

53 communicated to the other parts of the body, must we not acknowledge that this happens by means of the blood, which is reheated in passing through the heart and spreads from there through the whole body? So it is that if we remove the blood from some part of the body, we thereupon remove the heat as well; and even if the heart were as hot as glowing iron, it would not be able to reheat the feet and the hands as it does unless it continually sent new blood to these parts. Then, too, we know from this that the true function of respiration is to bring enough fresh air into the lungs to cause the blood entering there from the right-hand cavity of the heart, where it has been rarefied and almost changed into vapours, to thicken immediately into blood again before returning to the left-hand cavity. For if this did not happen the blood would not be fit to serve as fuel for the fire in the heart. This is confirmed by seeing that animals without lungs have only one cavity in their hearts, and that unborn children, who cannot use their lungs while enclosed within their mother's womb, have an opening through which blood flows from the vena cava into the left-hand cavity of the heart, and a tube through which blood comes from the arterial vein into the great artery without passing through the lungs. Again, how would digestion take place in the stomach if the heart did not send heat there through the arteries, together with some of the most fluid parts of the blood which help to dissolve the food we have put there? And is it not easy to understand the action that converts the juice of this food into blood, if we consider that the blood passing in and out of the heart is distilled perhaps more than one or two hundred times each day? Again, what more do we need in order to explain nutrition and the production of the various humours present in the body? We need only say that as the blood is rarefied it flows with such force from the heart towards the extremities of the arteries that some of its parts come to rest in parts of the body where they drive out and displace other parts of the blood; and certain parts of the blood flow to some places rather than others according to the situation, shape, or minuteness of the pores that they encounter, just as sieves with holes of various sizes serve to separate different grains from each other. But the most remarkable of all these facts is the generation of the animal spirits: like a very fine<sup>1</sup> wind, or rather a very pure and lively flame, they rise continuously in great abundance from the heart into the brain, passing from there through the nerves to the muscles and imparting movement to all the parts of the body. The parts of the blood which are the most agitated and penetrating, and hence the best suited to compose these spirits, make their way to the brain rather than elsewhere. For this we

54

need suppose no cause other than the fact that they are carried there by the arteries which come most directly from the heart. For according to the laws of mechanics, which are identical with the laws of nature, when many things tend to move together towards a place where there is not enough room for all of them (as when the parts of blood coming from the left-hand cavity of the heart all tend towards the brain), the weakest and least agitated must be pushed aside by the strongest, which thus arrive at that place on their own.

I explained all these matters in sufficient detail in the treatise I previously intended to publish.<sup>1</sup> And then I showed what structure the nerves and muscles of the human body must have in order to make the animal spirits inside them strong enough to move its limbs – as when we see severed heads continue to move about and bite the earth although they are no longer alive. I also indicated what changes must occur in the brain in order to cause waking, sleep and dreams; how light, sounds, smells, tastes, heat and the other qualities of external objects can imprint various ideas on the brain through the mediation of the senses; and how hunger, thirst, and the other internal passions can also send their ideas there. And I explained which part of the brain must be taken to be the ‘common’ sense,<sup>2</sup> where these ideas are received; the memory, which preserves them; and the corporeal imagination, which can change them in various ways, form them into new ideas, and, by distributing the animal spirits to the muscles, make the parts of this body move in as many different ways as the parts of our bodies can move without being guided by the will, and in a manner which is just as appropriate to the objects of the senses and the internal passions. This will not seem at all strange to those who know how many kinds of automaton, or moving machines, the skill of man can construct with the use of very few parts, in comparison with the great multitude of bones, muscles, nerves, arteries, veins and all the other parts that are in the body of any animal. For they will regard this body as a machine which, having been made by the hands of God, is incomparably better ordered than any machine that can be devised by man, and contains in itself movements more wonderful than those in any such machine.

I made special efforts to show that if any such machines had the organs and outward shape of a monkey or of some other animal that lacks reason, we should have no means of knowing that they did not possess entirely the same nature as these animals; whereas if any such machines bore a resemblance to our bodies and imitated our actions as closely as possible for all practical purposes, we should still have two very certain

<sup>1</sup> See footnote 2, p. 100 above.

