

# 1: Facts and texts

The science of the soul exceeds all other parts of philosophy not only in “dignity and exactness”, but also in “usefulness, necessity, charm, and, above all, in difficulty”.<sup>1</sup> As the body is the subject of health and disease, so too the soul is the subject of virtue and vice; and just as the physician must devote great effort to knowing the body, anyone who treats morals “must take care to have a clear understanding of things pertaining to the *scientia de anima*”.<sup>2</sup> To be mistaken about the soul, in the way of materialists or the impious Averroes, is to leave “the good without reward, and evil without punishment”, and thus to “uproot all good morals, all laws and Republics”.<sup>3</sup> The study of the soul is inescapably a prolegomenon to moral philosophy and to theology.

But because it studies what is common to all living things, the science of the soul also prepares the way for the study of particular plants and animals, just as physics precedes the study of elements and mixtures.<sup>4</sup> The natural philosopher deals with six kinds of bodies: the simple incorruptible bodies of the heavens, the simple but corruptible terrestrial elements, imperfect mixtures (ice, comets), perfect inanimate mixtures (metals and pre-

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1. Toletus In de An. “Quæstiones proœmiales”; Opera 3:1. This is a paraphrase of Aristotle De An. 1c1, 402a1-5 and 11.

2. Suárez De An., “Proœmium”; Opera 3:464.

3. Toletus In de An. 2c1q2, Opera 3:45ra. This is a “moral reason” against Averroes’ opinion that the intellect is one and the same in all individuals, but similar remarks would also apply to any view according to which the soul is mortal. Compare 3c5q16, on the immortality of the soul, especially 3:153rb-154ra and 155rb: “we do not want, at least, to be like beasts and brute animals, but rather like the Angels and God; and so in this manner too we want to imitate them, and lift ourselves up to divine works and the contemplation and imitation of divine things”.

4. Aristotle, “before descending to the more particular consideration of living things (which he did in the books On the Motions, History, Parts, and Generation of animals, and in the [apocryphal] book On Plants) prefaces them with a general treatment of the principle of life itself, namely, the soul (to which may be added the books called Parva naturalia)” Eustachius, Physica pt3, Præfatio, Summa 247.

cious stones), plants, and animals.<sup>5</sup> Natural philosophy is accordingly divided into eight parts, two general and six specific:

In the first are treated the principles and *passiones* common to all bodies, such as matter, form, natural change, place, time; these form the books of the *Physics*, which hold the first place in the whole of *Physics*. Then the heavens are treated [in *De Cælo*], because the first *passio* of all, local motion, is in them, and because they are simple bodies. *De Cælo* also treats the elements, with respect to what they share with the heaven, namely, local motion. (...) Then follow other bodies, namely, the elements in their own right, that is, as generable and changeable, and as the cause of other changes; and this is in *De Generatione* (...). In the fourth place is the *Meteora*, which deals with imperfect mixtures; in the fifth *De Mineralibus*, which we do not have from Aristotle; followed by animate things. But [first] are some considerations on the soul by itself, on account of its many great difficulties, separately from [the books on] animals and plants; this is in the sixth place. In the seventh are animals. In the eighth, plants.<sup>6</sup> These are all the parts of *Physics* (Toletus *In de An.* “Q. proœmiales” q3; *Opera* 3:5ra).

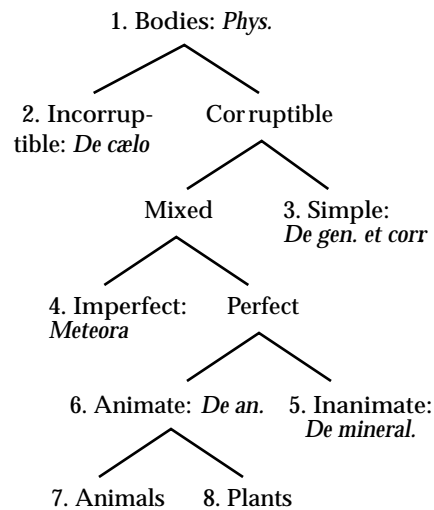


Fig. 1. Classification of corporeal substances in Toletus.

The study of sensible qualities like color and sound tends also to be placed in the *scientia de anima*. In Aristotelian natural philosophy sensible qualities are no less real than the sizes and shapes of things. In fact the tactile qualities of hot, cold, wet, and dry are more fundamental; those qualities are studied in texts on generation and corruption. Aristotle occasionally hints that the remaining sensible qualities—color, sound, and so forth—may have effects on bodies other than the sense organs of animals. But perhaps because those effects are dubious, while their effects on the senses are well known, while the others are uncertain, color, sound, and so forth are treated at the same time as the senses they affect. Although optics and music, because they are “mixed” sciences,<sup>7</sup> are not properly part of

5. Toletus *In de An.* “Q. proœmiales” q3; *Opera* 3:5ra. The word ‘scientist’ came into use only in the nineteenth century. In the Latin vocabulary of the period, the most common terms for those who study natural philosophy are ‘physici’ and ‘philosophici’.

6. The reference here is to the apocryphal *De plantis* composed by Nicolaus of Damascus. Aristotle’s original was lost, and the *Historia plantarum* of Theophrastus was not known until the fifteenth century. See Grafton 1988:791, Schmitt 1971:267. Suárez notes the doubtful authorship of *De plantis*, but cites it even so (Suárez *De An.*, 1c4¶5; *Opera* 3:493).

the system of natural philosophy outlined above, questions about sensible species, their media, and their causes do belong to that system, and are treated mostly in the *scientia de anima*.

The most important object of study for the *scientia de anima* is the rational soul. The *scientia de anima*, when it studies plants and animals, and the vegetative and sensible powers of the human soul, differs only in its objects from the sciences prior to it. When it arrives at the human rational soul, however, it is confronted with new kind of object, a spiritual object, but one which is fitted by nature to be joined with matter, and which depends for its knowledge on the senses, which are corporeal. It is “neither a purely intellectual substance, nor a purely sensitive form, but rather a sort of intermediate substance embracing both”; for that reason it is said to be “the horizon between spiritual and corporeal [things]”.<sup>8</sup> Its study cannot, therefore, be included entirely within natural philosophy. By virtue of its relations with the body, the rational soul remains a proper object of natural philosophy. But the study of the “separated” soul—the soul after death and before the resurrection of the body—is hardly part of natural philosophy at all: it “is very much a theological matter, and greatly transcends natural science”.<sup>9</sup>

The data of the *scientia de anima*, the topic of this chapter and the next, are as various as its objects. They include, first, the knowledge of the habits and forms of plants, animals, and people that comes from everyday experience, or is attested by creditable observers—including authoritative texts like those of Pliny and Aristotle himself.<sup>10</sup> That knowledge includes our knowledge of ourselves, which, though not the cornerstone of the Aristotelian edifice as it is of Descartes’, is essential, especially in the study of the senses and the intellect. Second, there is the knowledge provided by those texts whose claim to convey the word of God is recognized by religious institutions—the Old and New Testaments,

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7. In Aristotelian classifications of the sciences, optics and music (comprising not only acoustics but also part of music theory) are called mixed or middle sciences, because they borrowed their principles (e.g. concerning the nature of light) from natural philosophy but used mathematics (geometry in the case of optics, arithmetic in the case of music) to study them. The *scientia de anima*, on the other hand, studies the nature and causes of visible and aural qualities. On the *scientia media*, see Dear 1988, Dear 1995.

8. Toletus *In de An.* 2c1q2; *Opera* 3:46va.

9. “Sextus [liber] de statu animæ separatæ, illius enim consideratio valde theologica est, multumque naturalem scientiam transcendit” (Suárez *De An.*, “Prooemium”; *Opera* 3:465).

10. The *Parva naturalia* and the “animal books”—the *De generatione animalium*, *De partibus animalium*, *De motu animalium*, and the *Historia animalia*—contain, of course, a wealth of observations. There were, however, rather few commentaries on those works. In Blum’s tabulation of the commentaries listed by Lohr, there are 603 *De Anima* commentaries; next is *Parva naturalia* with 113; there are only 13 on *De partibus*, 6 on *Historia*, 4 on *De generatione*, none on *De motu* (Blum 1988, Lohr 1974–1982).

the fathers of the Church. Of special significance for Catholic philosophers and those who, like Descartes, wished to avoid outright disagreement with tradition were the decrees of the Church, especially the propositions on the soul originating from the Lateran Council under Pope Leo X. These will be treated in the next chapter.

## 1.1 The living world

No doubt some sort of distinction between living and nonliving things comes to us early in life.<sup>11</sup> In every human culture the classification of things into living and nonliving is among the most basic. Though sometimes judgments have changed, Aristotle's division between the living and the nonliving, those of Aristotelian authors, Descartes', and our own, overlap a great deal. But broad agreement on the domain of life coexists easily with controversy about cases or with grossly dissimilar concepts of life. The list of things that Hobbes, Descartes, and Regius would call plants and animals differs little from the lists that Toletus, Suárez, or Eustachius would give. The concept of the living in the new philosophers, on the other hand, differs as greatly from the Aristotelians' as do their concepts of body and natural change.

