door, there is opposed to you the frame of a wolf in the hangings, which, surprising your eye suddenly, gives a false alarm to the heart, and that was it called your blood

out of your face, and so routed the whole rank of your spirits." Shakespeare has a somewhat similar referenee in *Measure for Measure* (II. iv. 20) :—

"Why does my blood thus muster to my heart,
Making both it unable for itself,
And dispossessing all my other parts
Of necessary fitness?"

The blood was also summoned to the heart at the approach of death in order to guard the seat of life. This is stated explicitly in 2 *Henry VI.* (III. ii. 161-167) :—

"Oft have I seen a timely-parted ghost
Of ashy semblance, meagre, pale and bloodless,
Being all descended to the labouring heart;
Who, in the conflict that it holds with death,
Attracts the same for aidance 'gainst the enemy;
Which with the heart there cools and ne'er returneth
To blush and beautify the cheek again."

Anger on the other hand was believed[1] to drive the blood outwards from the heart to the surface of the body. This is the meaning of Henry V.'s admonition to his soldiers before Harfleur[2] :—

"Stiffen the sinews, *summon up the blood*,
Disguise fair nature with hard-favour'd rage."

[1] *De Sympt. Causis*, II. c. 5. [2] *Henry V.*, III. i. 7, 8.

Not only anger, but other emotions, such as joy, might draw blood away from the heart, sometimes with fatal consequences. Marston in *Antonio and Mellida* (I. iv.) thus explains a sudden death through excess of joy :—

> "The vast delights of his large sudden joys
> Open'd his powers so wide, that's native heat
> So prodigally flow'd t' exterior parts,
> That th' inner citadel was left unmann'd,
> And so surpris'd on sudden by cold death."

Another old belief about the blood was that it flowed from the corpse of a murdered man at the touch, or even in the presence, of the murderer. Shakespeare makes the murdered Henry VI. bleed in the presence of Richard.[1]

> "*Anne.* O gentlemen, see, see! dead Henry's wounds
> Open their congeal'd mouths and bleed afresh!
> Blush, blush, thou lump of foul deformity ;
> For 'tis thy presence that exhales this blood
> From cold and empty veins, where no blood dwells."

Similarly Earle[2] says of "A meere dull phisician" :—"His most unfaithfull act is that hee leaves a man gasping, and his pretence is, death and he have a quarrell and

[1] *King Richard III.*, I. ii. 55-59.
[2] *Microcosmography*, ed. West, No. 42 and note.

must not meete; but his feare is lest the carkasse should bleed." Compare Otway, *The Soldier's Fortune* (IV. iii.): "Oh, come not near him; there's such horrid antipathy follows all murders, his wounds would stream afresh, should you but touch him."

In the early sixteenth century came Harvey's revolutionary discovery of the circulation of the blood. After this it was only a matter of time and the theories that were based on the Galenian doctrines must inevitably die out. In the next generation Harvey's theory was generally accepted, and Dryden pays him a tribute in the following lines:—

"The circling streams, once thought but pools of blood,
(Whether life's fuel or the body's food)
From dark oblivion Harvey's name shall save."

Lee, the Restoration dramatist, in his tragedy, *Alexander the Great*, thus refers to the circulation (Act I.):—

"A blessing like the beauteous Parisatis,
Whole years of service and the world's wide empire,
With all the *blood that circles in our veins*,
Can never merit."

And in the same scene :—

"Alas, the stream that *circles through my heart*
Is, less than love, essential to my being."[1]

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[1] Bell's *British Theatre*, vol. vi. pp. 12, 14. *Cf.* also p. 27.

CHAPTER VI

"SPIRIT": NATURAL, VITAL AND ANIMAL

FROM the earliest times of which we have written record, one of the most important and yet mysterious problems in connection with the human body was the part played by air in the support of animal life. Obviously the air regularly inhaled through the mouth and nostrils, and as regularly exhaled, was, in some way, essential to life, for its stoppage was sufficient to cause death, and death was always accompanied by a cessation of the act of breathing. Hence the Hebrew account of the creation of man in the book of Genesis represents the "breath of life" as bestowed in a separate creative act after the human body had been completely formed out of the element of earth. The religious Hebrew mind represents this "breath of life" as the direct breath of God the Creator: "The Lord breathed into his nostrils the breath of life, and man became a

living soul." Hence the direct influence of God upon the human soul was ascribed to God's breath or "spirit," and the part of man's nature thus influenced was called the "spirit of man."

Ancient Hindu physiology[1] asserted the existence of humours and of "spirit" in the human body. It is at least probable that the early Greek philosophers became acquainted with Hindu thought through the medium of Egypt, and the ideas connected with the humours and the "spirit" were gradually elaborated by Greek thinkers.

Starting from the obvious necessity of air for the support of life, Hippocrates asserted that "the body is sustained by three kinds of nutriment, food, drink, spirit (*πνεύματα*), of which the last is by far the most important."[2] And Cicero, nearly four centuries later, spoke of "that aerial nutriment (*cibus animalis*), which is the chief support of animal life."[3] By "spirit" Hippocrates simply meant the "inbreathed air," and when Celsus speaks of

[1] Wise, *Review of Hist. of Med.*, pt. i. bk. i. c. iii. sec. 2, and Introduction.

