One of Descartes’ hallmark contributions to natural philosophy is his denunciation of teleology. It is puzzling, then, to find him arguing in Meditation VI that human beings have sensations in order to preserve the union of mind and body (AT VII 83). This appears to be just the sort of teleological explanation that he proscribes. Descartes’ Anglo-American commentators have had little to say about the teleological overtones of his claims about sensation. His French commentators acknowledge these overtones, but seem largely untroubled by them. It is worth pausing to be troubled, for a closer analysis reveals that Descartes’ famous proscription against teleology is not as simple as it is generally thought to be. In the first half of this essay, I argue that Descartes advocates a genuinely teleological conception of the senses. My aim is not to charge Descartes with employing illicit teleology, but to argue that there is a place for teleology even in his revisionist...
natural philosophy. Accordingly, in the second half of this essay, I argue that Descartes’ assault on teleological explanation is not a sweeping assault on finality, but a more directed attack on particular uses of ends in natural philosophy. Descartes’ assault leaves standing a form of teleological explanation that proves crucial to his own treatment of sensation.

I. Descartes’ Rejection of Teleological Explanation at a Glance

A teleological explanation is one that purports to account for something in terms of its ends or its function relative to the ends of the system of which it is a part. Aristotle’s physics provides many classic examples: plants produce leaves for the protection of their fruit; spiders spin webs in order to catch food; animals grow sharp front teeth and dull back teeth in order to facilitate biting and chewing respectively; eyes are for seeing. According to Aristotle, all natural phenomena are directed toward ends and no explanation is complete without a teleological component that specifies the end for the sake of which the phenomenon occurs. Indeed ends take explanatory priority over other causes: “Both causes [the end and the matter] must be stated by the student of nature, but especially the end; for that is the cause of the matter, not vice versa.”3 And:

[T]he causes concerned in natural generation are, as we see, more than one. There is the cause for the sake of which [the end], and the cause whence the beginning of motion comes [the efficient cause]. Now we must decide which of these two causes comes first, which second. Plainly, however, that cause is the first which we call that for the sake of which. For this is the account of the thing, and the account forms the starting-point.4

In other words, Aristotle argues that natural substances have the matter they do, have the parts or organs they do, are organized as they are and act as they do for the sake of their ends. To explain


why things are as they are, the natural philosopher must therefore explain the ways in which they contribute to ends.

Among the late scholastic Aristotelians familiar to Descartes there is considerable debate concerning the causal efficacy of ends. Genuine final causation, in which something is said to be acted on by an end, is limited to the intentional behavior of rational agents who consciously recognize their ends: only something that recognizes an end can be “moved” by one. Even here the sort of causation involved is peculiar: a rational agent is “moved” by an end insofar as the end induces a “metaphorical motion” toward (or desire for) the end in the agent’s will.5 While these scholastic Aristotelians resist attributing final causation to non-rational creatures, they nevertheless persist in attributing ends to them. When Toletus, Rubio, the Coimbrans and Suarez take up the question whether nature acts propter finem, each answers it affirmatively: natural things have ends and their behavior is described as directed toward those ends.6 Meteors, for example, occur for the sake of moderating the weather. Rocks made of earth fall downward because their natural place of rest is

5 See Toletus, Commentaria unà cum Quaestionibus in octo libros Aristotelis de Physica auscultatione, volume 4 of Opera omnia Philosophica (Cologne, 1615/16; facs. reprod., New York: Georg Olms Verlag, 1985), II.ix, q. 14, f. 76vb; Coimbra College, Commentaria…super octo libros physicorum Aristotelis (Venice, 1616), II.vii, q. 21, 267 ff.; Rubio, Commentaria in octo libros Aristotelis de Physica Audite (Brescia, 1626), II.v, q. 5, 180ff.; Suarez, Disputationes Metaphysicae, volumes 25-26 of Opera Omnia, P.M. André, ed. (Paris: Vivès, 1856-78; facs. reprod., Hildesheim: Georg Olms Verlag, 1965), Disp. 23, sec. 4, 858-864.

6 Toletus, de Physica, II.ix, q. 12, ff. 73vb-75rb; Rubio, de Physica, II.viii, text & q. 1, 220ff.; Coimbra College, Commentaria…physicorum, II.ix., q. 1, 282ff; Suarez, Disputationes Metaphysicae, Disp. 23, sec. 10, 885-890. Eustachius à Sancto Paulo, whose cursus Descartes claims to have reread in 1640 (AT III 232), does not have a separate discussion of this question, but does affirm that “since natural agents do not act randomly or irregularly, it is necessary that they operate toward some end” (De rebus Physicis, part 3 of Summa philosophica quadrupartita (Cologne, 1629), part I, tract. ii, disp. i, q. 2, 35).
the center of the cosmos. Meteors and rocks do not recognize their ends, and so they cannot be said to be moved by ends in quite the way that the wills of rational agents are. Instead, these Aristotelians maintain, a propensity is built into their natures, carrying them inevitably toward their ends.\textsuperscript{7} Teleological causation is banished, but teleological explanation persists in their natural philosophy.

There is another important thread added to the teleological fabric of this scholastic Aristotelianism: God. Because God creates the natures through which non-rational creatures act, he serves as the ultimate source of ends. This addition is important, for it represents an attempt to ground the directed behavior of non-rational creatures in a rational agent who recognizes his ends. Indeed Toletus suggests that the natural world is best thought of as an instrument of God’s intentional acts, so that the ends found in it are at best derivative ends.\textsuperscript{8} Teleological explanation is thus rooted in God.

By contrast with his predecessors, Descartes explicitly eschews teleological explanation: I consider the sort of cause which is customarily derived from an end to have no use in physics; for it is not without rashness that I think myself capable of investigating the ends of God. (Meditation IV, AT VII 55) Although in ethics, where we may often legitimately use conjectures, it may be pious on occasion to try to guess what end God may have had in mind in directing the universe; but in physics, where everything must be supported by the strongest explanations, such conjectures are not fitting. (Fifth Replies, AT VII 375; see also Principles III.2-3, AT VIII-A 80-81)

\textsuperscript{7} Toletus, \textit{de Physica}, II.i, q. 2, f. 47vb-48ra & II.ix, q. 12, f. 74vb; Rubio, \textit{de Physica}, II.viii, q. 1, 223; Coimbra College, \textit{Commentaria…physicorum}, II.ix, II.ix, q. 2, 286ff.; Suarez, \textit{Disputationes Metaphysicae}, Disp. 23, sec. 10, paras. 5-6, 887.

\textsuperscript{8} Toletus, \textit{de Physica}, II.ix, q. 12, f. 75ra. For a detailed and helpful discussion of late scholastic Aristotelian treatments of finality and final causes, see Dennis Des Chene, \textit{Physiologia} (Ithaca, NY: Cornell University Press, 1995), ch. 6.
We will never derive any explanations concerning natural things from the ends that God or nature had in mind when creating them <and we shall entirely banish from our philosophy the search for final causes>.

*(Principles I.28, AT VIII-A 15; passage in <> added by Picot in the French edition)*

In addition, Frans Burman reports Descartes to have said the following in conversation:

This rule—that we must never argue from ends—must be observed. For, first, the knowledge of an end does not lead us to knowledge of the thing itself; its nature is still hidden from us. Indeed, this is Aristotle's greatest fault, that he always argued from ends. Second, all the ends of God are hidden from us, and it is rash to want to delve into them. *(Conversation with Burman, AT V 158)*

I will look more closely at the details and arguments of these passages below. For the moment, I want simply to acknowledge that Descartes rejects the teleology of the Aristotelian tradition in no uncertain terms. I turn now to his account of sensation with the question whether it is free of the forbidden teleology.