For the moment, my concern is not with concepts but with the world as it presents itself in the discourse of natural philosophy, through what the Aristotelians call *experientia*.<sup>12</sup> The word is most often used to introduce singular statements or generalizations of limited scope:

Every accident of a living thing, every organ and the temperament and disposition of every organ is conserved by the soul: this we see from experience, for when the soul departs, all these things melt away and are corrupted.<sup>13</sup>

The first reason is taken from experience. Sometimes we hear in the most hidden and closed-in places, with which the air outside cannot communicate, since it is entirely surrounded by the strongest walls: therefore the continuous motion of the air cannot reach to the sense of hearing.<sup>14</sup>

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11. See Atran 1990:50–51, and the studies cited there.

12. On the notion and use of experience in medicine, see Roger 1971, 1c1§4, p31–45.

13. “Omnia accidentia viventis, & omnia organa, & eorum temperies, & dispositio ab anima conservatur: quod experientia videmus: nam ipsa recedente, omnia diffluunt & corrumpuntur” (Toletus In de An. 2c1q1; Opera 3:40ra).

It is sometimes used generally, in phrases like *experientia constat* ('experience shows') or *patet ex experientia* ('it is clear from experience'), to affirm that some such statement, which the reader may readily divine, will furnish a reason for what is asserted:

Some mistakenly hold that however many *actus* there are, there are that many *potentiæ* ⟨...⟩ (but this is clearly false, as arguments prove and experience testifies).<sup>15</sup>

For example, as Toletus later notes, vision is one power with many objects—white, black, red, and so forth.<sup>16</sup>

*Experientia* need not, and usually do not, denote something the author himself has observed. Even when the first person is used, it is rather to suggest an implicit generality than to report an actual event in the author's life:

When I see myself in a mirror, it is nothing other than myself that I see in the mirror, but I myself; the species of my figure, going forth toward the mirror, bounce off of it, and make me appear outside of me; so that if I were to see myself directly I would appear to be two.<sup>17</sup>

I see a man, whom I have not seen before, and right away, with eyes closed, I form a conception of him, which before my seeing him it was impossible to have: therefore I receive something from the object, since if I received nothing, I would be as I was before I saw him, and I could not form a conception [of him].<sup>18</sup>

Many *experientia*, indeed most, are taken from other texts. Often they are passed along from one version of a standard *quæstio* to the next without alteration. Despite the jibes of their opponents, textbook authors were not unduly credulous. But attempting to see for oneself, or to recreate the situation described in an authority, was not among the things they customarily did, no more than they are for most of us when we read the newspaper

14. "Prima ⟨ratio⟩ sumitur ab experientia. Audiemus enim aliquando in locis occultissimis, & clausissimis, quibus non communicat aer externus, cùm tota fuerint fortissimè muris circumdata: ergo motus aeris non perveniet usque ad auditum continuus" (Toletus In de An. 2c8q21; Opera 3:94ra).

15. "Nonnulli decepti putarunt, ut quod sint actus, tot sint potentiæ, vel quot sint in mundo objecta formalia, tot sint potentiæ, vel quot actus, tot objecta, vel contra (nam hoc perspicuè falsum est, ut probant argumenta, & experientia constat)" (Toletus In de An. 2c4q8; Opera 3:61va).

16. *Experientia* could of course be introduced without the word itself. But it was routine to do so, especially when distinguishing arguments a priori from arguments a posteriori, or (as in n. 15) argumenta—conceptual grounds, we might say—from reasons based on experience.

17. "Cùm ego video in speculo me, non est aliud à me, quod in speculo video, sed ego ipse: species enim meæ figuræ procedentes versus speculum, reperiuntur, ac me, extra me, apparere faciunt: unde si viderem me directè, apparerem duo ⟨...⟩" (Toletus In de An. 2c8q22; Opera 3:94vb). The passage comes from a question on echoes.

18. "Video hominem, quem non vidi, statim, oculo clauso, formo notitiam illius, quam ante primam visionem impossibile fuit habere: ergo aliquid recipio ab objecto: si enim nihil reciperem, haberem me sicut ante visionem, nec possem formare notitiam" (Toletus In de An. 2c12q33; Opera 3:109vb).

or the *Scientific American*. The encounter between the philosopher and the world was mediated by texts that custom had sanctified—Pliny, Galen, ancient commentators like Themistius and Philoponus, with occasional references to recent authors like Vesalius and Fernel.<sup>19</sup>

Some *experientia* do appear to result from interventions or contrived situations, and approach what now are called experiments:

We see from experience that a flute, however much it is moved by the tongue, cannot distinctly express speech [*vocem*]: how then does the air, when it strikes a wall, or other air, produce discourse with syllables? (...) <sup>20</sup>

Experience shows that a nerve from which the flesh has been stripped, will have sensation if it is pricked. <sup>21</sup>

Rarely, if ever, do we find the kind of first person report that Descartes—fictively or not—gives of the experiments he used to analyze the causes of rainbows, and still less the dated, located reports produced by Pascal and Boyle. In the texts of interest here, there is no “virtual witnessing”; trust is generated in other ways.<sup>22</sup>

*Experientia*, then, consist in reports, mostly impersonal, of things sensed; their warrant is either an implicit appeal to what the reader, as a person with normal faculties, has seen or might see or else an explicit appeal to an authority.<sup>23</sup> The world of living things, for the purposes of what follows, is the world of phenomena, not the world as it actually is or as we believe it to be—with due allowance for disagreement among the Aristotelians themselves—over the precise contents of that world.

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19. For example: Toletus In de An. 2c7q16, Opera 3:84ra (Vesalius on the eye); 2c11q30, 3:105ra (Fernel on feeling in the nerves); Suárez De An. 2c9¶11, Opera 3:601 (Zimara, Valles on the role of heat in nutrition), 3c6¶8, 3:639 (Cajetan, Soto, Nifo, Javellus on judgment and the senses), 3c13¶5, 3:659 (Valles and Fernel on the brain and the senses), 3c18¶1, 3:673 (Dandin and Vesalius on the eye).

20. “Experimur enim, quòd tibia, quantumcunque à lingua moveatur, non potest distinctè vocem exprimere: quo modo ergo aer percutiens murum, vel alium aërem, syllabicum faciet sermonem? Et hoc etiam argumento probari potest, non multiplicari voces per medium, nec sonus consequenter” (Toletus In de An. 2c8q22; Opera 3:95ra). Note that here the *experientia* is called an *argumentum*, and said to “prove” a statement. The distinctions mentioned in n. 16 were not rigidly adhered to.

21. “Experientia ostendit, quòd nervus denudatus à carne, sentit, si pungatur” (Toletus In de An. 3c2q5; Opera 3:121va). The observation comes from Galen.

22. In other kinds of text Aristotelian authors too presented first-person reports of dated and located events. E.g. Scheiner, *Rosa ursina*.

23. An authority, that is, other than a sacred text or a pronouncement of the Church. Those have a special status: unlike even the most credible secular authors, they cannot be contradicted.

## 1.2 Operations

The powers and forms that populate the Aristotelian world affect the senses only indirectly, through their *actus*, their activity or operation. Through experience we know that animals eat, move, see; from which the Aristotelian infers the power to be nourished, to move oneself, to see, and beyond that the substantial form which is the unifying principle of those powers, and from which they emanate. The operations of animals, moreover, typically are directed toward certain objects. Eating requires food, seeing requires light and color. Certain kinds of self-motion have the body itself as their object. There is a standard question, which I will discuss later, asking whether *potentiæ* are distinguished by their *actus* or their objects. Here the details can be neglected. What matters is that the data are, first of all, the activities or operations of plants and animals, and, second, the structures needed to support them.

Aristotle's fundamental division of vital operations is fivefold: vegetation, sensation, appetite, local motion, and intellection.<sup>24</sup> Vegetation includes nutrition, growth, and generation; sensation includes memory and imagination; appetite all kinds of desire (but not acts of will). There is no harm in using Aristotle's own classification, since I do not pretend that the phenomena are anything like raw data. They are colored from the start by their intended uses.

1. *Vegetation*. The only operations found in all living things are nutrition, growth, and generation. Of these, generation is basic: the end of all forms is existence, eternal if possible, but failing that, the immortality which consists in being generated anew in successive matters. Only in living things does the form provide the individual with the powers to produce its like in new matter.<sup>25</sup>

But like from like is not the only way living things are produced. Sometimes animals issue spontaneously from putrefying matter, under the action of the sun—worms, frogs,

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24. “{...} quinque esse vitæ opera, vegetationem, sensationem, appetitionem, motionem secundum locum, & intellectionem” (Toletus In de An. 2c1q7, Opera 3:60rb; cf. Aristotle De An. 2c3, 414a30–34, Thomas Aquinas In de An. (Pirota) 2lec5). Elsewhere Aristotle lists four operations, combining sensation and appetite, which are always found together, into one (Toletus In de An. 2c2tx13, 18; Aristotle De An. 2c2, 413b5–10, 414a3–4). It is worth noting that Descartes in L'Homme reproduces the division (except for intellection, since that is an operation of the soul alone).