[2] *De Flatu*, 4.

[3] *De Nat. Deorum*, ii. secs. 134, 136, with Mayor's notes.

him as believing the chief cause of disease to be in the "spirit,"[1] we must not think of the later doctrines of vital and animal spirit, which were unknown to Hippocrates. As nutriment, the supposed effect of "spirit" was to feed the fire within, the innate heat of the heart. Aristotle denied this, saying that ordinary food effected the same purpose, but thought that the use of respiration was to cool the heart.

The followers of Hippocrates elaborated the doctrine of "spirit." There were several phenomena that required explanation, and "spirit" seemed to supply this. The difference in structure between arteries and veins suggested that their functions were different. Further, it was observed that the arteries of a dead man were empty, though the veins were full. Hence it was inferred that the arteries were channels for air and not for blood.[2] This was the teaching of Erasistratus, who explained the escape of blood from a severed artery by supposing

[1] *De Medicina*, bk. i., Prooem. *Cf.* Montaigne, II. xxxvii.

[2] Galen, *De Usu Part.*, vi. 7. *Cf.* Cic., *N.D.*, ii. sec. 138, Mayor; Celsus, *De Medicina*, i. Prooem.; Seneca, *N.Q.*, III. xv. 1-4.

communications between veins and arteries. Later on, when blood was known to flow through the arteries, the difference between venous and arterial blood was explained by the presence of vital spirit in the latter.

Again, the functions of the nerves, which, starting from the brain and spinal marrow, branched through every part of the body, offered another problem. On the analogy of the veins and arteries, which branched out in a similar way from other organs, the nerves were supposed to be channels conveying some fluid. This fluid must be "spirit," and, as the nerves were very different in structure from the blood-vessels, the spirit conveyed by them was probably different from the arterial spirit. Hence came the theory of "animal" spirit in the nerves.

The manufacture of the two kinds of spirit was ascribed to the organs, from which they respectively flowed. As the left cavity of the heart produced vital spirit, so the cavities of the brain were believed to have their use in the formation of a subtler spirit out of the vital spirit brought to the brain by the arteries. Hence the theory of spirit helped to explain (1) the fact that air was

essential to life; (2) the apparent emptiness of the arteries; (3) the functions of the nerves; (4) the uses of the ventricles of the brain, and (later) the difference between venous and arterial blood.

The physiological uses ascribed to "spirit" were numerous. It caused the dilatation of all organs capable of this: heart, arteries, liver, spleen, stomach, etc.[1] It cooled the native heat of the heart, and afforded essential nutriment. It helped digestion in the stomach.[2] In the veins it gave the nutritive powers to the organs concerned with digestion. In the arteries it enabled the vital organs to perform their functions. In the nerves it endowed the body with the powers of sensation and voluntary movement, while in the brain itself it was the material cause of the intellectual activities. Thus it was the connecting link between all the parts and functions of the body and soul —a thought upon which the Stoics[3] laid stress.

Hippocrates thought that spirit as well as

[1] Galen, xvi. [2] Cic., *N.D.*, ii. sec. 136.
[3] Galen, *Hipp. et Plat.*, p. 257 K.; Seneca, *N.Q.*, II. vi. 1-6.

blood was contained in both veins and arteries,[1] but he did not distinguish between different kinds of spirit. Erasistratus (about 294 B.C.) said there was spirit in the nerves,[2] and recognized two kinds of spirit, vital and animal, of which the former proceeded from the heart, the latter from the brain.[3] He asserted that the arteries contained spirit and not blood, and that this was vital spirit which came from the left ventricle of the heart.[4] The Stoic Chrysippus (280-206, B.C.), according to Galen, did not profess to know anatomy, but he dogmatized freely in spite of that. He maintained, against Erasistratus, that the left ventricle of the heart contained animal, not vital, spirit.[5] He and the other chief Stoics believed that spirit was the substance (*οὐσία*), the material basis of the soul. In early Christian times Celsus accused Christians of "borrowing from the Stoics their doctrine of the all-pervading Spirit." "But the Stoic *πνεῦμα*, as Origen points out, is material; it is the warm air or ether which

[1] Galen, *In Hipp. Libr. de Alim*, iv. 6,
[2] Galen, *De Atra Bile*, c. v.
[3] Galen, *Hipp. et Plat.*, p. 281 K.
[4] *Ibid.*, vol. iv., 664, 671; v. 168, 185; xi. 153 K.
[5] *Ibid.*, v. 185, 187 K.

penetrates and gives life to all things and connects them together in one organic whole, just as man's body is unified by the living soul, which is also material. . . . The term πνεῦμα is material; it is the material basis of soul." [1] Seneca, the Roman Stoic, arguing that air is the unifying element in nature, appeals to the human body as a proof. "For what else," he says, "holds our bodies together but spirit? What else is it by which our mind is set in motion?" [2] The doctrines of Erasistratus prevailed over those of the Stoics as regards vital and animal spirit, and when Galen wrote he developed these doctrines in a systematic way, applying them to the increased body of anatomical and medical knowledge which had, meanwhile, been accumulated.