**II. The Senses Considered as Biological Systems**

Let ‘sensation’ refer to all those obscure and confused modes of mind received through the senses that, according to Descartes, fail to resemble their bodily causes; these include secondary quality sensations (sensations of color, sound, flavor, odor, hot and cold) and the so-called bodily sensations (pains, tickles, hunger, thirst, etc.). Whether there are also primary quality sensations (or only primary quality perceptions) is a matter of interpretive dispute that is beyond the scope of this project. Since the texts I draw on explicitly refer only to secondary quality sensations and bodily sensations, I will restrict my discussion to them.

As it is often interpreted, there is nothing teleological about Descartes’ account of sensation. The account describes a process of efficient causation that divides into two parts. First, there is some mechanical physics and physiology, which includes a physical description of the distal causes of sensation (e.g., the compression of air particles for auditory sensations) and a mechanistic account of their effects on the medium and on the perceiver’s sense organs. This part of the account
culminates in the effluence of animal spirits from the pineal gland in the brain, which produces motions in the gland itself. Second, there is the psycho-physiology of sense perception, which, putting aside the metaphysical complications of body-mind interaction, amounts to a type-type correspondence between pineal motions in the brain and sensations in the mind. Explanation stops here: sensations are the regular mental effects of brute mechanical processes. As a piece of natural philosophy, the account looks to be a fine example of teleology-free explanation given in terms of efficient causes.9

This interpretation is not wrong, but it is incomplete. It fails to take into account several texts in which Descartes conceives sensations as more than simply the mental results of motions in the brain. In Meditation VI and in several of his works in natural philosophy, Descartes portrays sensations as an integral part of a biological system: the mind-body union or human being. What is more, he describes the phenomenological and representational aspects of sensation as contributing to the normal functioning or to the attainment of the goal-state of that system, viz., survival. In other words, he describes sensations teleologically. These texts have not been entirely overlooked, but they are routinely dismissed as Descartes’ ad hoc attempt to soften the blow of his epistemic attack on the senses.10 These texts warrant a closer look, for the teleology implicit in them is much deeper and more central to Descartes’ account of sensation than typically acknowledged. In them we find Descartes advancing an explanation for why sensations are the way they are that is genuinely

9 For present purposes I put aside the interpretive question whether motions in the brain are supposed to be real efficient causes or only occasional causes of sensations. Either way, the account is so far free of teleology.

10 Ann MacKenzie, for example, writes: “The epistemological bottom line, for Descartes, is that sensations are inherently non-veridical and can play no role in the mind’s search after truth. Instead, the role Descartes assigns (in the Sixth Meditation) to sensations...is merely to help embodied minds get around, on a day to day basis” (“Descartes on Sensory Representation: A Study of the Dioptrics,” Canadian Journal of Philosophy, supplementary volume 16 (1991): 125).
teleological and that supplements, without contradicting, their explanation in terms of efficient causes. Or so I shall argue.

II.A.1. Mediation VI: The Biological Context of Sensation

In Meditation VI, Descartes reflects broadly and seriously on the role of the senses in the life of the human being. Elsewhere in his corpus, he has made it clear what the senses cannot do: they cannot discover metaphysical truths; nor can they discover the first principles of natural philosophy. These cognitive activities are the province of the pure intellect alone, operating through its clear and distinct ideas. In Meditation VI, however, Descartes proposes that the senses have their own job to do in the life of the human being: “…without a doubt sensations are, properly speaking, given to me by Nature in order to signify to the mind what things would be beneficial or harmful to the composite of which it is a part” (AT VII 83; see also Principles II.3, AT VIII-A 41-42 and the letter to Henry More, 5 February 1649, AT V 271). Descartes is not simply offering a consolation prize to the otherwise epistemically demoted senses. He is doing nothing short of re-conceiving the cognitive economy of the human mind: whereas his Aristotelian predecessors had depicted the

11 This is not to say that the senses have no role to play in natural philosophy. The pure intellect or understanding may establish a priori the geometrical essence of body and the first principles governing its motion. The senses, however, are required to reveal actual instantiations of body so that we can (a) isolate particular phenomena to be studied (e.g., the size and distance of the sun, the viscosity of oil), (b) identify the solutions to problems (e.g., which among the possible meteorological phenomena are actual) and (c) provide macroscopic models for the positing of micro-mechanisms (e.g., organs, fountains, clocks). See Discourse VI, AT VI 64-65 and Principles III.4 & 46, AT VIII-A 81-82 & 101. For some recent discussion of the limited role that the senses play in Cartesian physics, see Daniel Garber, “Descartes and Experiment in the Discourse and Essays,” in Stephen Voss, ed., Essays on the Philosophy and Science of René Descartes (New York: Oxford University Press, 1993), 288-310 and Gary Hatfield, “Science, Certainty, and Descartes,” Philosophy of Science Association 2 (1988): 249-262.
senses as under-laborers to the intellect, delivering up the raw materials for theoretical knowledge, Descartes re-conceives them first and foremost as tools for survival. It is precisely in this biological re-conceptualization of the senses that Descartes begins to draw teleology into his account.

Descartes’ biological conception of the senses is intimately connected with his conception of the human being as a union of mind and body. Sensations, he claims, “pertain to” or are “referred to” the union or composite of mind and body (Principles I.48, AT VIII-A 23 and II.2, AT VIII-A 41). This is important both as an etiological claim and as a functional claim. The etiological claim is that sensations arise from the “blending” or “intermingling” of mind and body (Meditation VI, AT VII 81; Sixth Replies, AT VII 437; letter to Hyperaspistes, August 1641, AT III 424; letter to Gibieuf, 19 January 1642, AT III 479; Discourse V, AT VI 59; and Principles I.48, AT VIII-A 23). Whatever else this means, it means that the mere co-presence of mind and body is not sufficient for the production of sensations in the mind. He writes to Regius:

[S]ensations such as pain are not pure thoughts of a mind distinct from a body, but confused perceptions of a mind really united to a body. For if an angel were in a human body, he would not have sensations as we do, but would simply perceive the motions which are caused by external objects, and in this way would differ from a real man. (AT III 493; see also Meditation VI, AT VII 81)

Of its own nature, then, the mind is capable of purely intellectual thoughts. Co-presence of mind and body is enough to occasion in the mind intellectual thoughts of body. It is not enough, however, to incite sensations. For that to occur, the body must be so united to the mind that it affects the character, not just the objects, of its thoughts.\(^{12}\)

\(^{12}\) Just how to interpret this etiological claim (e.g., do sensations simply require the body to causally interact with the mind or do they require that it be somehow literally blended with the mind?) is a vexed matter that has been much discussed by commentators. See, for example, Janet Broughton and Ruth Mattern, “Reinterpreting Descartes on the Notion of the Union of Mind and Body,” Journal of the History of Philosophy 16 (1978): 23-32; John Cottingham, Descartes (New York: Blackwell, 1986), ch. 5; Daisie Radner, “Descartes’s Notion of the Union of Mind and Body,”
More important for present purposes is the functional claim. As Descartes sees it, sensations arise not only from but also for the mind-body union. Human beings have an interest in their own continued survival as mind-body unions. In order for the union to survive, however, the body must be kept intact and in good working order, for only a body in good working order, i.e., a body with a certain arrangement of integrated parts, makes a suitable home for the mind; if any crucial part of the body breaks down, the body is rendered defective, the soul departs from it and the human being dies (Treatise on Man, AT XI 144 and Passions I.5-6 & 30, AT XI 330-331 & 351). This conception of the human body is already teleological: the body is only in ‘good working order’ or ‘well-arranged’ or ‘defective’ relative to the end of providing a suitable home for the mind. And it is only in this teleological context that it makes sense for Descartes to speak, as he often does, of the ‘health’ and ‘harm’ of the body: these are evaluations of the body’s functional capacity to sustain a soul. There is more, however. The human body is constantly impacted by other bodies in its