25. This needs to be qualified in various ways: (i) distinguishing generation of animals from that of elements; (ii) animals are not self-sufficient in generation—they require the assistance of “universal causes” or (in the case of humans) God himself.

wasps, mice. Sometimes, even, animals are born from other animals not of their own species. Since some animals are generated both spontaneously and by parturition, there is a threefold division:

- (i) those generated only by putrefaction, like worms;<sup>26</sup>
- (ii) those generated only by birth, including horses and people;<sup>27</sup>
- (iii) those that can be generated in either way, including wasps and ants.<sup>28</sup>

Only in the mid-eighteenth century did so-called “equivocal” or “spontaneous” generation began to be rejected.<sup>29</sup> Until then, generation did not require antecedent life, except insofar as the souls of living things, which require the assistance of celestial powers for their production, could be said to exist “eminently” in those powers.

The norm of generation by parturition is of like by like. But some animals give birth, sometimes or always, to species other than their own: frogs produce tadpoles; “silkworms ⟨...⟩, since they are worms, produce butterflies, and these again give birth to eggs, from which come the same kind of worms”.<sup>30</sup> Because the boundary later erected by the impossibility of generating life from non-life does not yet exist, the realm of the living is, in fact, permeable, both downward and upward. Since what are undoubtedly animals

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26. “Animalia tripliciter generantur. Quædam semper ex putrefactione generantur, ut anguillæ, & alia animalia, quorum meminit Arist. 7. histor. cap. 15. & 16. hæc enim semper ex putrefactione generantur” (Toletus In de An. 2c4q11; Opera 3:72vb).

27. The difference, it should be noted, is one of degree—the amount of time needed to produced the new animal. “Quædam alia semper ex partu generantur, ut homo, & equus, & alia; quorum meminit Arist. problem. sect. 10 q. 64 ubi petit, cur aliqua semper ex partu fiant, aliqua aliquando ex putrefactione? Respondet quia sunt animalia perfecta, quæ ad sui productionem indigent multo tempore, & hæc non possunt ex putrefactione fieri: quia materia exterior, non potest tanto tempore conservari. Quædam alia brevi fiunt, & sic ex putrefactione aliquando fiunt” (Toletus In de An. 2c4q11; Opera 3:72vb).

28. “Quædam sunt alia animalia in tertio gradu, quæ modo ex putrefactione fieri, modò ex partu fiunt, ut vespæ, mures, & alia; quorum meminit Aristoteles 7 Metaphysicor. cap. 7.” (Toletus In de An. 2c4q11; Opera 3:72vb).

29. Generation without seeds was not universally accepted even in the seventeenth century. But the reasons for rejecting it are sometimes surprising. Giovanni-Benedetto Sinibaldi argued against it on the grounds that “if animals could be born spontaneously, God would not have ordered Noah to bring onto the Arc one pair of each kind” (Roger 1971:30).

30. Advertendum ulterius, quòd eorum, quæ ex putrefactione sunt, quædam nunquam generant, ut anguillæ, & alia; ut docet Aristot. 7. histor. cap. 16. Alia generant, sed sibi dissimilie in specie, quod docet Aristot. 1 de generat. animal. ca. 1. Ut ranæ ranunculos, & muscæ aliud diversum generant, ut docet Plinius lib. 10. cap. 68. Et bombices, ex quibus fit sericum, cùm sint vermes, producunt papiliones, & illi rursus ova pariunt, ex quibus ovis iterum fiunt iidem vermes. Quædam alia sibi simile in specie generant, ut mures & vespæ, quæ ex putrefactione sunt, iterum vespæ sibi in species similes generant; ut docet Philoponus super text. 34” (Toletus In de An. 2c4q11; Opera 3:72vb).



can be produced from nonliving matter, it may be—some thought it was—that other things, like crystals and metals, that grow from the same mud are intermediate between the living and the nonliving.<sup>31</sup> Above corporeal life, on the other hand, are the intelligences that, as *formæ assistentes*, guide the planets and the heavens, and the innumerable ranks of angels. Though their souls are never joined with matter, they do share with living things, or at least with humans, the intellectual operations and the free acts of will that are the highest expression of life on earth. Even God—so Thomas argues—must be said to live; indeed he is *viventissimus*, the most alive of all.

Now, after the discovery of the gene and the double helix, it has become increasingly difficult to recover that sense of the ease with which nonliving and living could exchange places. That the heavens are alive, that the world is filled with microscopic *semina vitales*,<sup>32</sup> that the Earth and planets have souls—none of that was definitively put to rest, even in this century. For Bernard de Maillet, author of *Telliamed* (1748), all of space is “filled with the seeds of whatever can have life in the universe”, seeds so fine “that it is impossible to perceive them even with the aid of the best microscopes”.<sup>33</sup> Gustav Fechner gave the Earth a soul, to which our souls and those of all the living creatures around us stand as our sense organs do to us.<sup>34</sup> More recently, Svante Arrhenius held that germs of life, transported throughout the universe by light rays, “come to fecundate the wandering planets”.<sup>35</sup>

In a mechanistic physiology, on the other hand, it is the nonliving that extends its dominion to everything but humans and the superhuman. Descartes never, to be sure, quite managed to explain how generation occurs, nor did he explain how there could be beast-machines in the first place (no-one have expected him to: that was already recounted in Genesis). But when, at the outset of the *Météores*, after noting that clouds, like all things above, excite admiration, he expresses the hope to “explain their nature, in such a way that there will no longer be occasion to admire anything one sees there”, that

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31. G. E. R. Lloyd notes that despite his criticism of earlier philosophers for blurring the distinction, even for Aristotle “the dividing line ⟨...⟩ is hard to determine, and ⟨...⟩ nature passes in continuous sequence from the inanimate to the animate” (Lloyd 1992:153). On the other hand, Suárez writes that “certain moderns (so I am told) have dared to deny that the vegetative form, considered absolutely [præcise], is a soul; and consequently they deny that plants are alive” (Suárez De An. 1c4¶7, Opera 3:494).

32. Du Chesne, *La Morocosmie*, première chant dorique, 1583 (Tuzet 1988:330). Tuzet’s fascinating book includes several chapters on cosmic vitalism.

33. Tuzet 1988:333; Maillet *Telliamed*, quoted in Tuzet 1988:193.

34. Fechner’s views are enthusiastically reported by James Plur. univ., Lect. 4.

35. Tuzet 1988:194; see Arrhenius, *L’Évolution des mondes* (1907).

hope could have equally well have applied to the living world.<sup>36</sup> Animals no more deserve our admiration than clouds. If their organs exhibit “marvelous artifice”, still the only difference between their workings and those of the machines we make is size.<sup>37</sup> If admiration is the passion we feel when we encounter something “new, or greatly different from what we have known before”,<sup>38</sup> then the animate world ought not to excite admiration. There is nothing new in the living that was not in the nonliving, nothing except a difference in scale. Nature takes no account of scale, nor should we.

After generation, the first and most natural of vital operations, comes nutrition. Unlike inanimate things, animals and plants nourish themselves. “Every living thing nourishes itself by an agreeable food [*alimento*]; the agreeable is whatever can be assimilated easily into the body being nourished”.<sup>39</sup> Experience shows that although one may live for some time without food, “the daily conversion of food cannot cease without some corruption”.<sup>40</sup> A tree uprooted dries out quickly, because its humidity, no longer replenished, is consumed and weakened by its heat.<sup>41</sup> Living things, therefore, naturally exhibit thirst and hunger, and seek their proper aliment.

Food, once eaten, is transmuted or “decocted” into a variety of substances: “in the stomach [the nutritive virtue] is for generating chyle, in the liver for elaborating the blood, in the veins for purifying it”.<sup>42</sup> Though there was controversy over the precise character of the process of assimilation—whether, for example, the blood or some further decoction of it is genuinely animated by the soul<sup>43</sup>—it was clear from experience that at some point food is transmuted into bodily substance.

Aside from maintaining a balance of the hot and the cold, the wet and the dry, in the various organs of the body, nutrition is necessary to growth. Most if not all animals and plants have a characteristic size, which is necessary for sustaining vital operations, and in

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36. Descartes *Météores* 1, AT 6:231; compare 6:366.

37. Descartes *Homme*, AT 11:201; PP 4¶203, AT 8/1:326.

38. Descartes PA 2a53, AT 11:373.

39. Suárez De An. 2c4¶2, Opera 3:587, citing Galen De temp. 3c2.

40. “Secundo patet experientia: nam licet homo cesset a cibando dies aliquot, non continuo moritur, quamvis debilitetur aliquanto, tunc autem cessat a conversione alimenti, cum nullum habeat, imo propriam substantiam consumat” (Suárez De An. 2c7¶5, Opera 3:592). “Cessatio a conversione alimenti diuturna esse non potest absque corruptione viventis. Ita ostendit experientia <...>” (¶6).