Galen thus traces the gradual perfecting of this:—

"The spirit which is drawn outwards from the rough arteries (*i.e.*, the trachea and bronchial tubes) receives its first elaboration in the flesh of the lungs, but afterwards in the heart and arteries, and in those especially

[1] J. B. Mayor on Cic., *N.D.*, ii. sec. 19.
[2] *Nat. Quaest*, II. vi. 1-6.

which are in the (cerebral) network receives its last and most perfect elaboration in the ventricles of the brain, where, undoubtedly, it, for the first time, becomes animal spirit."[1] The assumption of "natural spirit" in the liver and veins probably had its origin in the desire for logical completeness. When liver, heart and brain were regarded as ruling organs in their respective spheres it was natural that parallelism should be found or supposed in their functions. Hence, by an analogy which was not supported by physiological evidence, a "natural spirit" was assumed to exist corresponding to the vital and animal spirits.

If we may judge from references in literature, it is probable that this doctrine of spirits was not a matter of general knowledge until the sixteenth century. Gower in the fourteenth century gives a versified sketch of pseudo-Aristotelian physiology, but, so far as I know, makes no reference to the theory of spirits. Chaucer is silent on this point in his description of the doctor of physic in his *Prologue*, though in a few

[1] *De Usu Partium*, VII. viii.

other passages[1] he makes slight reference to it. The revival and the spread of the doctrine in the sixteenth century were due partly to the general revival of Greek learning, and partly to the special revival of anatomy and medicine in that century. The scholars of the Renaissance wrote on medical subjects as a branch of learning; Burton in his *Anatomy of Melancholy* mentions Melanchthon and Cardan amongst the numerous writers of the age as authorities on physiology, and quotes their remarks on the doctrine of spirits. The first distinctively literary use of the doctrine in the sixteenth century is to be found in *Rabelais*,[2] in Panurge's discourse in praise of borrowers and lenders. To prove his thesis that the whole universe may be divided into borrowers and lenders (an idea borrowed by Charles Lamb) he employs the fable of the Belly and the Members, and gives much physiological detail. He describes the formation of vital and animal spirits, but ignores the "natural."

[1] *Book of the Duchesse*, ll. 489, 900. K.T., 511, 1907.

[2] Bk. iii. ch. 4.

At the end of the sixteenth and throughout the seventeenth century we find numerous references to the "spirit" theory in English literature. We may now deal with the most important of these passages, and it will be convenient to deal with them without any observance of chronological order. Milton makes several allusions to "spirits" in the body, and in one passage distinguishes three kinds, but in naming them he diverges from the usual teaching. In the fifth book of *Paradise Lost* (ll. 482 *sqq.*) he makes the archangel say :

> "Flowers and their fruit
> Man's nourishment, by gradual scale sublim'd,
> To vital spirits aspire, to animal,
> To intellectual, give both life and sense,
> Fancy and understanding, whence the soul
> Reason receives."

Thus he makes no mention of natural spirits, but adds an intellectual kind, presumably more refined than animal spirits. This may be Milton's own invention (for I know of no support for it in any other author), or it may be an adaptation of the teaching of Paracelsus,[1] who believed in four

[1] Burton, *Anat. Mel.*, I. 1, ii. 5.

souls, the most refined being the "spiritual soul."

In the eighth book of the same poem Adam describes thus the removal of his rib for the creation of the first woman :

> "Who stooping opened my left side, and took
> From thence a rib, with cordial spirits warm,
> And life-blood streaming fresh."

Here the cordial spirits (whether "cordial" means "from the heart" or "genial"), must be the vital spirits, as Milton apparently does not recognize the natural.

When the word "spirits" is used without qualification, it is usually easy to identify the particular species ; if they are distributed by the heart they are "vital" ; if they come from the brain or are concerned with the senses or the powers of movement they are "animal." Sometimes, however, there is a lack of definiteness, as in Ben Jonson's *Alchemist* (Act II. Sc. i.), where Sir Epicure Mammon, anticipating the projection of the philosopher's stone, eagerly asks after the colour of the mixture in its last process :—

> "Thou art sure thou saw'st it blood ?
> *Face.* Both blood and spirit, sir."

In Shirley's tragedy, *The Traitor* (Act II. Sc. ii.) we have :—

> "Why then
> Should our desires, that are so nimble, and
> More subtle than the spirits in our blood,
> Be such stay'd things in us, and not share
> Their natural liberty?"

In both these passages the spirits may be either natural or vital. But as there is a remarkable absence of specific reference in our literature to the natural spirits, it is more probable that the vital are intended. And in the same play of Shirley (Act IV. Sc. i.) when the Duke says :—

> "Thou makest my spirit caper in my veins,"

the reference is no doubt to the vital spirits, the word "veins" being used in the modern loose way as including all channels of the blood. The same are probably meant in the following couplet from Butler's *Hudibras* (I. 2, 975-6) :—

> "Knock'd on his breast as if 't had been
> To raise the spirits lodged within."