13 Considered by itself, the body is simply a spatially individuated collection of extended moving parts with no intrinsic unity: no arrangement of parts is better than another. When it is part of a mind-body union, Descartes argues, the body has a functional unity: “[T]he [human] body is a unity which is in a sense indivisible because of the arrangement of its organs, these being so related to one another that the removal of any one of them renders whole body defective” (Passions I.30, AT XI 351). But this functional unity amounts to its being able to serve as a suitable residence for the soul: “we think that the body is whole and entire so long as it has in itself all the dispositions required to preserve that union” (letter to Mesland, 9 February 1645, AT IV 166). The finality of the human body relative to the mind-body union has been discussed in illuminating detail by Gueroult and Rodis-Lewis in the texts cited above. It is also taken up in the work of Descartes’ follower, Nicolas Malebranche (see, e.g., The Search After Truth, Thomas Lennon and Paul Olsacm, trans. (Columbus, OH: Ohio State University Press, 1980), Bk. III, ch. I, §2, 200).
environment that affect its fitness. The embodied mind must therefore dedicate most of its cognitive labor to monitoring and protecting the body. In order to do that, the mind needs to know not simply how things stand in the corporeal world, but how they stand relative to its body and especially relative to its body’s continued fitness. It needs to have perspectival and in some cases evaluative information about the world if it is to make accurate judgments about how to act: Where are external bodies relative to where my body is right now? Will they pose a threat to my body’s fitness? Will they promote its fitness? Is my body damaged? Is it healthy? This is where sensations come in. They provide the mind with a self-interested view of the corporeal world: they “show us external bodies [not] exactly as they are, but only insofar as they are related to us and can benefit or harm us” (letter to More, AT V 271; see also Principles II.3, AT VIII-A 41-42; Meditation VI, AT VII 83; and Passions II.52, AT XI 372). What’s more, sensations do so reliably: “in matters regarding the well-being of the body, all my senses report the truth much more frequently than not” (Meditation VI, AT VII 89).

It is a mistake to think that this biological conception of the senses is the result of an ad hoc attempt on Descartes’ part to find something good to say about them. Far from being an afterthought, it reaches into the heart of Descartes’ account: the naturally instituted correspondence between types of pineal motions in the human brain and types of sensations in the human mind. This correspondence is taken by almost all commentators to be brute and arbitrary, so that in principle any given type of pineal motion could have given rise to any type of sensation. As Descartes actually depicts it in Meditation VI, there is an explanation for the correspondence being the way it is: pineal motions are instituted by nature to give rise precisely to those sensations that are most behaviorally informative under the circumstances in which those pineal motions typically occur. Each type of pineal motion, he writes, is paired with the type of sensation that “of all

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14 See, for example, John Cottingham, Descartes, 139ff. and Margaret Wilson, “Descartes on the Origin of Sensation,” Philosophical Topics 19 (1991): 296.
possible sensations, is most especially and most frequently conducive to the preservation of the healthy person” (AT VII 87). The sensation that most especially and most frequently leads to self-preservation is one that (a) represents to us its usual distal cause (rather than any other more proximate cause along the chain) and (b) phenomenally presents that distal cause in a behaviorally salient way (a way that will move us to appropriate action). Thus Descartes writes of pain sensations:

…when the nerves in the foot are moved in a violent and unusual way, this motion of theirs reaches the inner parts of the brain by way of the spinal cord, and there gives a signal to the mind to sense something, namely pain as existing in the foot. This stimulates the mind to do its best to remove the cause of the pain as harmful to the foot…Nothing else would have been so conducive to the continued well-being of the body. (AT VII 88; italics mine)

Descartes explains here why pain-in-the-foot sensations, and not any other sensations, are hooked up with these particular pineal motions. In so doing, he appeals to the end or function of the senses: we have pain-in-the-foot sensations under these corporeal circumstances because that is most conducive to our well-being—they stimulate the mind to get rid of whatever is harming the foot in a way that green-in-the-foot sensations, or pain-in-the-pineal-gland sensations, or even clear and distinct intellectual perceptions cannot. Similarly, Descartes maintains that dryness in the throat mechanically produces pineal motions that give rise to the sensation of thirst “because nothing in this whole affair is more useful to know than that we need drink in order to remain healthy” (AT VII 88). These are examples of teleological explanation: Descartes is offering a reason or purpose for pineal motions to give rise to one type of sensation rather than another and is doing so by appeal to the end of the system of which sensations are a part.

It is one thing to know that sensations are regularly produced by the mechanical impact of bodies on the sense organs. It is quite another to know that we have the sensations we do when we do because they are the best cognitive means to survival available to the embodied mind. Sensations thus admit of two kinds of explanation in Descartes’ writing, one in terms of efficient causes and
one in terms of reasons and ends. I shall have more to say below about the nature and cooperation of these sorts of explanation in part IV below. First, however, I consider some objections to this teleological reading of Meditation VI.

II.A.2. Meditation VI: Objections and Replies

One might object to my reading of Meditation VI in a couple of ways. First, admitting that Descartes says that the senses have the function of facilitating our bodily well-being, perhaps he is not claiming that the senses have a purpose, but simply that they have a regular pattern of functioning; in other words, the notion of function at work here is not normative but merely descriptive. Perhaps Descartes is simply observing the causal mechanisms by which the senses operate and calling attention to the fact that their regular effects in the mind are behaviorally advantageous to human beings. This fact does not entitle us to postulate ends governing the senses.15

This objection does not succeed, for Descartes does not rest content with describing dispositional regularities of the senses. He also suggests that the senses sometimes malfunction or err insofar as our sensory nature sometimes urges us toward things that are in fact bad for us (Meditation VI, AT VII 84). Malfunction and error carry with them a normative, not merely a descriptive, force: something malfunctions or errs when it fails to do what it is supposed to do, not simply when it fails to do what it usually does. Thus Descartes’ dropsy patient, who has a sensation of thirst at a time when his body is sufficiently hydrated, is not simply the victim of an unusual causal chain of events: he is the victim of what Descartes calls a “true error of nature” (Meditation VI, AT VII 85). Something has gone wrong with his sensory system.

Another objector might respond that even in the discussion of the dropsy patient Descartes’ talk of the senses malfunctioning, while normative, is only a way of speaking, an extrinsic denomination that has no reality in re. This objection gets some prima facie support from the text. When Descartes

15 I owe this objection to discussion with Allen Wood.
considers the claim that the dropsy patient has a corrupted nature that malfunctions, he
distinguishes two senses of ‘nature’ or ‘natural’ of which only one appears to exist in re. In the first
sense, it is no less natural for the dropsy patient to feel thirst when he does not need water than it is
for a healthy person to feel thirst when he does need water: no physical law of motion or psycho-
physiological law of correspondence has been violated. With respect to this sense of ‘nature’,
nothing can be said to be malfunctioning in the dropsy patient. In the second and teleological sense
of ‘nature’, just as we can say of a clock intended by its maker to tell time that its ‘nature’ is to tell
the right time and that it ‘malfunctions’ when it tells the wrong time, so we can say of the sensory
system that its ‘nature’ is to facilitate self-preserving behavior and that it ‘malfunctions’ when it
facilitates self-destructive behavior. But, the objector notes, Descartes rejects the attribution of this
second (teleological) sort of ‘nature’ as being founded only on an “arbitrary denomination extrinsic
to the things of which it is predicated and dependent only upon my thought” (Meditation VI, AT
VII 85). Any teleology in the discussion of the malfunctioning of the dropsy patient’s senses is thus
discharged to the minds of those thinking about them. Or so the objection goes.