41. Suárez De An. 2c7¶6, Opera 3:593.

42. Suárez De An. 2c4¶7, Opera 3:588.

43. Suárez argues that “neither the blood, nor the other humors, is informed by the soul” (De An. 2c5¶6, Opera 3:590).

particular for generation by birth, since that requires the “cutting off [*decisio*] of some part of the generator’s own substance”.<sup>44</sup> As Toletus puts it,

A living thing, at the beginning, cannot have a quantity sufficient to carry out its operations perfectly, because the matter from which it was made, was meager, being taken from another living thing; and thus it is born with a small quantity: on account of this, there is another operation by which the living thing is brought forth to its due limits through external nutriment: and this is called growth.<sup>45</sup>

Growth serves generation, as nutrition serves growth. In fact all the operations of life, except intellection, are arranged in two orders: the first according to the ultimate end of living forms, which is existence in perpetuity, the second, according to the spirituality of the operation. In the first order, generation is primary, in the second, intellection. In both, as we will see, there is an imitation of God, his eternity or his omniscience.

That generation is primary in the order of perpetuation can be seen from the fact that “through generation animals shorten their lives”, so that, as Aristotle says, “salacious animals have a shorter life than chaste ones do”.<sup>46</sup> No doubt clerics vowed to chastity were happy to learn that Nature herself vindicated their chosen path. But why should it be that sexual relation, which after all further the end of perpetuation, should be harmful, not only shortening life but weakening judgment and memory? “For the conservation of the species, Nature permits some amount of harm to the individual, as it permits the corruption of the whole form of wood for the production of fire”.<sup>47</sup> The parallel is not entirely convincing, since the wood is entirely destroyed for the fire’s sake, but the mode of argument is clear enough. It is seen, for example, in discussions of the *horror vacui*, where some authors have it that to preserve the integrity of the world, which would be threatened by a void, bodies will rush in even to their own detriment. That animals’ health should be put at risk in the interest of procreation—whether by intercourse or preg-

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44. Suárez De An. 2c8¶2, Opera 3:593–594.

45. “Vivens in principio non potuit habere suam sufficientem quantitatem, qua perfectè exerceret suas operationes: quia materia, ex qua fuit factum Vivens, fuit pauca, quia sumpta ex altero vivente, & ideo in parva nascitur quantitate: ob id est alia operatio, qua Vivens ex nutrimento externo producitur ad suum debitum terminum: & talis dicitur augmentatio” (Toletus In de An. 2c4q11; Opera 3:71ra).

46. “Nam animalia per generationem vitam abbreviant. Dicit enim Aristot. lib. de longit. vitæ cap. 3 animalia salacia esse brevioris vitæ, quàm casta” (Toletus In de An. 2c4q11; Opera 3:72rb-va).

47. “Certum est, castitatem referre ad longitudinem vitæ; imò etiam ad perspicacitatem ingenii & iudicii, & ad firmitatem memoriæ: & sic hic finis spectaretur, verè nocumentum adferret. Sed propter speciei conservationem, Natura patitur aliquam nocumenti partem in individuo; sicut etiam totius formæ ligni corruptionem ad productionem ignis (...)” (Toletus In de An. 2c4q11; Opera 3:73va).

nancy—thus confirms the primacy of generation among the nutritive, indeed among all, powers of the soul.

2. *Sensation, appetite, locomotion.* Though plants have sometimes been credited with sensation, for Aristotle and his commentators sensation divides plants from animals.<sup>48</sup> In the broadest sense, sensation includes appetite, change of place or local motion, as well as the internal senses: the *sensus communis*, which receives those sensible qualities which are known by more than one sense; imagination and memory; and a certain power of judgment, sometimes called the *vis aestimativa*, which manifests itself in the foresight and prudence exhibited by some animals.

Reports of sensation are, in a certain sense, *experientia per excellentiam*. But from the standpoint of Aristotelian natural philosophy, and above all where humans are concerned, they present difficulties absent from *experientia* concerning inanimate things and plants.

The majority of *experientia* in arguments on the senses are reports of human experience. The sensations of animals we know only indirectly, from their actions, or from trying to teach them; that knowledge is far less detailed and extensive than our knowledge of what we sense. Aristotle notes in the *Historia animalium* that “fishermen, when they are catching fish, do not utter a word, because their words would immediately be heard by the fish”.<sup>49</sup> The meagre catches of noisy fisherman provide evidence that fish can hear. Or again: it is hardly to be doubted that we have imagine and remember. But with other animals, one might well wonder. In *De anima* commentaries, a standard question asks whether ants and bees have imagination (including memory). The *experientia* in favor of their having imagination is that they exhibit *prudentia*. In other animals, it is their teachability, which is an indication both that they have imagination and of the acuity of their hearing. In the *Metaphysics* Aristotle distinguishes three grades of animals that make use of imagination [*phantasia*].

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48. Augustine ridicules the Manichæans for attributing sense and even reason to trees (De mor. Manich. 2c17; see also De hæresi c46, De vera relig. c55; Suárez De An. 1c5¶1, Opera 3:499). According to Aristotle, “sense inheres first of all [primò, echoing primum in Moerbeke’s translation of the text] in animals. As vegetation is first of all in plants, so sense is in animals: there is no animal without sense” (Toletus In de An. 2c2tx16, 3tx27; Opera 3:49vb; Aristotle De An. 413b, 414b).

49. “Sonus recipitur aliquando, ubi nullus est motus localis: ergo non est motus. Antecedens patet 4. histor. Animalium, c.8 ubi dicit, piscatores, dum pisces capiunt, nullum emittere verbum, quia statim audiuntur à piscibus: & tamen non est credendum, quòd motus transeat per totam aquam: erit ergo sonus” (Toletus In de An. 2c8q19; Opera 3:92va). See also 2c8q20; 3:93rb.

The first is of those imperfect animals whose imagination [*imaginatio*] is indeterminate and not distinct from touch. The second is of those that have a perfect imagination, together with memory: and such are the animals that have prudence.

The third [grade] is of those that, along with memory and imagination, have hearing, and these can be trained [*disciplinabilia*]: by hearing they perceive the voice of the trainer, by memory they retain similar sounds, and become accustomed to operating according to a certain inclination. But not just any kind of hearing suffices.

Animals' hearing is threefold: (...) some hear only confused sounds, and all [sounds] uniformly without distinction; that is how I think bees hear. Others perceive, with the sound, a certain pleasant harmony, like dolphins and nightingales. Still others hear voices distinctly, and make distinctions among sounds: these can be trained. Note that many [animals] can be taught than might be apparent to those unversed in training them. Mice are commonly held to be untrainable, and yet Albert says he saw mice holding candles with their paws on a table at the command of the master of the house for the other people dining.<sup>50</sup>

Nevertheless, a far greater number of *experientia* report on what we humans typically see, hear, and so forth. For reports based on reflection, the appeal to *ordinary* experience would seem crucial. It is one thing to draw on reports of unusual events recorded by observers known to be trustworthy, and another to accept the report of an unusual experience, an unusual *seeming* or *appearance*, especially one that, unlike the troubled vision of drunks, would not have a marked effect on action.<sup>51</sup> There are exceptions, however. A few people achieve beatitude, which “consists in a clear vision of God”.<sup>52</sup> Such visions, though not at all ordinary, or encountered in everyday life, require explanation, ideally in a manner consistent with that of other kinds of perception. The experience of separated souls is again a problem for which everyday experience can offer no help; nevertheless,

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50. Primus est illorum imperfectorum, qui solam illam indeterminatam imaginationem à tactu non distinctam habent. Secundus, est habentium perfectam cum memoria: & talia sunt animalia prudentiam habentia.

Tertius, est eorum, qui simul cum memoria, & imaginatione habent auditum: & hæc disciplinabilia sunt: nam auditu percipiunt docentis vocem, memoria retinent similes sonos, & assuescunt ad operandum inclinatione quadam; tamen non quicunque auditus sufficit.

Tripliciter enim audire contingit animalia; (ut docet albert. libr. 8 histo. tract. 5 ca. 1) quædam audiunt tantum sonos confusos, & omnes uniformiter absque distinctione; quomodo ego puto audire apes. Alia cum sono quadam harmoniam delectantem percipiunt; sicut Delphines, & Philomæla. Quædam distinctè voces percipiunt, distinctionemque sonorum formant: & hæc sunt disciplinabilia. Et attende multa esse disciplinabilia, quæ non apparent inexpertis; communiter enim mures indiscipinabiles existimant, & tamen Albert dicit se vidisse supra mensam, murem candelam manibus tenere ad imperium domini aliis cœnantibus (Toletus In de An. 3c3q8; Opera 3:128vb).