While the natural spirits carried from the liver by the veins are seldom, if ever, referred to in our literature, there is abundance of

mention of *vital spirits* proceeding from the heart through the arteries. It is interesting, for example, to find the phrase in Chapman's translation of the *Iliad*, for it is hardly necessary to say that the theory was unknown in Homeric times. Where the *Iliad* says simply "to cut off their heads,"[1] Chapman paraphrases: "empty all their veins of vital spirits." There is a striking passage in the second part of Shakespeare's *Henry IV.*,[2] where Falstaff discourses with gusto on the excellent qualities of sherris-sack. After referring to its effects on the brain, he proceeds:—"The second part of your excellent sherris is the warming of the blood; which, before cold and settled, left the liver white and pale, which is the badge of pusillanimity and cowardice; but the sherris warms it and makes it course from the inwards to the parts extreme: it illumineth the face, which as a beacon gives warming to all the rest of this little kingdom, man, to arm; and then the *vital commoners and inland petty spirits* muster me all to their captain, the heart, who, great and puffed up with this retinue, doth any deed of courage; and this valour comes

[1] *Iliad*, xxiii. 22. [2] IV. iii. 116-122.

of sherris." Here is an allusion to the spirits, complicated by a metaphor drawn from soldiering. The "commoners" are the private soldiers, and "inland" belongs to the same metaphor. Hence the "vital commoners" are the vital spirits, and it may be that the "inland petty spirits" are the same. But in older French the phrase "*petits esprits*" according to Littré,[1] meant "animal spirits," and we learn from writers on the old physiology, *e.g.*, Burton,[2] that the animal spirits under the influence of emotion flock from the brain to the heart, and are thence despatched wherever it is necessary. It is therefore quite possible that the "petty spirits" are the purer animal spirits, especially since they are here said to influence action.

Sylvester, the translator of du Bartas, refers thus to the vital spirits :—

"Man (the little world of cares)
Within the middle of the body bears
His heart, the spring of life, which with proportion
Supplieth spirits to all and every portion."

And Donne in his poem, *The Progress of the*

[1] *S. v.* Esprit. [2] I. 2, iii. 1.

Soul, in describing the gradual formation of the body, says :—

"Part hardenèd itself to a thicker heart,
Whose busy furnaces life's spirits do impart."

King James I. in his *Counterblaste to Tobacco* grounded some of his arguments upon the accepted theories in physiology. One current justification of what the King calls "the vile custom of tobacco taking" was "that, the brains of all men being naturally cold and wet, all dry and hot things should be good for them"; in ridiculing this doctrine that contraries are good for one another he says: —"as if because the heart is full of vitall spirits and in perpetual motion, a man would therefore lay a heavy pound stone on his breast, for staying and holding down that wanton palpitation."

No account of the older physiology is complete without reference to Burton's immortal *Anatomy of Melancholy*, which opens with a methodical account of the anatomy and physiology of the human body. He thus describes the spirits:[1] "Of these spirits there be three kinds, according to the three principal parts, brain, heart, liver; natural,

[1] I. 1, ii. 2.

vital, animal. The natural are begotten in the liver and thence dispersed through the veins to perform those natural actions. The vital spirits are made in the heart, of the natural, which (vital spirits) by the arteries are transported to all the other parts : if the spirits cease, then life ceaseth, as in a syncope or swooning. The animal spirits, formed of the vital, brought up to the brain and diffused by the nerves to the subordinate members, give sense and motion to them all."

This reference to syncope or swooning may send us to our Shakespeare, for he has several allusions to spirits in connection with swooning or suspended animation. In *Pericles* (III. ii. 84)—it matters nothing for our purpose whether this passage was written by Shakespeare or not—when the queen who was supposed to be dead appears likely to revive, someone says :—

> "Death may usurp on nature many hours,
> And yet the fire of life kindle again
> The o'er-press'd spirits."

The doctor in *Cymbeline* (I. v. 41) who has been asked by the queen for deadly drugs, and has given her some that will only

"stupefy and dull the sense awhile," explains in an aside that

> ". . . there is
> No danger in what show of death it makes,
> More than the locking up the spirits a time,
> To be more fresh, reviving."

There is a similar allusion to the vital spirits in the scene in *The Winter's Tale* (V. iii. 41), where Perdita stands spellbound before her mother Hermione, long supposed to be dead and now exhibited as a statue; the king, addressing the supposed statue, refers to the paralyzing effect of the sight upon Perdita:

> "There's magic in thy majesty, which has
> My evils conjured to remembrance and
> From thy admiring daughter took the spirits
> Standing like stone before thee."

And when Hero swoons in the church scene in *Much Ado about Nothing* (IV. i. 113, 127), Don John exclaims:—

> "Come, let us go. These things come thus to light
> Smother her spirits up."

And her father, thinking the slander true, cries:

> "Do not live, Hero; do not ope thine eyes:
> For did I think thou wouldst not quickly die,
> Thought I thy spirits stronger than thy shames,
> Myself would on the rearward of reproaches
> Strike at thy life."