This objection does not succeed either, for as a reading of Meditation VI it stops
prematurely. The passage in question continues in a way that makes it clear that the second sense of
the term ‘nature’ (the teleological one) is a mere label when attributed to the body of the dropsy patient.
It is wrong to say that the patient’s body has a ‘disordered nature’ or that it is ‘malfunctioning’. That
is because his body is subject to the physical laws of motion, and these have not been violated. But
the second sense of the term ‘nature’ is not a mere label when attributed to the mind-body union, that is
to the dropsy patient considered as a human being:

although with respect to the body suffering from dropsy it is only by an extrinsic label that we say its nature is
disordered because it has a dry throat and yet does not need drink, with respect to the composite, that is, the mind
united with this body, what is involved is not a mere label, but a true error of nature, namely that it is thirsty at a time
when drink is going to cause it harm. (Meditation VI, AT VII 85; italics mine)
Descartes is not, after all, attempting to discharge the teleological sense of ‘nature’ and ‘malfuction’ in this passage; he is attempting to locate it properly. So long as we understand that we are taking about the senses in the context of the mind-body union, a system that has self-preservation as its end, then Descartes thinks they have an end and that they sometimes malfuction with respect to that end. The ends here are not simply in the mind of the philosopher; they belong to the mind-body union itself.

II.B. Works of Natural Philosophy: Mechanizing Sensory Physiology

One might grant my reading of Meditation VI, but think that this teleological gloss on the senses represents a momentary glitch in Descartes’ otherwise consistent practice of eschewing ends. The *Meditations*, after all, is a work in epistemology and metaphysics, not a work in natural philosophy. Perhaps he over-reached. In fact, the teleology turns up in Descartes’ writings in natural philosophy as well, including the *Treatise on Man*, Part IV of the *Principles of Philosophy* and the *Passions of the Soul*.

One expects to find in these works the two-part account of sensation outlined above: a mechanical account of sensory physics and physiology followed by a type-type correspondence between pineal motions and sensations. This expectation appears to be fulfilled in passages like the following from the discussion of touch at *Principles* IV.191: “Corresponding to the different ways in which the nerves are moved, or have their normal motion checked, various different sensations are produced in the mind” (AT VIII-A 318). End of story. There is little suggestion that the sensational effects have a biological function that is important to their explanation. On further inspection, however, the biological function emerges. Consider the following treatments of pains and tickles:

…tickling occurs when the objects of the senses excite some movement in the nerves which would be capable of harming them if they did not have enough strength to resist it or if the body were not in a healthy condition. This makes an impression on the brain which, being instituted by nature to testify to the body’s healthy condition and strength, represents this to the soul as a good which belongs to it insofar as it is united
with the body…[Pain] always results from an action so violent that it injures the nerves. This sensation, instituted by nature to indicate to the soul damage that the body receives from this action, and the body’s feebleness in not being able to resist it, represents both as evils which are always unpleasant to the soul. (*Passions* II.94, AT XI 399-400)

…if the filaments that compose the marrow of these nerves [viz., nerves running to the brain] are pulled with force enough that they break and thus are separated from the part to which they were joined, so that the structure of the whole machine is somehow less intact, the movement they then cause in the brain will cause the soul (to which it is essential that its place of residence be preserved) to have the sensation of pain. And if they are pulled by a force almost as great as the preceding one without, however, being broken or separated from the parts to which they are attached, they will cause a movement in the brain which, testifying to the good constitution of the other parts, will occasion the soul to feel a certain corporeal sensual pleasure referred to as tickling, which as you see, being very close to pain in its cause, is quite the opposite in effect. (*Treatise on Man*, AT XI 143-144; see also *Principles* IV.191, AT VIII-A 318)

These passages are filled with comments that are irrelevant to the mechanical and psychophysiological processes under investigation, but that suggest the biological function of sensation explicitly set out in Meditation VI: sensation occurs only in a mind that is united to a body; because it is essential to such a mind that its place of residence be preserved it needs to be alerted to any damage or health of the body so that it can initiate body-preserving behavior; pain and tickling sensations inform the mind of damage and health of the body; they facilitate the appropriate practical judgments and action and thereby aid in the preservation the body and so of the mind-body union. The biological function of the senses, although not a topic of discussion in its own right, clearly sets the backdrop for Descartes’ treatment of the production of sensations throughout his career in natural philosophy.

More to the point, this biological conception of the senses is not a mere rhetorical flourish. It does some work. Consider the question, *how does Descartes arrive at the micro-mechanisms that are supposed to underlie these sensory processes?* He does not arrive at his mechanisms by an unbroken chain
of deduction from the first principles of natural philosophy, i.e., the conception of body as *res extensa* and the laws of motion. The first principles constrain the range of possibilities: whatever the mechanisms are, they must be modes of *res extensa* and they must operate according to the laws of motion. Beyond that, however, the micro-mechanisms are arrived at by hypothesis. Hall and Hatfield have convincingly argued that Descartes translates into a mechanistic idiom the traditional scholastic and Galenic accounts of sensory physiology. To the extent that he willingly adopts these accounts, however, he adopts a teleological conception of sensory physiology according to which the sensory systems and their parts have certain normative functions in the human system. When Descartes hypothesizes that severed nerve filaments are the regular distal causes of pain sensations and jostled-but-not-severed nerve filaments are the regular distal causes of tickling sensations, he identifies those bodily states as *damage* and *health*. Damage and health are not the sort of properties that are recognized by Cartesian physics. What are they doing here? They are helping Descartes to make a guess at what might be the underlying micro-mechanisms that produce these sensations: severed nerve filaments is a sensible guess at how the bodily damage that is represented by pain sensations might be instantiated in *res extensa*. Descartes’ hypotheses may be fantastical, but they are not unmotivated; they derive from his assumption that these sensations are telling us something about the biological conditions of the body that cause them.

Descartes’ treatment of secondary quality sensations employs similar assumptions. Consider his discussion of gustatory sensations in the *Treatise on Man*. While bodily sensations like pains and tickles track the damage and health of one’s own body, gustatory sensations alert us to a biologically important feature of *external* bodies that we might ingest, viz., their digestibility:

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But what must be principally noted here is that the particles of food that, while still in the mouth, can enter the pores of the tongue and elicit the sensation of taste are the same ones that, once in the stomach, can pass into the blood and proceed thence to join and unite with all the parts of the body. And indeed only those that moderately tickle the tongue, and can make the soul sense an agreeable taste, will be entirely suitable to that end [of incorporation into the body]. For just as particles that are too active or too inactive can cause too sharp or too bland a taste, so are they too penetrant or too soft to enter into the composition of the blood and serve for the maintenance of the members. (AT XI 146)

Descartes is conceiving the gustatory system as a means for guiding our eating behavior. That conception informs his hypotheses about the physical mechanisms that underlie the system: pleasant flavors arise from bodies that are readily digestible and hence, Descartes supposes, from particles that “moderately tickle the tongue,” i.e., ones that can be readily broken down by saliva and then incorporated into the blood; bad flavors arise from things that are more difficult to digest and hence, he supposes, from particles that are “too penetrant or too soft to enter into the composition of the blood.” What is more, he depicts the system as self-regulating: “as the temperament of the stomach changes, so the strength of taste changes too” (AT XI 147). In other words, the gustatory system is itself influenced by feedback from the digestive system so that on certain occasions, as when one is full and does not need food or when one is ill and food would be harmful, things that are otherwise nutritious no longer taste good. There is little question that the gustatory system is conceived here along biological lines, and that Descartes’ underlying physiology is designed to support that conception.