51. See Toletus In de An. 2c7q17; Opera 3:84vb.

52. “Nam beatitudo consistit in clara Dei visione” (Suárez De An. 3c5¶22, Opera 3:636). Although the beatific vision is miraculous, it consists rather in the miraculous impressing of species on the senses than in a direct intervention in mental processes. It is, in other words, normal perception, mediated by a peculiar instrument.

understanding the status of the soul after death “does pertain to having perfect knowledge” of it, and so arguments must be made either by speculation from the world of the living, or by drawing on reports of afterlife experience, however unusual these might be.<sup>53</sup> Admittedly beatitude is rare, and the life of separated souls lies more in the province of theology than of philosophy. Yet granting even the possibility of beatific visions or of perception in separated souls constrains theories of perception to those which can reconcile themselves to that possibility.<sup>54</sup>

There are, finally, reports of illusion. In these there is something paradoxical from the Aristotelian standpoint. They are not reports of nature following its ordinary course, but of nature failing, even if in predictable ways. To cite a famous example:

A straight rod half immersed in water appears bent. Either the eye is the cause of this deception, or the rod, or the medium. The eye is not, since it operates uniformly, whether in water or in air. Nor is the rod, since it is straight. Therefore the medium itself [is the cause]; therefore the medium receives something from the object, since if by its mere presence [the object] made vision occur, there would be nothing to cause the deception.<sup>55</sup>

That the rod appears bent is functioning as an *experientia*, one easily repeated. But *experientia* are supposed to report on events that occur in the ordinary course of nature—“always or for the most part”, rather than by violence or chance<sup>56</sup>—and that therefore exhibit the normal, unimpeded operation of the powers of natural agents. Illusions are not, in that sense, ordinary: in the present example, the medium, by distorting the visible species of the rod, hinders the soul from recognizing its shape.

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53. Suárez De An. 6, introduction, Opera 3:782.

54. The arguments in the book of Suárez’s De anima devoted to separated souls are largely a priori, starting from the proposition, proved earlier, that the individual soul is immortal. The few references to the experiences of separated souls occur in citations from the Bible (De An. 6c3¶3 & 5, c10¶4, Opera 3:786–787, 801) or from patristic authors (6c7¶4, 3:795).

55. “Baculus enim rectus habens medietatem in aqua, apparet fractus: vel oculus est causa deceptionis huius vel baculus, vel medium. Non oculus, cum uniformiter se habeat, sive ille sit in aqua, sive in aere. Nec baculus, cum rectus sit: ergo medium ipsum; ergo aliquid medium ab objecto recipit; si enim per solam praesentiam fieret visio, nulla illic esset causa deceptionis” (Toletus In de An. 2c12q33; Opera 3:109vb). Cf. 6 Obj. no. 8, AT 7:418, 6 Resp., AT 7:438.

56. ‘Always or for the most part’ is a set phrase denoting what occurs normally, rather than by chance. Its precise sense is unimportant here; what matters is that experientia typically report what occurs always or for the most part, which in turn yields information about the powers exercised by things under normal conditions. See Des Chene 1996, §6.4 for some Aristotelian interpretations. Two recent analyses are Mignucci 1981 and Judson 1991b.

Reports of illusion record regular *malfunctions* of the senses. Among non-normal conditions, some give rise to similar outcomes each time they occur; so that if we abstract momentarily from the purpose of sensation—which is knowledge of the sensible qualities of things—then the bent appearance of the rod is not fortuitous at all. It is indeed what happens always or for the most part when we see a rod half-immersed in water. Under the Aristotelian conception of chance, the illusion is a chance event with respect to the observer, but not with respect to the medium and the object. A second example illustrates the point:

⟨...⟩ sometimes light from the outside joins with certain mixed bodies, and because of various reflections, makes diverse colors appear, as in the necks of doves and other animals.<sup>57</sup>

The third cause [of species' not representing things as they should be represented] may be the situation and distance of the object: thus colors appear in the neck of a dove, because light so positioned is transmitted in such a way that species representing those colors are diffused, even though they do not exist in the neck.<sup>58</sup>

Again, the setup consisting of the object, the light, the species, the medium, and the eye is malfunctioning. Yet the appearance of colors in the necks of doves occurs as regularly as does the appearance of their true colors on the rest of their bodies.

Illusions are like monsters. A monster is “a mistake of nature acting on account of some end, from which it is frustrated by some corrupt principle”.<sup>59</sup> Monsters are characterized by rarity and by their failure to resemble the usual effects of similar causes—of the seed, the womb, and the other factors in generation. Still the Aristotelians do induce regularities connecting the conditions of the womb, for example, in monstrous births with the outcome. So too an illusion is, though predictable given the circumstance, rare by comparison with instances of veridical sensation; its causes are similar to those of veridical sensations, but it itself does not resemble them. We don't usually see colors where there are none, or receive impressions of figures which are not the real figures of the objects they supposedly inhere in.

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57. “⟨...⟩ aliquando lumen externum conjungitur cum aliquibus corporibus mistis, & ob varias reflectiones, diversos facit apparere colores; ut in collo columbæ, & aliis” (Toletus In de An. 2c7q17; Opera 3:85vb).

58. “Tertia causa [cur species non repræsentet rem, ut repræsentari deberet] esse potest situs, et distantia objecti, sic colores in collo columbæ apparent, quia sic positam lux ferit eo modo, ut species illos colores repræsentantes diffundat, cum tamen ii colores in collo non existant” (Suárez De An. 3c10¶4; Opera 3:652). The phrase in brackets occurs a few lines earlier.

59. Toletus In Phys. 2c9q13, Opera 4:75rb.

Reports of illusion are an exception to the rule that *experientia* record the usual course of events, and yet they occupy an important role in the study of the senses. In *Physics* commentaries, monsters are brought in partly to illustrate the notion of chance, partly as an objection—quickly met—to the view that nature acts according to ends. Like reports of violent motion, which being contrary to nature cannot disclose it except a *tergo*, as virtue may be taught by showing what is vice, reports of monsters can serve only obliquely in the study of generation. In fact—though this undoubtedly has largely to do with the absence of any such discussion in Aristotle’s text—monsters are hardly mentioned in *De anima* commentaries, or the corresponding sections of *cursus*.

Consider another *experientia*. Aristotle’s doctrine on touch, according to which the temperament of the skin is a mean between hot and cold, helps solve the following problem:

Tears shed in crying appear hot, while those shed in laughing appear cold, even though the tears are the same in either case.

The reason is that the face of someone laughing is very hot, because of the diffusion of the blood, so that the tears, which are moderate in temperature, seem cold; but the face of someone crying, because of the retraction of the blood toward the heart, is cold, and so the tears seem hot. Just as if water is moderate in temperature, and the hand is extremely hot, the water seems cold; but if [the hand] is extremely cold, the water will seem hot.<sup>60</sup>

To feel the tears as they are would be to feel them as neither hot nor cold; so too with the water.<sup>61</sup> Nevertheless the illusory sensations help to confirm the underlying physical fact about the sense of hot and cold: that it relies on a comparison between the temperature of the skin and the temperature of the object.

Why are experiences of the abnormal more informative about the senses than about the powers of generation? One answer is that the conditions of illusion are more easily replicated and thus better known than those of monstrous births. But there is a more interesting answer that begins to illuminate the differences, even within Aristotelianism,

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60. “{...} quòd lachrymæ flentibus calide, ridentibus frigidæ apparent, cùm tamen eodem modo illæ se habeant.

Ratio est. Ridentibus enim facies est valdè calida ob sanguinis diffusionem: ob id lachryma quæ temperata est, videtur frigida: lugentibus verò, ob fugam sanguinis ad cor, est facies frigida, ob id lachryma videtur calida. Sicut si sit aqua temperata, & manus sit calidissima: tunc videtur talis aqua frigida: si verò sit frigidissima, videbitur aqua calida” (Toletus In de An. 2c11q30; Opera 3:104va).

61. ‘As they are’ might seem troublesome here. But the term ‘sensible qualities’ or *sensibilia* means (real) qualities that affect the senses, not qualities as sensed. Unlike Descartes or Berkeley, the Aristotelian finds no argument against their reality in the fact that one and the same sensible can be sensed differently; that can be attributed to the differing conditions of the sense organs.



between the *scientia de anima* and the other branches of natural philosophy—differences that would become only more emphatic in post-Aristotelian psychology.

The senses have the task of producing species from which will come knowledge of things around us. It doesn't matter for the moment what species are supposed to be; what matters is that when they "represent the thing as it ought to be represented", they are subject to a criterion, not of likeness *simpliciter*, nor of occurring always or for the most part, but rather to one of truth, defined in terms of conformity, of representing something as it is.<sup>62</sup> Thus it can happen that something can produce, without impediment or interference, species which nevertheless fail to represent it as it is, as in the case of the dove's neck. Considered in themselves, the species introduced into the medium or even the sense organ are not the outcome of violence or chance, but of changes just as natural as those that occur in veridical sensation. The *scientia de anima* could, and did, study the production of species in the medium and the sense organ without reference to cognition or truth. When they are studied in that way, there is nothing "monstrous" about illusory species. Only when considered in relation to the end of representing the thing as it ought to be represented will they be seen to depart from the normal.