These passages from Shakespeare, then, have reference to the vital spirits, whose partial stoppage caused swooning and whose complete failure brought instant death. We may supplement these examples by a striking passage in the first part of Dekker's *Honest Whore* (I. 2) :—

"*Duke.* Uncurtain her.
[A curtain is drawn back and Infelice discovered lying on a couch.]
Softly ! See, doctor, what a coldish heat
Spread over all her body !
Doctor. Now it works :
The vital spirits that by a sleepy charm
Were bound up fast, and threw an icy rust
On her exterior parts, now 'gin to break." [1]

The action of poison [2] is referred to in *The Tempest* (III. iii. 106) :—

"Their great guilt,
Like poison given to work a great time after,
Now 'gins to bite the spirits,"

that is, prey upon and begin to destroy the vital spirits, thus tending to cause death.

Another idea was that indigestible food tended to dull the vital spirits. This is

[1] *Cf.* also Rowe, *Jane Shore*, V. i.
[2] Galen, *Meth. Med.*, XII. v.

explicitly stated by Beaumont and Fletcher in *Philaster* (II. 2) :—"Of all your grace must fly phlebotomy, fresh pork, conger, and clarified whey ; they are all dullers of the vital spirits."

Not only articles of diet, but also violent emotions were thought to affect the vital spirits. Instances were recorded of sudden death as the direct effect of violent terror or of excessive joy,[1] and this was explained as brought about by the agitation, the contraction and dilatation of the vital spirits.[2] Marston, *Antonio and Mellida* (Act V.) exemplifies the effect of amazement :—

"We are amazed, our royal spirits numb'd."

In 2 *Hen. IV.* (II. iii. 46) we have the effect of grief :—

"Fair daughter, you do draw my spirits from me,
With new lamenting ancient oversights."

And *Rabelais* (I. x.) tells us : "the heart with excessive joy is inwardly dilated, and suffereth a manifest resolution of the vital spirits, which may go so far on, that it may thereby be deprived of its nourishment, and

[1] Galen, *De Sympt. Causis*, ii. c. 5 ; *Meth. Med.*, xii. 5.
[2] Burton, *Anat. Mel.*, I. 2., iv. 3.

by consequence of life itself, by this extremity of gladness, as Galen[1] saith." With this we may contrast what is alleged by Defoe in *Robinson Crusoe*,[2] that a sudden ecstasy of joy—as for example when a malefactor is reprieved upon the scaffold — drives the *animal* spirits from the heart, and (in another place) that Crusoe would have died from this cause if the physician had not given a vent to the spirits by phlebotomy. Lastly we may cite a passage in Montaigne using Florio's translation : a German lord, unexpectedly discovering his son dead upon the battlefield, "stood still upright, till the vehemencie of his sad sorrow, having suppressed and choaked his vitall spirits, fell'd him starke dead to the ground."[3]

Passing on to the consideration of the animal spirits, we notice first that the name was derived—not from the Latin word animal, a living being, but from *anima*, the soul. In the last century or two the two ideas were sometimes confused, but the original name was given because these

[1] Galen, ed. Kuhn, vii. 193.
[2] Ed. Masterman (Pitt Press), pp. 46, 287.
[3] *Essays*, bk. i. ch. 2.

spirits were regarded as the instruments of the rational soul. The Greek term, of which the Latin *spiritus animalis* (τὸ ψυχικὸν πνεῦμα) was a translation, was similarly derived from ψυχή, in the sense of "soul." The Italian Vesalius, who may be regarded as the founder of modern anatomy, wrote thus[1] in 1543: "As the power of the vital soul is situated in the substance of the heart, and the power of the natural soul in the proper substance of the liver, . . . so also does the brain, in appropriate structures and in organs properly subserving its work, manufacture the animal spirit, which is by far the brightest and most delicate, and indeed is a quality rather than an actual thing. And while on the one hand it employs this spirit for the operations of the chief soul, on the other hand it is continually distributing it to the instruments of the senses and of movement by means of nerves, as it were by cords. . . . Nerves therefore serve the same purpose to the brain that the great artery does to the heart and the *vena cava* to the liver, inasmuch as they convey to the instruments to which it ought to be

[1] Quoted by Sir M. Foster, *op. cit.*

sent the spirit prepared by the brain, and hence may be regarded as the busy attendants and messengers of the brain." And Descartes in the following century thus described the formation of this subtle spirit :—

"The grosser particles of the blood taken by arteries to the brain carry along with them the smaller, more subtle particles; these latter flow through minute orifices into the (pineal) gland in the middle of the substance of the brain, which gland must be regarded as a very full reservoir whence the spirits at the same time flow into the ventricles of the brain. They retain the extreme velocity which the heat of the heart has given them; they cease to have the form of blood, and are called animal spirits." [1]

The channels supposed to carry the animal spirits were what we now call *nerves*. But the term "nerves" was formerly used in a much wider sense, so as to include

[1] *Cf.* also *Rabelais*, bk. iii. ch. 4; Burton, *Anat. Mel.*, I. 1, ii. 4; Berkeley, *Min. Phil.*, i. 134; Fletcher, *Purple Island*, canto v. *See* Galen, *De Usu Partium*, VI. xvii.; VII. viii.; VIII. x. xi. xiii.; IX. iv.; *De Meth. Med.*, xii. v.; *De Placitis Hipp. et. Plat.* VIII. iv.

other parts that are now distinguished. Greek and Roman writers ordinarily use the word *νεῦρον* or nervus for sinew, tendon, ligament, but it "included also the white tissues of the body generally, *e.g.*, the nerves proper." (J. B. Mayor on *Cicero*, *N.D.*, ii. 135.) The functions of the nerves proper were not ascertained until after the days of Hippocrates, Plato and Aristotle; the discovery is variously attributed to Erasistratus in the third century B.C. and to Galen.[1] In his *Medical Definitions* Galen writes thus: "Nerve is a white and solid body. There are three different kinds of nerves: some rise from the brain and spinal marrow, and these are properly called nerves; others from the muscles, tendons; others from the bones, ligaments." Hence in English literature down to the eighteenth century we find "nerves" and "sinews" frequently used as synonymous, though sometimes, as luck would have it, they were used with correct discrimination.