In short, the philosophical conception of the senses that Descartes develops in Meditation VI plays a methodological role in his natural philosophy: it guides his search for the efficient mechanical causes by which the sensory system operates.
III. Beyond the Senses

It is worth noting that Descartes’ use of teleology is not restricted to his account of the senses. It pervades his discussion of the mind-body union. In his treatment of human physiology in the *Principles of Philosophy*, for example, Descartes claims outright that the stomach, esophagus, throat and other internal organs of the human body are “designed (*destinatas*) to satisfy our natural needs” (IV.190, AT VIII-A 316). Similarly, in the *Discourse on Method* he writes: “the true function of respiration is to bring enough fresh air into the lungs to cause the blood entering there…to thicken immediately into blood again…*For if this did not happen the blood would not be fit to serve as fuel for the fire in the heart*” (AT VI 53; italics mine). Sometimes our organs malfunction: when we feel hate, Descartes writes in the *Passions*, the stomach “ceases to do its job [*cesse de faire son office*]” (II.98, AT XI 402) by failing to digest properly what we eat; when we feel merely sad, however, the stomach continues to “do its duty [*faire son devoir*]” (II.100, AT XI 4403). This portrayal of bodily organs as functioning well or badly makes sense only against the background assumption that the body is supposed to provide a suitable home for the mind and therefore must maintain a certain arrangement of its parts; the organs are conceived here as contributing well or badly to the home-providing end of the bodily system of which they are a part.17

The passions too have a natural function, one that is closely related to that of sensations, for they “are only given to the soul insofar as it is joined to the body, so that their natural function is to

17 One might object that Descartes would (even does) say the same sort of thing about the bodily organs of animals. Animal bodies, however, do not serve as the domicile for a mind, so how can this be a condition on the functionality of bodily organs? The answer is that the attribution of functions to the organs of animals, like the attribution of functions to artifacts, is only an extrinsic denomination based on an (admittedly compelling) analogy with the organs of the human body. Because it does not serve as the home to a mind, there is no basis for attributing a genuine end to the animal body, and so no basis for attributing a function to organs that are alleged to sub-serve that end.
incite the soul to consent and contribute to the actions that can serve to preserve the body or make it more perfect” (*Passions* II.137, AT XI 430). More specifically, the passions incite the will to set in motion the pursuit of goods and avoidance of evils that are presented sensorily to the mind (*Passions* I.40, AT XI 359 and II.52, AT XI 372). They do this not by directly compelling the will in one direction or another (the will, after all, is free), but rather indirectly by calling the soul’s attention to certain thoughts and thereby providing the will an extra opportunity to take appropriate action. As with sensations, Descartes suggests that passions can malfunction; they malfunction by “strengthening and preserving these thoughts beyond what is required, or by strengthening and preserving others on which it is not good to dwell” (*Passions* II.74, AT XI 383) thus encouraging the will to act in a self-destructive way.

Considered by itself, the body may be just a blind machine. Once it is united with a mind, it becomes for Descartes a machine with a purpose: to provide a home for the mind. At the same time, the bodily organs and the modes of mind that arise from this union are means for maintaining whatever is bodily required for the continued presence of the soul. But that is to say that they are all, like sensations, susceptible to teleological explanation.

IV. Descartes’ Attack on Teleological Explanation Revisited

So far I have argued that there is un-discharged teleology Descartes’ account of the human being, and especially in his account of the sensory system. The pressing question now is: Why would Descartes allow teleology here, when he launches an explicit attack on it elsewhere? Some

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18 I owe this understanding of the function of the passions to discussions with Sean Greenberg. For a development and defense of this line, see his manuscript “Impassioned Life: The Nature and Function of the Passions in Descartes’ *Passions of the Soul.*”
commentators have charged Descartes with inconsistency. In this section, I will argue that there is no inconsistency. First we first have to get clear on just what Descartes rejects and why.

It is worth noting that Descartes’ attack is directed specifically to the use of final causes in natural philosophy or physics: “I consider the customary search for final causes to be totally useless in physics” (Meditation IV, AT VII 55; italics mine; see also Principles I.28, AT VIII-A 15). He explicitly allows some form of teleology in moral philosophy: “In ethics…it may admittedly be pious on occasion to try to guess what purpose God may have had in mind in his direction of the universe” (Fifth Replies, AT VII 375; see also Principles III.3, AT VIII-A 81). The objection, then, is not that there is something intrinsically suspect about ends, purposes, functions or finality, but that they do not have a proper place in the causal explanations of natural philosophy.

While important, this qualification only gets us so far. One might try to argue that since the teleology discussed above enters into Descartes’ account along with the mind-body union, a distinctively metaphysical topic, Descartes cannot be accused of contaminating his natural philosophy with the stuff. Unfortunately, the line between metaphysics and natural philosophy is not a clear one in Descartes. He claims in a letter to Mersenne that his metaphysical Meditations contains “all the foundations of my physics” (AT III 233). In the Principles of Philosophy, Descartes purports to derive the physical laws of motion from God’s immutability (II.37, AT VIII-A 62). Moreover, Descartes is quite clear that that the study of the senses and of the psycho-physiological nature of the human being belongs to natural philosophy. He announces his intention to include a discussion of man’s psycho-physiological nature in his early Treatise on Man (AT XI 119-120). It seems he never realized his intention in this work, but he did not give up on it. He later announces a similar intention to include a discussion of man’s psycho-physiological nature in his Principles of Philosophy (AT VIII-A 315). He again failed, citing unforeseen difficulties that left him unable to complete it.

19 See, for example, Daniel Garber, Descartes’ Metaphysical Physics (Chicago: University of Chicago Press, 1992), 338, n. 14.
Whatever troubles Descartes had actually producing a complete work of natural philosophy on
man’s psycho-physiological nature, he conceives the topic as part of the field.

The next question we need to ask is: What exactly is supposed to be wrong with explaining
things in terms of ends in natural philosophy? And then: Does Descartes’ appeal to ends in the
account of the senses commit these wrongs? In answering these questions, it will be convenient to
distinguish three kinds of end-attribution. First, there is the attribution of ends to God, and in
particular to God’s creative acts, which I will call ‘divine teleology.’ Second, there is the attribution
of ends to finite rational creatures engaged in conscious deliberative action, as when I say that I go
for a run in order to reduce the stress of writing papers; I will call this sort of ends-attribution
‘rational teleology.’ Third, there is the attribution of ends to non-rational natural bodies and their
parts, as when we say that an animal’s teeth are for chewing and that a plant’s leaves are for
protecting its fruit; I will call this sort of ends-attribution ‘natural teleology.’ (We might add a fourth
category, viz., the attribution of ends to artifacts, as when we say that clocks have the end of telling
the time, but since these ends are agreed by Descartes and his opponents to be derived from the
intentions of their designers, builders and users and therefore to be only, as Descartes would put it,
‘extrinsically denominated’ of the artifacts, they are not pertinent to the present discussion.) I do
not suggest that Descartes had these distinctions clearly in mind when condemning the use ends in
natural philosophy. I introduce them in order to gain some interpretive control over (a) the various
elliptical things that Descartes does say about ends and (b) the things that his other philosophical
commitments imply about them. In what follows I argue that Descartes banishes divine and rational
teleology categorically from natural philosophy. He banishes natural teleology too, primarily on the
ground that it interferes with the natural philosopher’s pursuit of efficient causes. This leaves open
the possibility of a natural teleology that does not interfere with, but rather complements, the pursuit
of efficient causes. The teleology at work in Descartes’ account of sensation, I argue, is of this latter
form: it complements, rather than contradicts, his causal explanation of sensation.