Even within Aristotelianism, then, there can be a gap between the "physical" description of sensory processes and the "psychological" description of them in their cognitive role. In the physical description, natural ends are not absent, but the cognitive purpose of yielding true belief, which provides grounds for distinguishing veridical sensations from

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62. The theory of truth—needless to say—was controversial and complicated. Here I sketch Suárez's view. The truth of cognitions is not something real in addition to the cognitive act, nor a relation between the act and its object. To call a cognition true is simply to connote that the "object is as it is represented by the act". ("Veritas addit cognitioni connotationem objecti, sicut judicatur se habere.—Quarto dicendum est, veritatem cognitionis ultra ipsum actum [sc. iudicii] nihil addere reale et intrinsecum ipsi actui, sed connotare solum objectum ita se habens, sicut per actum repræsentatur", Suárez Disp. 8§2¶9; Opera 25:279). The 'as' need not signify resemblance. Suárez does use the term 'conformity' (or sometimes 'commensurability' or 'similitude'), but when he spells it out we have a theory that says: the thought that snow is white is true if it represents snow as it is, namely, white.

The truth of sensations is assimilated to that of judgments generally: "when the sheep forms a conception of the wolf and flees, then although the act [of conception] is simple, still it truly knows the wolf as inimical, and thus judges, although imperfectly; and vision, when it recognizes a white such-and-such, also in some way judges it to be white" ("quando enim ovis concipit lupum et fugit, quamvis simplicem tantum actum habeat, tamen vere cognoscit illum ut inimicum, et ita judicat, quamvis imperfecto modo; et visus, dum cognoscit hoc album, aliquo etiam modo judicat hoc esse album", ib. §4¶7, 25:291). Though this is certainly not the only view on truth among Aristotelian authors, it shows that Suárez's theory of truth for sensations is close to what is now called a "redundancy" theory: to say that the sheep recognizes truly a dangerous wolf is simply to say: the sheep sees the wolf, and the wolf is (indeed) dangerous.

illusions, is set aside. The role of *experientia* in the study of the senses thus differs, subtly but significantly, from its role in the other natural sciences.

### 1.3 Structures

Animal bodies, to support their diverse and subtle powers, require organs likewise diverse and subtle. One finds in Aristotelian textbooks and commentaries descriptions of the parts of the body, especially the sense organs, that exceed in detail and precision virtually anything else to be found in them. Even the succinct Eustachius devotes over a page, and one of his few illustrations, to the eye.<sup>63</sup> In general, and with the notable exception of the eye, Aristotelian descriptions are at least as complete and accurate as Descartes'. His new science of life was not, for the most part, arrived at on the basis of new or revised phenomena, but on a new conception of its aims and objects.

In their descriptions of the body, the Aristotelians assembled a rich collection of observations, taken from both ancient and recent authors: Galen, of course, but also Vesalius, Fernel, and Cesalpino. They treat Aristotle's own reports with respect, but they do not hesitate to use others when he seems to be wrong, even on important matters like the site of the *sensus communis*. In that respect, it is not so surprising that Harvey should have it taken upon himself to overturn traditional theories of the movement of the blood.<sup>64</sup> In their use of recent authors, the textbooks are not offering novelty for its own sake. Their task, as they conceive it, is to weigh the opinions of authorities, old and new, not to challenge them with fresh observations, or to refashion their subject.

I confine myself here to the sense of hearing. Hearing is, next to vision, the most refined and noble of the senses. Only some of the higher animals hear sounds distinctly enough to respond to human commands; in humans alone do we find the ability both to produce and to perceive the articulate sounds of speech. The anatomy of hearing Toletus describes as follows:

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63. Eustachius, Phys. pt3tr3§2q8, Summa 303–305.

64. On Harvey as an Aristotelian, see Pagel 1967, Pagel 1976; but compare Wear 1983 and Grene 1993:334. I do not mean, of course, to minimize Harvey's achievement (which certainly did meet with opposition from Aristotelians), but to observe that there was precedent for rejecting certain kinds of claim about the operations of the body. Harvey goes further in contradicting all the ancients, rather than contenting himself with weighing their opposing views; but in attributing a *vis pulsifica* to the heart, he remained, at least in Descartes' view, wedded to an Aristotelian philosophy of nature.

from the fifth conjugation of the nerves two nerves are drawn through the middle of the brain to those parts of the brain that correspond to the ears, while at the other part of the ears, outside the brain, a certain small bone is included, in which there is an extremely tortuous and very small channel, like the point of a pin, which, because of its subtlety and tortuosity, is called the “blind” channel [*foramen cæcum*], since nothing could issue from it. At the end which is toward the brain, there is a slightly bigger cavity, which is covered by a membrane projecting from the brain; this is called the *miringa* or eardrum, because it behaves like a drum, and in which the power of hearing resides.<sup>65</sup>

One point of the description is that because the chamber of hearing is so tightly enclosed, the air within cannot communicate with the air outside.<sup>66</sup> Hence the sound which *is* communicated to the air within cannot consist in vibrations in the air.

It will be noticed that the anatomy described is human. Animal anatomies are seldom mentioned; though Aristotle himself makes comparisons in *De partibus* and elsewhere, the textbooks seldom follow his example. The human case has, of course, the greatest interest; it is, moreover, the exemplar for the whole animal kingdom. In certain respects, like the acuity of smell, humans may be inferior; nevertheless human organs, even when not the most perfect of their kind, are the type to which others are referred.

Suárez, who holds that the air in the chamber sealed off by the eardrum is continuous with the air outside, takes note of the researches of Vesalius and Valverde, only to reject their insinuation that the auditory sensorium is not the immobile air within the chamber:

It should be noted ⟨...⟩ that in anatomical dissections the nerve and membrane just mentioned clearly appear; and on the basis of this Vesalius ⟨...⟩ and Valverde ⟨...⟩ deny that the part of the air, which we hold to be the sensorium, has ever been noticed by anatomy. But that may be because when the soul set loose from the body this part of air easily dissipates; so that although it is not known by experience [*experimento*], it will not be rejected, since reason convinces us that the organ of hearing must be aereous.<sup>67</sup>

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65. “⟨...⟩ à quinta conjugatione nervorum, habentium originem à cerebro, derivari duos nervos per medium cerebrum, usque ad illas cerebri partes, quæ correspondent auribus: ex altera verò aurium parte, extra cerebrum, ossiculum quoddam continetur, in quo foramen est anfractuosum valde, & minimum, ut extremum acus capiat, quod, ob eius subtilitatem & tortuositatem, foramen cæcum dici solet: quasi nihil per illud exitum habeat. In extremitate versus cerebrum maiusculam facit excavitatem, quæ tunica à cerebro procedente tegitur, quæ dicitur miringa, seu timpanum auditus: quia ad modum timpani, se habet, in qua potentia auditiva residet” (Toletus In de An. 2c8q21; Opera 3:93rb–va; compare Suárez De An. 3c22; Opera 3:685–686).

66. For that reason it is called “connaturalis et immobilis”, or “natural” air—the latter because the chamber must have been filled with air in the womb before it was sealed. “Auditus autem connaturalis, est aeri”; “Hic autem [aer] est in auribus ædificatus in hoc, ut immobilis sit, quatenus exacte sentiat omnes differentias motus” (Aristotle De An. 420a5, 10–12). The immobility of the air within the chamber is essential to its being the “medium of hearing” since it must fit to “perceive all the differences among sounds” (Suárez De An. 3c22¶4, Opera 3:685).

Such arguments put one in mind of Harvey's insistence that the observation of the senses should be a "higher authority" than "causes and probable principles".<sup>68</sup> But Suárez is not in fact opposing observation to principles. The anatomists have not seen the *aer connaturalis*, and that, he agrees, requires an explanation. It is better, he says, to suppose that the *aer* dissipates than to give up the explanation of how sounds are sensed, an explanation that in turn rests on principles applicable to all the senses, and rooted in Aristotelian doctrines on causes.

A similar relation between principle and *experientia* is at work in accounts of voice.<sup>69</sup> There are three characteristic features in genuine voices:

First, extension: a voice has breadth, and a certain corpulence, so to speak.<sup>70</sup> The next is melody, that is, consonance, according to which the mixture of low and high sounds well with itself, and makes a harmony. Third, speech [*locutio*], that is, distinctness of syllables, which exists only in perfect animals.

To this definition [Aristotle] immediately adds another difference: that voice is the sound of animals that breathe. This is shown by the fact that not all animals emit a voice, but only those that have blood, and of those not all. Fishes have imperfect blood, but they do not breathe, and because of that they do not emit voices. The reason is that voice is a sound, and sound does not exist except in air, and so neither does voice. Since fishes do not draw in air by breathing, they do not emit a voice; likewise other non-breathing animals.