<sup>1</sup> See footnote p. 132, above.

<sup>2</sup> Cf. *Rules*, above p. 41, and *Treatise on Man*, above pp. 104ff.

means of recognizing that they were not real men. The first is that they could never use words, or put together other signs, as we do in order to declare our thoughts to others. For we can certainly conceive of a machine so constructed that it utters words, and even utters words which correspond to bodily actions causing a change in its organs (e.g. if you touch it in one spot it asks what you want of it, if you touch it in another it cries out that you are hurting it, and so on). But it is not conceivable that such a machine should produce different arrangements of words so as to give an appropriately meaningful answer to whatever is said in its presence, as the dullest of men can do. Secondly, even though such machines might do some things as well as we do them, or perhaps even better, they would inevitably fail in others, which would reveal that they were acting not through understanding but only from the disposition of their organs. For whereas reason is a universal instrument which can be used in all kinds of situations, these organs need some particular disposition for each particular action; hence it is for all practical purposes impossible for a machine to have enough different organs to make it act in all the contingencies of life in the way in which our reason makes us act.

58 Now in just these two ways we can also know the difference between man and beast. For it is quite remarkable that there are no men so dull-witted or stupid – and this includes even madmen – that they are incapable of arranging various words together and forming an utterance from them in order to make their thoughts understood; whereas there is no other animal, however perfect and well-endowed it may be, that can do the like. This does not happen because they lack the necessary organs, for we see that magpies and parrots can utter words as we do, and yet they cannot speak as we do: that is, they cannot show that they are thinking what they are saying. On the other hand, men born deaf and dumb, and thus deprived of speech-organs as much as the beasts or even more so, normally invent their own signs to make themselves understood by those who, being regularly in their company, have the time to learn their language. This shows not merely that the beasts have less reason than men, but that they have no reason at all. For it patently requires very little reason to be able to speak; and since as much inequality can be observed among the animals of a given species as among human beings, and some animals are more easily trained than others, it would be incredible that a superior specimen of the monkey or parrot species should not be able to speak as well as the stupidest child – or at least as well as a child with a defective brain – if their souls were not completely different in nature from ours. And we must not confuse speech with the natural movements which express passions and which can be imitated by

machines as well as by animals. Nor should we think, like some of the ancients, that the beasts speak, although we do not understand their language. For if that were true, then since they have many organs that correspond to ours, they could make themselves understood by us as well as by their fellows. It is also a very remarkable fact that although many animals show more skill than we do in some of their actions, yet the same animals show none at all in many others; so what they do better does not prove that they have any intelligence, for if it did then they would have more intelligence than any of us and would excel us in everything. It proves rather that they have no intelligence at all, and that it is nature which acts in them according to the disposition of their organs. In the same way a clock, consisting only of wheels and springs, can count the hours and measure time more accurately than we can with all our wisdom.

59 After that, I described the rational soul, and showed that, unlike the other things of which I had spoken, it cannot be derived in any way from the potentiality of matter, but must be specially created.<sup>1</sup> And I showed how it is not sufficient for it to be lodged in the human body like a helmsman in his ship, except perhaps to move its limbs, but that it must be more closely joined and united with the body in order to have, besides this power of movement, feelings and appetites like ours and so constitute a real man. Here I dwelt a little upon the subject of the soul, because it is of the greatest importance. For after the error of those who deny God, which I believe I have already adequately refuted, there is none that leads weak minds further from the straight path of virtue than that of imagining that the souls of the beasts are of the same nature as ours, and hence that after this present life we have nothing to fear or to hope for, any more than flies and ants. But when we know how much the beasts differ from us, we understand much better the arguments which prove that our soul is of a nature entirely independent of the body, and consequently that it is not bound to die with it. And since we cannot see any other causes which destroy the soul, we are naturally led to conclude that it is immortal.

### Part Six

It is now three years since I reached the end of the treatise that contains all these things. I was beginning to revise it in order to put it in the hands of a publisher, when I learned that some persons to whom I defer and who have hardly less authority over my actions than my own reason has over my thoughts, had disapproved of a physical theory published a little

<sup>1</sup> The section of the *Treatise on Man* referred to here has not survived.