IV.A. Divine teleology
Descartes’ case against divine teleology, the ascription of creative ends to God, is the clearest. First he charges that it is simply hubristic to think that, revelation aside, we can guess at God’s ends in creating this or that:

[W]e should not be so arrogant as to suppose that we can share in God’s plans. (Principles I.28, AT VIII-A 15; italics mine)

It is not without rashness that I think myself capable of investigating the ends of God. (Meditation IV, AT VII 55; italics mine; see also Fifth Replies, AT VII 375)

It is all the more hubristic, he charges, to suppose that the end God chiefly has in mind when creating things is our benefit:

It would be the height of presumption if we were to imagine that all things were created by God for us alone, or even to suppose that the power of our minds can grasp the ends which he set before himself in creating the universe. (Principles III.2, AT VIII-A 81; italics mine)

Second, and more problematic from the natural philosopher’s point of view, since we cannot be sure about God’s ends, explanations that appeal to them are going to be merely conjectural. Conjecture, however, is not good enough for natural philosophy, the explanations of which need to be at least morally certain (Principles IV.204-206, AT VIII-A 327-329). Third, it is not just that the chance for uncertainty, and so error, is high in guessing at God’s ends, but so is the cost, for if we guess wrong, then we may develop prejudices that blind us to the true (i.e., Cartesian) explanations of things. Not only do we risk being blinded to the truth here, but we risk having “insufficient appreciation of the magnificence of God’s creative power” (Principles III.1, AT VIII-A 80). Thus, for example, by supposing that God intended to create a range of corporeal species, each essentially unique, we blind ourselves to (what Descartes believes to be) the true and even more impressive possibility that the corporeal world has but a single essence (extension) that suffices to explain all natural phenomena.

Fourth, even if we could know God’s ends, there is little reason to think that that would help us understand the natures of things any better. Perhaps God created tulips because he like their shape,
or because he thought they would bring happiness to people or because he thought they would serve the advertising campaign of Holland. None of these insights helps us understand the nature, that is, the constitution, structure and behavior of tulips any better. At best, guessing at God’s creative ends fails to advance the natural philosopher’s inquiry into how things work. At worst, it leads him or her down the wrong path.

There is one final problem with divine teleology to consider. In the Sixth Replies, Descartes makes a remark that implies that searching for God’s purposes is futile not only because they are hidden from us, but because, strictly speaking, there aren’t any. God, he maintains, acts indifferently:

It is inconsistent to suppose that the will of God was not indifferent from eternity concerning everything that was or will be, for one can imagine no goodness or truth, or anything worthy of belief or action or omission, whose idea was in the divine intellect prior to the decision of his will to make it so. I am not speaking of temporal priority here; there is not even a priority of order or nature or ‘rationally determined reason’ as they call it, such that the idea of the good impelled God to choose this rather than that. (AT VII 431-432)

This is not to suggest that God acts with no intention or that he makes no decisions. The suggestion is rather that God’s intentions and decisions are not governed by any antecedent conception of what is good or true. What God creates is good and true, but he does not create it because it is (antecedently) good and true; to the contrary, it is good and true because he creates it. If God is not moved to act in one way rather than another by an antecedent conception of the good and the true, then it seems there are no divine purposes to seek.

The voluntarist strain of this passage is admittedly extraordinary. In light of it, one wonders what to make of Descartes’ persistent reference to God’s hidden purposes and of his claim that things in the natural world testify to the goodness and perfection of God. Is this just deceptive rhetoric aiming to please readers who are not prepared to accept the idea that God has no ends? That is Leibniz’s accusation. Does Descartes think that from our limited point of view within creation, we have little choice but (falsely) to see things as expressions of God’s good and wise
choices? Or is Descartes simply inconsistent? It seems to me difficult to decide the matter on the thin basis of the texts. Because this is an extraordinary strain in Descartes’ thought, I will rest on it neither Descartes’ case against divine teleology nor my case against Descartes’ illegitimate use of divine teleology.

In a theistic framework, it might seem a short step from proscribing divine teleology to proscribing natural teleology. If God creates the natural world, the thought goes, then surely any ends in nature are really God’s ends. If we are not in a position to know God’s ends, then we are not in a position to know the ends in nature. (Alternatively, if God has no ends, then surely there are no ends in nature.) There is an ambiguity lurking in this line of thought, for it fails to distinguish (a) the ends that move God to create and (b) the ends of the things he creates. Perhaps God creates eyes because he wants his creatures to get around by seeing and he determines that eyes be a means to sight. Perhaps he creates eyes so that his creatures will behold the rest of his creation and praise him. Perhaps he just likes their glassy look. Or perhaps he has no end in mind at all—he just creates them. This is a matter of divine teleology about which Descartes claims the natural philosopher has no business making guesses. It is a further question whether the eyes that God creates serve the creature’s end of survival. To be sure, it is God who decides that this sort of creature have the means-and-ends structure it does. God is thus the source of creaturely means and ends. But the creature’s ends are not God’s ends (except in the limited sense that he decides to create them); they are ends with which (not for which) God creates things. Even in a theistic framework, then, there is at least conceptual room for a natural teleology. Whether Descartes endorses any form of natural teleology is a question to which I return below in IV.C.

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20 Descartes does not explicitly draw this distinction between ends that move God’s creative act and ends found in the things he creates. As Etienne Gilson and Jean Laporte have convincingly argued, however, this is a distinction with which he would have been familiar from the work of Aquinas and Gibieuf, both of whom argue that although God does not pursue ends when he creates, he nevertheless creates things that (intentionally or naturally)
Is Descartes guilty of using divine teleology in his account of sensation? It is prima facie tempting to discharge the teleology of Meditation VI from the senses to God: it is not that the senses have the end of contributing to human survival, but rather that survival is what God has in mind when he creates human beings with senses. In light of Descartes’ banishment of divine teleology, this interpretive strategy is unacceptable. First, it is unclear whether Descartes’ God has ends before him in the act of creation. Second, even if he does, Descartes has no business guessing at them. This strategy thus removes the appearance of natural teleology only to convict Descartes of illicit divine teleology. I propose instead that we take the natural teleology at face value: Descartes’ concern is with the ends that the senses have insofar as they have a purpose or function in the mind-body union, and not insofar as they contribute to God’s greater creative aims. If Descartes illicitly employs teleology in his account of sensation, it is not divine teleology.