If you object that the fishes of the river Acheloi emit a voice, as they are commonly reputed to do, [Aristotle] answers that these are not genuine voices, but are made with the gills; so also cicadas and crickets make sound with their diaphragm, not their mouth, since when the head is removed they still emit such sounds, as Albert notes.<sup>71</sup>

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67. "Sed advertendum est tertio in scissionibus et divisionibus anatomicis apparere manifeste dictum nervum et membranam, de quo Vesalius, libro 1, de Fabrica, cap. 8, Valverde, lib. 1, cap. 3, qui diligenter de his scribunt, et cuncta auris ossicula enumerant, negant tamen, partem aeream, quam posuimus sensorium, hucusque per anatomem fuisse deprehensam, quod ideo forte contingit, quia dissoluto a corpore animo pars illa facile dissipatur: licet ergo experimento non sit cognita, neganda non erit, cum ratio convincat, organam auditus debere esse aereum: caetera enim quae in auribus reperiuntur terrestria sunt: ponendum est ergo aliquid aereum, quod sensorium sit audiendi, unde falsus est Albertus, in Summa de homine, tract. de auditu, quaest. 1, qui cum Avicenna dixit sensorium auditus esse nervum, quibus videtur assentire Galenus 1, de Causis symptomatum, cap. 3, attamen 7, de placitis aperte consentit Aristoteli hac in parte" (Suárez De An. 3c22¶3, Opera 3:685). Suárez, but not Toletus, takes note of the bones of the inner ear.

68. See Grene 1993:334, which quotes from the second discourse to Riolan.

69. Vox, translating Aristotle's φωνή. See Liddell & Scott, s.v.: Aristotle seems to be explicating a commonsense distinction.

70. The word 'fat' is used today to describe the sounds made by analog, as opposed to digital, synthesizers. Its sense is, roughly, rich in overtones, a bit noisy, and so more rewarding to the ear.

Fishes cannot have a voice because water does not transmit sound (or so Aristotle believes); crickets and fishes alike, even when they make sounds, do not make them in the right way.<sup>72</sup> What we would call physical grounds suffice to clarify the difference.<sup>73</sup>

The argument is effectively one of definition. Sounds are perfect—that is, voices—or imperfect. Voice is *defined* to be, in the words of Philoponus: “a sound educed from the soul, by the vocal parts, accompanied by the imagination of something to be signified”. What is signified, Suárez adds, need be nothing more than delight, as when humans and birds burst into song.<sup>74</sup> Coughs and other involuntary sounds, though also produced in the mouth and throat, are not, in this sense, voices, because they are not “ordered to signification”.

The notion of voice, therefore, combines three aspects: the physical character of richness, physical production by the lungs, throat, and mouth, and an accompanying imagination of something to be signified, without which the physical character and manner yield only a sound which is like a voice, and called ‘voice’ only *analogicè*. The point shows even more clearly in the explication of speech (*locutio*). Speech adds articulateness and distinctiveness in terminations, produced, in the case of vowels, by the throat, and in the case of consonants by the teeth and tongue.

By these means, speech is perfected, and from that there comes another difference between voice and speech, namely, that for voice it suffices that the imagination should signify, while

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71. “Primum, est extensio: habet enim dilatationem, & velut corpulentiam quandam, vox ipsa. Alterum, est melos, id est, consonantia, secundum quam grave acuto mixtum consonat, harmoniamque facit. Tertium, est locutio, id est syllabarum distinctio: quæ non nisi animalibus perfectè insunt.

Statim aliam addit differentiam definitioni, quòd vox sit animalis respirantis sonus. Quod ostendit, quòd non omnia animalia edant vocem, sed quæ sanguinem habent: & eorum non omnia. Pisces enim sanguinem quandam habent imperfectum, non tamen respirant, nec vocem ob id edunt. Et ratio est: quia vox, sonus est; at sonus non est nisi in aere, nec ergo vox. Cùm ergo pisces non trahant aerem per respirationem, non edunt vocem: similiter & alia non respirantia.

Quòd si objicias: Pisces Acheloi fluvii vocem edere, ut communis fert fama.

Respondet non esse veras voces, sed sonos branchiis effectos: sicut etiam cicadæ, & grilli sonant diaphragmate, non ore: ablato enim capite tales emittunt sonos, ut refert Albert” (Toletus In de An. 2c8tx87; Opera 3:91va).

72. Suárez notes that in Pliny (Hist. 9c18) whales and dolphins are said to lack gills, and to respire through holes [fistula], which indicates that they have lungs. The implication is that they are therefore not debarred from having voices (Suárez De An. 3c20¶2, Opera 3:680). Aristotle numbers them among the fishes

73. In a brief question on the nature and causes of voice, Toletus adds a description of the vocal tract similar in detail to that of the organ of hearing quoted above, taken mostly from Aristotle. Aristotle, De partibus 3c3 (on the lungs). To this Suárez adds De gen. anim. 5c7, Hist. anim 4c9; Pliny Hist. 9c18; Albert Summa de homine, tract. de voce, q4; Galen De usu part. 7c4 & 5, De vocis instrum. c4 & 7; and Vesalius De fabrica 2c21 (Suárez De An. 3c20¶1–3, Opera 3:679–680).

74. Suárez De An. 3c20¶2, Opera 3:680, quoting Philoponus’ definition of vox [in loc.?).

for locution it is required that it [the imagination] should be expressive of a rational concept: for brutes, which claim only a sense of what is pleasing or irksome, voice suffices to make their affections explicit, while for humans speech is necessary, so that they can reveal their inward concepts <...><sup>75</sup>

Again there is a set of qualities, a manner of production, and an end. In effect the four causes (the material cause is the medium) of speech are already present in the description: the classification of sounds is not in some way prior to the giving of their causes, but is halfway there already.

The double character already noted in the description of illusions is found here too. Suárez continues:

For that reason the speeches of parrots and the like, or even of people sleeping cannot lay claim to being speech in the full sense, although taken materially, they are similar to speech, as are also the sounds of musical instruments: even though these are not vocal, or speech, still they have a certain distinctness, and melody or consonance.<sup>76</sup>

There is no reason why parrots or people muttering in their sleep should not be making the sounds in just the way we do in speech. Yet these sounds, like those of instruments (which are not even voices), are speech only analogically. What we would call the “physical” aspect of sound is insufficient to classify all its differences: the “mental” aspect too must be adduced.

But that is perhaps too modern a way to put it. Suárez and Toletus do not evince any sense of shifting from one criterion to another when they distinguish sounds from lights or odors, where the difference in material and formal causes is paramount, and when they distinguish voice from speech, where similarities in form (that is, in sensible qualities) are so great that the best, if not the sole, means of distinction is to refer the sound to its end—the revelation of inward concepts. Suárez and Toletus would not, of course, deny that referring a sound to its purpose is a different way of conceiving it than referring it to its means of production. The difference is as between an end and an efficient

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75. “<...> ex his ergo locutio perficitur unde alia differentia vocis, et locutionis est, quod ad vocem sit satis, si imaginationem significet, ad locutionem vero requiritur, ut expressiva sit raitonalis conceptus: brutis enim, quæ sensum jucundi et molesti solum vendicant, satis fuit vox ad eas affectiones explicandas: homini vero necessaria fuit locutio, ut posset interiores conceptus declarare <...>” (Suárez De An. 3c20¶3, Opera 3:680).

76. “Quapropter locutiones psittacorum et similium, imo et hominum dormientem non vendicant perfectam rationem locutionis, quamvis materialiter sumptæ, sint locutioni similes, ut sunt etiam soni instrumentorum musicæ, cum enim hi nec vocales sint, nec locutiones, distinctionem tamen quamdam habent, melodiamque, seu consonantiam” (Suárez De An. 3c20¶3, Opera 3:680).

cause. But nature, not just human nature, abounds in ends, and there is no point at which a new kind of description begins abruptly to be appropriate.

## 1.4 Variety and order

The individual dog, horse, or human has habits much more diverse and complicated than those of rocks or heavenly bodies; it contains numerous kinds of stuff, and organs of great intricacy, quite distinct in form from one another, and subordinated in various ways to one another by their ends. The living world as a whole is in many ways similar. Animals and plants are of many kinds; those kinds are associated with different styles of life, and exhibit order both in form and in subordination according to ends.

With the exploration of the New World, and the rise of trade with Asia and Africa, the sixteenth and seventeenth centuries saw an enormous expansion in the number of recognized species and genera. Just as important was the realization among botanists in northern Europe that the Mediterranean flora inherited from the ancients were incomplete and inaccurate when applied to the plants they observed in their own countries.<sup>77</sup> The Aristotelians, at least through the time of Descartes, paid no attention to those developments, contenting themselves for the most part with the ancients. Descartes himself gives no indication of noticing them either; but the variety of the living world matters little to him in any case. Like Suárez, he is interested in just one animal: the human. The rest of the living world appears only sporadically and unsystematically in his work.