Cotgrave in his *Dictionary* explains the French *nerf*: "A synnow (and thence might,

[1] Archer Hind on *Plato's Timaeus*, 72 D; Mayor on *Cic. N.D.*, ii. 135.

strength, force, power)," and Burton also gives sinew as an alternative for "nerve."[1] When Chapman in his translation of the *Iliad*[2] writes :—

> "He struck his neck athwart
> With his forced sword, and both the nerves he did in sunder wound,"

he means the tendons and muscles of the neck. And even as late as Queen Anne's reign, Blackmore, who was physician as well as poet, speaks in his poem, the *Creation*, of sinews and nerves as convertible terms. And so Shakespeare speaks of the nerves[3] as indicative of strength, and also of the sinews instead of the nerves as the channels of sensation.[4] Sometimes, however, he mentions the nerves in the Galenic sense, as the means of distribution of the animal spirits, although even then he includes the sinews in the denotation of the term. For example in *Coriolanus* (II. i. 177) we have :—

> "Death, that dark spirit, in's nervy arm doth lie;
> Which being advanced declines, and then men die."

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[1] *Anat. Mel.*, I. 1, ii. 2. [2] X. 456.

[3] E.g., *Cymb.*, III. iii. 94; *Hamlet*, I. iv. 83; *Coriol.*, I. i. 131.

[4] *Ven. and Ad.*, 903.

Here Death, dealt by his strong arm, is compared to the spirit coursing through his nerves, and yet the word "nervy" undoubtedly suggests the idea of "sinewy" or "vigorous."

In a normal state of mind and body the animal spirits were believed to course nimbly along the nerves. Under the influence of pleasure they were (as Addison[1] says) "set in agreeable motions," or (in Rabelais' phrase)[2] they were "serene and lively." As "the messengers that preserved a communication between the soul and the outward members"[3] they then performed their functions with alacrity and success. This being so, the experiences of sleep and dreaming were explained in the following way:—the outward senses were bound up, and of the so-called inward senses the phantasy alone was free. This binding or "ligation of senses" (I am now quoting Burton[4]) proceeds from an inhibition of spirits, the way being stopped by which they should come; this stopping is caused

[1] *Spectator*, 411.
[2] Bk. III. c. xiii. *Cf.* Rowe, *Tamerlane*, IV. i.; V. i.
[3] Berkeley, *Min. Phil.* i. 134.
[4] *Anat. Mel.*, I. 1, ii. 7.

by vapours arising out of the stomach, filling the nerves by which the spirits should be conveyed. When these vapours are spent the passage is open, and the spirits perform their accustomed duties; so that "waking is the action and motion of the senses, which the spirits dispersed over all parts cause." This explains a passage in *The Tempest* (I. ii. 484-86):

"*Prospero.* Thy nerves are in their infancy, again,
And have no vigour in them.
Ferdinand. So they are:
My spirits as in a dream are all bound up."

And in the same play (II. i. 202), when Sebastian says: "I find not myself disposed to sleep," Antonio rejoins: "Nor I; my spirits are nimble." Milton gives a similar physiological explanation of sleep:[1]

"Soon as the force of that fallacious fruit
That with exhilarating vapour bland
About their spirits had play'd and inmost powers
Made err, was now exhal'd, and grosser sleep,
Bred of unkindly fumes, with conscious dreams
Encumber'd, now had left them, up they rose
As from unrest."

A slightly different account is given by

[1] *P.L.*, ix. 1046-1052.

Buckingham in *The Rehearsal* (Act II. Sc. iii) when Prince Prettyman surprises the critics by falling asleep at the appearance of his lady-love. Bayes, the author-manager, thus explains the situation: "Does not that surprise you now, to fall asleep in the nick? his spirits exhale with the heat of his passion and all that, and swop he falls asleep, as you see."

These vapours supposed to be caused by imperfect digestion were thought to dull and cloy the animal spirits even in a waking subject. Caused by some disorder in the digestive system, especially in the spleen, they were carried by the blood to the heart, whence some of them were expelled from the body by way of the lungs and the rest conveyed in the arteries along with the vital spirits to the brain. Hence Falstaff mentions the drying up of these vapours as one of the two effects of a good sherris-sack:[1] "It ascends me into the brain; dries me there all the foolish and dull and crudy vapours which environ it; makes it apprehensive, quick, forgetive, full of nimble, fiery and delectable shapes; which delivered o'er to the voice, the tongue, which is the

[1] *2 Hen. IV.*, IV. iii. 104-111.

birth, becomes excellent wit." Pantagruel gives the following advice to Panurge: "You will eat at supper no beans, no hares, or other flesh; no cabbage or other victuals which could trouble and dim your animal spirits."[1] Hence came the name "vapours" so frequently used by eighteenth-century writers for what was regarded as a peculiarly feminine ailment.