IV.B. Rational Teleology

Rational teleology involves the attribution of ends to finite rational creatures, as when we say that students take our classes because they want to think more clearly. There is nothing wrong with pursue ends. See Gilson, La liberté chez Descartes et la théologie (Paris : F. Alcan, 1913), esp. chs. 3 & 5 and Laporte, “La Finalité chez Descartes,” Revue d’Histoire de la Philosophie 2 (1928): 366-396. This distinction between the ends that move God’s creative act and ends found in the things he creates is later exploited by Boyle in his 1688 essay, “A Disquisition about Final Causes of Natural Things: Wherein it is inquired, Whether, and (if at all) with what Cautions, a Naturalist should admit them?” in The Works, Thomas Birch, ed., vol. 5 (Hildesheim: Georg Olms Verlag, 1966), 392-444. Boyle insists on distinguishing (a) “physico-theological” or “metaphysical” reasoning from ends, which amounts to reasoning from supposed ends in nature to God’s creative aims (what I call “divine teleology”) from (b) “physical” reasoning from ends, which amounts to reasoning from supposed ends in nature to facts about the natures of the things themselves (such as that a certain property be granted or denied of a thing because by it the end is best attained). Thanks to Sean Greenberg for pointing me to this development in Boyle.
rational teleology per se, as far as Descartes is concerned. He does not deny that rational agents choose and act on the basis of ends or for reasons. Rational agents and their reasons, however, are not the subject matter of natural philosophy, and so rational teleology has no place here. Its principle danger is that one may inadvertently attribute to non-rational bodies and their parts properties that belong only to rational minds, and in particular deliberative or intentional behavior. Descartes accuses his predecessors of making just this blunder in their attribution of things like gravity to bodies. To suppose that a body tends toward the center of the earth because it is seeking its proper place is to suppose, he argues, that bodies can think: “For this surely could not happen without knowledge, and there can be no knowledge except in a mind” (Sixth Replies, AT VII 442; see also Descartes’ letter for [Arnauld], 29 July 1648, AT V 222). Descartes is wary of being accused of this mix-up himself in his discussion of light, and is eager to clear the air:

When I say that the globules of the second element ‘strive’ [conatur] to recede from the centers around which they revolve, it should not be supposed for that reason that I am implying that they have some thought from which this striving proceeds, but only that they are positioned and pushed into motion in such a way that they will in fact travel in that direction, unless they are prevented by some other cause. (Principles III.56, AT VIII-A 108)

Descartes thus stresses that in his physics, unlike that of his predecessors, natural phenomena are explained in terms of exclusively corporeal causes, which are clearly distinguished from the mind (Principles IV.187, AT VIII-A 315).

It should be said that Descartes’ accusation here is off-base. His Aristotelian opponents are not really guilty of attributing thought to non-rational bodies. As I mentioned above, they distinguish the sort of goal-directed activity that rational creatures engage in, which involves the conscious recognition of ends and deliberation about means to ends, from the sort of goal-directed activity that non-rational bodies engage in. When a rock falls toward the center of the earth, its ‘inclination’ to fall is understood to be nothing more than a built-in propensity so to move—something hardwired into its nature; there is no recognition of ends or, consequently, intention to
pursue them on the part of the rock. Mistaken or not, Descartes accusation makes clear what he objects to when rational teleology finds its way into physics.

Is Descartes guilty of introducing rational teleology into his explanation of natural phenomena in his account of the senses? No. He is not suggesting that the sensory systems are conscious goal-directed deliberative agents; he is not suggesting that they behave the way they do because they recognize that the human being to which they belong needs to survive, and intend to alert him or her to the potential benefits and harms in the environment. To the contrary, Descartes attributes to the senses a biological function that is hard-wired into the nature of the mind-body union and that is carried out by non-conscious mechanisms.

IV.C. Natural Teleology

The final sort of teleology is natural teleology. To begin, let’s call the ascription of ends an instance of natural teleology if the ends are attributed to non-rational natural systems, such as bodies and mind-body unions, and to their parts.21 An example: the pupil has the end of allowing the proper amount of light into the eye, which sub-serves the visual system’s greater end of enabling the creature to see, which in turn sub-serves the creature’s chief end of survival. If Descartes is guilty of importing illicit teleology into his account of sensation, then natural teleology is the most likely contraband: he attributes an end to the sensory system (presenting the corporeal world in a behaviorally salient way) that sub-serves the end of the natural system of which it is a part (survival of the mind-body union). We need to look closely, then, at what Descartes objects to in the natural teleology of his predecessors and contemporaries (as he interprets them) to determine whether he imports anything illicit into his own account.

21 I include mind-body unions and their parts only insofar as the events that occur in them (and to which ends are attributed) are the result of their hard-wired psycho-physiological nature lying outside the rational control of the mind.
To anticipate, I argue that Descartes has no objection to the natural philosopher’s attribution of ends to natural systems and their parts in and of itself. What he objects to are the ways in which the attribution of ends has interfered with the pursuit of efficient causes. Ends, Descartes maintains, are not causes, and so they have no role to play in the causal explanations of natural philosophy. There is no reason to think, however, that all explanations are causal explanations. Descartes’ proscription leaves open the possibility that a form of non-causal, teleological explanation assists the natural philosopher in his pursuit of efficient causes. In his practice, he puts this possibility to work.

So what about natural teleology does Descartes object to? Descartes objects most frequently to the use to which the scholastic Aristotelians put it when they appeal to occult powers, natural virtues, real qualities like gravity and levity, substantial forms (including vegetative and sensitive souls) and their faculties to explain the behavior of corporeal substances. This is a motley crew of powers, but Descartes dismisses them all for similar reasons, and so I will not distinguish them, collectively calling them ‘directed powers’. Let’s assume that the ascription of directed powers to corporeal substances does not amount to the claim that the substances in question consciously recognize and intend to pursue ends. What are these directed powers are supposed to be? They are supposed to be efficient causes through which non-rational creatures naturally (i.e., through something built into their nature) move. Despite being efficient causes, they might well be said to be teleological in the limited sense that, by contrast with Descartes’ blind mechanical efficient causes, they are directed toward, and defined by, the ends they bring about. I say ‘ends’ rather than simply ‘effects’ because the motions or changes brought about by these powers are, like all natural changes in Aristotelian physics, cast as the actualization of a potential (actus of a potentia); these are directed changes that naturally stop upon the achievement of some goal-state (or terminus ad quem). These changes, in other words, have a built-in end or resting place toward which the change is directed and
through which the change (and the power to change) is conceived.\textsuperscript{22} Gravity or heaviness, for example, is an intrinsic power of earthen bodies that directs its possessor’s movement toward the center of the cosmos, where it rests. The vegetative soul is or has the power to bring to life bodies appropriately arranged for life.

There are, I believe, two problem that Descartes identifies with the ascription of directed powers to corporeal substances. One problem is metaphysical: these powers are supposed to be \textit{active}. Gravity, levity and similar powers, Toletus writes, are “active instruments through which inanimate things are moved naturally toward a location.”\textsuperscript{23} The corporeal substances that are supposed to have these powers, however, are \textit{inert} and so \textit{passive} according to Descartes’ conception of body as all and only extended. Any active power moving a body has to be extrinsic to the nature of that body.\textsuperscript{24} There is, then, a straightforward metaphysical problem about accounting for corporeal changes by means of allegedly active powers intrinsic to bodies.

Is Descartes guilty of illicitly attributing any active powers to inert corporeal substances in his account of sensation? No: to say that certain pineal motions give rise to the sensation of pain so that the mind-body union is alerted to damage is to attribute an end to the system, but it is not to attribute to the system an active power in the body to bring about that end. Rather the regular (though not infallible) achievement of the goal (damage alert) is brought about by the sheer mechanics and psycho-physiology of the system.

\textsuperscript{22} For an extensive discussion of the Aristotelian notion of change as it develops in late scholasticism, see Des Chene, \textit{Physiologia}, ch. 2.

\textsuperscript{23} Toletus, \textit{de Physica}, Bk. II, ch. 1, f. 47vb.