Plants have only vegetative powers. Unlike the sensitive powers, the generative do not serve to distinguish kinds: whatever has one, has all. No doubt because *De anima* is, as Pellegrin argues, a zoology rather than a “treatise of general biology”,<sup>78</sup> and because

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77. In Aristotle’s taxonomy there are less than 600 indigenous and a few dozen exotic species. “His situation”, Atran writes, “is fundamentally no different from that of local folk the world over” (Atran 1990:113). The German herbalist, Leonhart Fuchs, based in Tübingen, lists some 200 plants “not found in the ancients” in his *Neu Kreüterbuch* (1543) (ib. 132). In 1623, Johann and Caspar Bauhin, in their *Pinax theatri botanici* (1623), were able to list 6000 forms. By the time of Michael Adanson (*Familles des plantes*, 1763), 25,000 species were recognized; Adanson “projected at least four times that number” (ib. 188).

78. “Il me semble que si on lit le *De anima* comme un traité de psychologie animale, c’est-à-dire ni comme un traité de biologie générale étudiant les formes supérieures de la vie comme des complications de la caractéristique vitale universelle qu’est l’âme nutritive, ni comme un traité tendu vers une fin qui serait une psychologie humaine, l’ouvrage d’Aristote reçoit un sens et une cohérence remarquables” (Pellegrin 1996:471; cf. 478). Needless to say, many Aristotelians did read *De anima* as tending toward the human; Suárez is explicit on that point (*De An. Prooemium* ¶2, *Opera* 3:464). Toletus, in part because he is writing a commentary, is more evenhanded.

Aristotle's *De plantis*, if it ever existed, was lost (see n. 6), Toletus and Suárez have nothing to say about the classification and hierarchy of plants. The enormous efforts of herbalists during the sixteenth century find no response in their work.

With animals, there is somewhat more. All animals are generated, but in different manners, as we have seen: some by birth, some by putrefaction, and some either way. Though it is true that only the simpler animals can be generated by putrefaction, the distinction does provide no basis for classification. A second distinction, among animals generated by birth, is more promising:

One should note that of animals some are live-bearing, some egg-bearing, some worm-bearing <...> Those animals are said to be live-bearing which do not produce the fetus outside themselves until it is animate and perfectly organized. Those [are said to be] egg-bearing which bear eggs from which hatchlings will afterwards be born.

Those [are said to be] worm-bearing which bear worms which take on form afterwards: for the worm is said here to enclose a butterfly or mosquito which has an opening to which food comes from outside, and is usually fastened to the ground or to a nest [*favo*] or to something else, from which it draws food: of this sort are ants, bees, wasps, spiders, and so on <...><sup>79</sup>

But this division too is mentioned only in passing by Toletus, and comes not from *De anima* but from the *Historia animalium*. In *De anima* the only character that matters is the number and kinds of sensitive powers. This is in keeping, no doubt, with its emphasis on animals. Having sensitive powers is the generic difference between animals and plants: and it is to differences in sensitive powers that one must look in classifying animals.

The powers of the soul within each animal are ordered by their relation to body and spirit: the generative power is the lowest, reason and the will are the highest; sense, imagination, and memory, are intermediate, with the senses being ranked from touch, whose object is the elemental properties of temperature and humidity, to vision, which because light is the most noble, the least corporeal of corporeal qualities, is the most perfect of the senses.<sup>80</sup>

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79. "Iterum adverte, quòd animalium quædam sunt vivipara, quædam ovipara, quædam vermipara, ut dicitur 1. histor. cap. 5. Illa dicuntur vivipara, quæ non emittunt extra se foetem, donec sit animatus & perfectè organizans. Illa ovipara, quæ pariunt ova, ex quibus pulli postea nascuntur.

Illa autem vermipara, quæ vermes pariunt informes, postea formandos: hoc enim vermis dicitur hoc loco, quod involutum est papillone, seu conopæo habente foramen, unde ab externo alimentum proveniat, esse enim solet affixum terræ vel favo, vel alteri, unde trahitur alimentum: huiusmodi sunt formicæ, apes, vespæ, araneæ, & alia; quorum meminit Aristot. histor. cap. 22. & sequentibus" (Toletus In de An. 2c4q11; Opera 3:73ra).

80. Suárez De An. 3c29¶1, Opera 3:700.



That same order induces an order among animal kinds. From the five powers of the soul—vegetation, sense, movement, appetite, and reason—Aristotle generates four ranks (*gradus*) of living things:

The first is of those that enjoy only the vegetative operations: such are plants. The second is of those that to the vegetative add only sense: of this sort are certain immobile animals like molluscs, sponges, and so on. The third grade is of those that to these add local motion, like many other animals. The fourth is of those that in addition make use of the Intellect, like people.<sup>81</sup>

There are just four ranks because appetite and sense are always found together.<sup>82</sup>

That suffices to isolate plants at the bottom, humans at the top. In between are animals. Aristotle notes that some have touch only, others have some of the other senses, and some have all five.<sup>83</sup> The *Historia animalium* treats the question at greater length, noting, for example, that moles lack vision, but adding that they have eyes beneath the skin: they are not, therefore, an exception to the rule that “perfect” animals have vision.<sup>84</sup> In general, the animal books—the *Historia animalia*, *De partibus*, and the rest—devote a great deal of effort to classification.

*De anima* itself goes no further than the four ranks and the division according to the presence or absence of the various senses. The term *bruta*, for example, which seems to designate a subset of what we call mammals (horses and lions are *bruta*, but not mice) is never defined. This even though their resemblance to us makes them the crucial case in arguments about the distinctiveness of reason: if their powers of judgment differ from ours only in degree, then either they have immortal souls or we don’t.<sup>85</sup>

Nevertheless, it seems clear that although taxonomy is not the primary aim of *De anima*, or of Aristotelian works based on it, the disparities among the things we call living do call for explanation. The orderly variety of the living world yields perhaps the strongest argu-

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81. Toletus In de An. 2c2tx23, Opera 3:50va.

82. Toletus In de An. 2c3tx27, Opera 3:57rb. See n. 24 above. On the arguments that sense entails appetite, see ib. & tx28. The Coimbrans reduce the number to three, arguing that no living thing with sense—even touch alone—lacks movement, and that the difference between Aristotle’s second and third ranks is one of degree only (Suárez De An. 1c7¶10–13, Opera 3:508–509, citing Coimbra In de An. 2c3q2a2).

83. Suárez De An. 3c28¶7–8, Opera 3:699, citing Aristotle De An. 2c2tx17 & 23, 413b5–9, 414a3–4.

84. See also Aristotle De An. 3c1; 524a10. Albert argues that in fact moles can see, and “affirms that he has witnessed moles searching for food outside their caverns, in the way that sighted [animals] search” (Suárez De An. 3c28¶7–8, Opera 3:699, citing Albert De animal. c22).

85. On judgment in *bruta*, see Suárez De An. 3c11¶7, Opera 3:639; 1c5¶2, 3:499–500; and Disp. 1§6¶18, 23§10¶12, [Check the Disp. references.]

ment for ascribing to the soul not just the power of living in general, but an ordered sequence of powers. We will see, for example, that the primary, if not the only, argument for distinguishing the vegetative from the sensitive powers is the existence of animals having one kind but not the other. Without such instances, one may attempt to distinguish powers in terms of acts, or in terms of their objects. But such arguments are perilous. The advantage of the first argument is that the difference between plants and animals is so obvious as to need no argument itself.

The explosion in the number of recognized species eventually led to the demise of the Aristotelian plan, which, as Atran puts it, proposed “a causal resolution of the whole array of prefabricated folkbiological groupings”.<sup>86</sup> The “abandonment of the folkbotanical life-forms” in the systems of Linnæus and his successors, which was partly motivated by the explosion, was also the abandonment of Aristotle’s system, even if, as in Linnæus, some reflex of it can be seen in the primacy of the sexual organs as the basis of a natural system. A certain irony accompanies its demise: Aristotle and the Aristotelians took a far greater interest in the abundance of living forms than did their opponent Descartes and his followers. We now agree with Descartes in holding that living things do not live by virtue of any power absent from or irreducible to those of nonliving things. But the presence in the animate world of variety, which the Aristotelians emphasized and Descartes ignored, together with the generation of like by like, are the facts upon which the Darwinian revolution is founded.

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86. Atran 1990:115. Sections 3.1 and 3.2 of Atran’s book argue against the view of Pellegrin (and Balme) that “on ne trouve dans les textes classificatoires d’Aristote nulle ébauche de taxinomie” (Pellegrin 1982:139; cf. 147). That indeed seems to be an exaggeration, since it would seem obvious that ‘animal’ subsumes the various species of animals. On the other hand, there is little evidence of a systematic distinction between genera and species: if taxonomy requires levels of classification, then certainly the Aristotelian texts do not aim at taxonomy.