As the spirits were the instruments of the rational soul, a plentiful supply of these in their purest form was necessary for the highest operations of the mind, such as wit and lofty imagination. Thus Blackmore, whom we have quoted before, says that wit owes its production partly to "an affluence of animal spirits, refined and rectified to a great degree of purity."[2] As regards imagination, we find Shakespeare modestly apologizing in his prologue to *Henry V.* for the inadequacy of his treatment of so lofty a subject:

> "But pardon, gentles all,
> The flat, unraised spirits that have dared
> On this unworthy scaffold to bring forth
> So great an object."[3]

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[1] *Cf.* Molière, *Mons. de Porc.* I. xi.; *Médecin malgré lui*, II. vi. *Cf.* Earle, *Microcosmography*, "A Drunkard."

[2] Quoted by Dr Johnson in *Life of Blackmore.*

[3] *Cf.* Marston, Prol. to *Antonio and Mellida.*

And Addison thus accounts for the limitations of the imagination, which is unable to grasp the infinitely great or the infinitely little: "the Animal Spirits may be incapable of figuring" such a variety of impressions "in such a manner as is necessary to excite so very large or so very minute ideas." [1]

The animal spirits were said to rush backwards and forwards between the brain and the organs of sense with incalculable velocity. The eye, the ear, the nose, the tongue for the four corresponding senses, and the whole surface of the body for the sense of touch, were thus kept in contact with the so-called "common sense," which residing in the brain was the organ of perception. "By mine eye," says Burton, "I do not know that I see, or by mine ear that I hear, but by my common sense, who judgeth of sound and colours." [2] For our present purpose, the interpretation of allusions in literature, the most important sense-organ is the eye. The spirits supplied to the eye were supposed not only to be affected by outward objects, but also, when agitated by certain powerful emotions, to

[1] *Spectator*, 420. [2] *Anat. Mel.*, I. 1, ii. 7.

dart forth and affect the spirits of other persons. The most striking passage in this connection is the opening paragraph of Bacon's essay, *Of Envy*. In this he says that love and envy are alike in that they "fascinate or bewitch"; *i.e.*, exercise a sort of enchantment upon other people, and that they "come easily into the eye!" "We see likewise," he continues, "the Scripture calleth envy 'an evil eye,' and the astrologers call the evil influences of the stars *evil aspects*; so that still there seemeth to be acknowledged, in the act of envy, an ejaculation or irradiation of the eye; nay, some have been so curious as to note that the times when the stroke or percussion of an envious eye doth most hurt are when the party envied is beheld in glory or triumph; for that sets an edge upon envy; and besides, at such times the spirits of the person envied do come forth most into the outward parts, and so meet the blow." The idea of ejaculation from the eye may be illustrated from Montaigne (bk. i. ch. xx.), who says: "The tortoises and the ostriches hatch their eggs with their looks only, a sign that they have some ejaculative virtue.

And concerning witches they are said to have offensive and harm-working eyes." In the play, *The Witch of Edmonton*[1] (written by Dekker, Ford and others), there is a similar reference to ejaculation from the eye in witch-craft:—"*Cuddy Banks.* That same party has bewitched me . . . I saw a little devil fly out of her eye like a burbolt, which sticks at this hour up to the feathers in my heart." For the effect of the eye upon the spirits of the person glanced at, we may compare Heywood's *A Woman Killed with Kindness* (Act II.):

"Oh, what a look did fly
To strike my soul through with thy piercing eye!
I am enchanted; all my spirits are fled."

The effect of love in fascinating or bewitching by rays emitted from the eyes is discussed by Burton, who quotes the following explanation: "So the beams that come from the agent's heart by the eyes infect the spirit about the patient's, inwardly wound, and thence the spirits infect the blood."[2]

[1] Act II. Sc. i. *Cf.* also Garth, *Dispensary*, i. 32, 33; Browne, *Pseud. Epid.* Bk. iii. c. 7.

[2] *Anat. Mel.*, III. 2, ii. 2. The subsection abounds with illustrations.

This may afford an explanation of a passage in *Much Ado about Nothing* (III. i. 34-36). Hero and Ursula are plotting to bring about a match between Beatrice and Benedick, and they discuss Beatrice, knowing all the while that she is eavesdropping :—

> "No, truly, Ursula; she is too disdainful;
> I know her spirits are as coy and wild
> As haggards of the rock,"

i.e., as wild hawks. I take this to refer to the action of the spirits of the lover upon those of the beloved object. The spirits of Beatrice would not allow themselves to be thus acted upon; when they felt the influence issuing from the lover's eyes, they fled back to the central organs, being as shy as a wild bird.

With regard to the spirits coming to the surface of the body, Burton[1] following Galen,[2] says of anger that it carries the spirits outwards, and the latter also states that "fear draws and collects within at the source both spirit and blood, at the same time making the surface parts cold." In

[1] *Anat. Mel.*, I. 2, iii. 9. [2] *De Sympt. Causis*, II. v.

Troilus and Cressida (IV. v. 56) the physical allurements of Cressida are thus described :—

"There's language in her eye, her cheek, her lip,
Nay, her foot speaks, her wanton spirits look out
At every joint and motive of her body."

Macbeth in his conversation with the murderers[1] believes their protestations because their sincerity is evident in their looks: "Your spirits," he says, "shine through you." And the following passage in *Cymbeline* (III. iii. 90) speaks of the spirits coming forth from the body under the influence of excitement :—

"When on my three-foot stool I sit and tell
The warlike feats I have done, his spirits fly out
Into my story . . .
(He) strains his young nerves and puts himself
in posture
That acts my words."

We are now in a position to understand Bacon's remark :[2] "In bashfulness the spirits do a little go and come; but with bold men, upon like occasion, they stand at a stay."

[1] III., i. 128.

[2] *Of Boldness.*

We have seen that Galen describes fear as drawing the spirits inwards to the heart; a little later in the same chapter[1] he continues: "In bashfulness at first the motion of the animal faculty (*i.e.*, of the animal spirits) is driven inwards; afterwards it hurriedly returns again to the outer parts, for if it should not return it is fear, not bashfulness."

The effect of study upon the spirits is mentioned several times by Burton.[2] He says: "Tis the common tenet of the world that learning dulls and diminishes the spirits, and so *per consequens* produceth melancholy." He quotes Cardan to the effect that the "natural spirits are resolved by study and turned into animal, drawn from the heart and those other parts to the brain," and he translates Ficinus (somewhat loosely) as follows: "whilst the spirits are intent to meditation above in the head, the stomach and liver are left destitute, and thence come black blood and crudities by defect of concoction (or digestion)." This will serve

[1] *De Sympt. Causis*, II. v.

[2] *Anat. Mel.*, I. 2, i. 6; iii. 15; 3, iii. *Cf.* Galen (ed. Kühn), vol. xvi. p. 311.

to illustrate the remark of Biron in *Love's Labour's Lost* (IV. iii. 306):

> "Why, universal plodding poisons up
> The nimble spirits in the arteries."

In an age when Demonology was the subject of a royal treatise, it is not surprising to find a widespread belief in the diabolic origin of many diseases. This was not the teaching of Galen, who like the Sadducees denied the existence of either good or evil spirits.[1] But writers of the sixteenth and seventeenth centuries firmly believed that devils acted both on the minds and on the bodies of human beings. This is what Burton says[2]:—"Many think he (the devil) can work upon the body, but not upon the mind. But experience pronounceth otherwise, that he can work both upon body and mind. Tertullian is of this opinion (c. 22): 'that he can cause both sickness and health,' and that secretly. Taurellus adds 'by clancular (secret) poisons he can infect our bodies, and hinder the operations of the bowels, though we perceive it not,' 'closely creeping into them,' saith Lipsius,

[1] Burton, *op. cit.* I. 2, i. 2. [2] *Ibid.*

and so crucify our souls. . . . And Jason Pratensis, 'that the devil, being a slender, incomprehensible spirit, can easily insinuate and wind himself into human bodies, and cunningly couched in our bowels vitiate our healths, terrify our souls with fearful dreams, and shake our minds with furies.' . . . Thus he argues, and that they go in and out of our bodies, as bees do in a hive, 'and so provoke and tempt us as they perceive our temperature inclined of itself, and most apt to be deluded.' It is to these beliefs that Milton refers in the fourth book of *Paradise Lost* (799-809), where Satan under the form of a toad is poisoning the body and mind of the sleeping Eve :—

"Him there they found
Squat like a toad, close at the ear of Eve;
Assaying by his devilish art to reach
The organs of her fancy, and with them forge
Illusion as he list, phantasms and dreams,
Or if, inspiring venom, he might taint
Th' animal spirits that from pure blood arise
Like gentle breaths from rivers pure, thence raise
At least distemper'd, discontented thoughts,
Vain thoughts, vain aims, inordinate desires
Blown up with high conceits ingend'ring pride."

The doctrine of vital and animal spirits received its death-blow when Harvey in

1628 demonstrated the circulation of the blood. If the blood that flowed through the arteries was the same blood that coursed along the veins, there was no need for the spirit-hypothesis. "So long," said Sir Michael Foster[1] "as the blood in the arteries and (that) in the veins were looked upon as two different kinds of waves, as it were, breaking upon and ebbing from the tissues, the one carrying natural and the other vital spirits, there seemed to be no opening for any attempts to explain the phenomena exhibited by this or that part, this or that organ or tissue, on physical or mechanical principles; everything was wrapped up in the mystery of the spirits. So soon, however, as it was recognised that the blood which was carried to a part along the arteries came back away from the part along the veins, the same blood, altered it may be in the transit but still the same blood, such attempts became at once possible. The spirits became at once mere qualities of the blood; their names might be retained, but the virtue had gone out of the names."

[1] *Hist. of Physiology Sixteenth to Eighteenth Century*, Lect. ii.

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