\textsuperscript{24} The view that Descartes categorically denies active powers to body is controversial. For a strong defense that he does, see Gary Hatfield, “Force(God) in Descartes’ Physics,” \textit{Studies in History and Philosophy of Science} 10 (1979): 113-140. See also Daniel Garber, “Descartes and Occasionalism,” in Steven Nadler, ed., \textit{Causation in Early Modern Philosophy} (University Park, PA: Penn State University Press, 1993), esp. 12-15.
The second and even greater problem with the Aristotelians’ directed powers is methodological: they are causal-explanation stoppers. Appealing to them in the causal explanation of a natural change blocks the search for more basic underlying processes by which that change occurs, and this constitutes a serious impediment to the progress of natural philosophy, which, as Descartes conceives it, is in the business of discovering the basic efficient (mechanical) causes of these changes. The reason that directed powers block the search for underlying processes is that they are put forward as simple and basic efficient causes that therefore admit of no further analysis.

Directed powers would pose little problem if they were conceived as placeholders for the latent or insensible processes that underlie regular and observable changes. Gravity or heaviness, for instance, would be unproblematic if it were shorthand for ‘something-I-know-not-what in the body that brings about its downward motion I-know-not-how’. But heaviness is purported to be a simple native power that actively carries a body downward; there is little room for further causal analysis.

Descartes’ charge, I submit, is that the Aristotelian natural philosophers effectively allow ends to masquerade as ultimate efficient causes, thereby putting a premature halt to their inquiry. When Descartes replaces directed powers with micro-mechanical efficient causes, he is not so much denying that natural processes have ends as he is denying that the Aristotelians have the right story about the mechanisms by which those ends are achieved.

The methodological misuse of ends is not unique to the scholastic Aristotelians, from Descartes’ disapproving point of view. Some advocates of the new mechanical science are guilty of it too. The new scientists know better than to confuse ends with proper (mechanical) efficient causes. The problem is that in their hands natural teleology lapses quickly into divine teleology: the attribution of natural ends to things engenders in them a tendency to pause to admire the extraordinary engineering skill of God rather than get on with their business. The mistake here is less pernicious than the one made by the Aristotelians, but it is troubling to Descartes nevertheless.

Descartes’ concern about the abuse of ends among the new scientists emerges from his exchange with Gassendi. Like Descartes, Gassendi rejects the Aristotelian directed powers in favor of micro-mechanical efficient causes. He is less optimistic than Descartes, however, about our
ability to discover those mechanisms. He thus argues that observing the functions or ends of the various parts of plants, animals and man ought to inspire reverential reflection on the ingenuity and benevolence of their designer and on their final causes (i.e., on the designer’s creative ends) rather than an inquiry into their micro-mechanical efficient causes, for the latter are hopelessly out of our reach:

No mortal can understand or explain the agent that forms and arranges the valves that serve as the openings to the vessels in the chambers of the heart. Nor can we understand the source from which this agent acquires the material from which the valves are fashioned, or how it makes them operate, or what organic structure it employs, or how it makes use of them, or what it requires to ensure that they are of the correct hardness, consistency, fit, flexibility, size, shape and position. Since, I say, no physicist is able to discern and explain these and similar structures, why should he not at least admire their superb functioning and the ineffable Providence which has so appositely designed the valves for this function? Why should the physicist not be praised if he then sees that we must necessarily acknowledge some first cause that arranged these and all other things with such supreme wisdom and in such precise conformity with his ends? (Fifth Objections, AT VII 309)

Descartes charges Gassendi with getting things exactly backwards: “The point you make to defend the notion of a final cause should be applied to efficient causation” (Fifth Replies, AT VII 374). In other words, what are beyond our reach are God’s creative ends. When presented with the manifest function of some part of nature, the natural philosopher should not throw his or her hands up in an overwhelmed state of awe and seek God’s ends in bringing the thing into existence; instead she should seek its underlying mechanical efficient cause. Efficient mechanical causes, Descartes argues contra Gassendi, are “easier to discover than God’s purposes” (AT VII 375) and, what is more, they are no less an incitement to admire God. Notice that Descartes voices no particular objection to observing natural functions or ends in things. What is at issue is the sort of inquiry this observation incites in the natural philosopher: it should incite an inquiry into their underlying mechanical causes rather than a speculative inquiry into divine teleology.
What, then, of Descartes’ ascription of ends to the sensory system and its parts? Descartes does not transform those ends into the sort of explanation-stopping efficient causes (directed powers) that he objects to in the Aristotelians. Nor does he use them to inspire the sort of reflection into divine teleology that he objects to in Gassendi. So far, Descartes has not violated his proscription even against natural teleology.

What, then, does Descartes do with ends? What legitimate use is there for ends in natural philosophy? I do not suggest that Descartes has an explicit doctrine about the legitimate use to which ends may be used in natural philosophy. He is interested in putting a stop to the many abuses of ends, and so he exercises no subtly and pauses to make no explicit exceptions in his denunciation of teleology. My sorting out of the problems that ends pose is a reconstruction of the arguments that lie behind his proscription. In what follows I similarly reconstruct a positive line of thought about ends that is suggested in Descartes’ response to Gassendi and that he implicitly endorses in his scientific practice.

Descartes suggests in his reply to Gassendi that the observation of ends might actually advance the progress of natural philosophy if used to incite or even assist the search into the underlying causes of natural phenomena: how, the natural philosopher might ask, does the system get that job done? This is precisely what it we find Descartes doing in his work: he uses the observation of ends to aid his investigation into the efficient mechanical causes of sensation. What is important is that the observation of ends not substitute for an inquiry into causes: to observe that pain sensations are for alerting us to bodily damage is no substitute for discovering the mechanisms that produce pain sensations. Teleological explanation of this sort is kept distinct from causal explanation. And causal explanation is given entirely in terms of efficient causes.

The teleological explanation we find in Descartes amounts to functional analysis. He attempts to determine what contribution the observable parts (or systems) of the human being make to the preservation or well-being of the human being as a whole; the observable parts are submitted in turn to a further analysis of the contribution that their insensible subparts (or subsystems) make to their well-functioning. Eventually these subparts (or subsystems) are instantiated by micro-
mechanical and psycho-physiological causal processes. This sort of analysis is evident throughout the *Treatise on Man, Description of the Human Body* and *Discourse V*: the human body is analyzed into the observable and functionally-described systems of traditional anatomy that contribute to its survival by performing certain tasks; these observable systems are analyzed into further insensible subsystems that account for their observable operations, and these subsystems are instantiated by microscopic parts of matter in motion. Thus, for example, respiration contributes to the survival of the body by regulating the consistency of the blood:

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 rarified and turned to vapor, 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 [that constitutes the life of the body]. (*Discourse V, AT VI 53*)

The respiratory system accomplishes the task of thickening of the blood by a micro-mechanical causal process of condensation (*Description of the Human Body, AT XI 236*). We have seen Descartes reasoning similarly about the sensory system: it contributes to the survival of the human being by informing it about the behaviorally salient features of its local environment; the gustatory subsystem contributes to this information-providing function by informing the mind about digestible and indigestible foods; the corporeal part of this process is instantiated by the flow of variously shaped and moving particles of foods across the tongue whose motions are instituted by nature to give rise of a more and less appetizing flavor sensations that incite appropriate eating behavior. The teleological explanation of these systems and their parts accompanies but does not interfere with causal explanation of how they operate.

Beyond these examples of functional analysis in Descartes’ practice, we have a programmatic statement from Descartes in which he endorses such a methodology:

Those who are experienced in dealing with machinery, when they know the function of a particular machine and see some of its parts, easily conjecture from this how the other parts which they do not see are made. In
the same way, from the sensible effects and parts of natural bodies I have attempted to investigate their imperceptible causes and particles. (*Principles* IV.203, AT VIII-A 326)

By knowing what work something is doing in the system and some of the observable operating parts, Descartes can better guess what the underlying insensible mechanisms are that make it work. Making assumptions about ends thus makes the natural philosopher’s task, the pursuit of efficient causes, more manageable.

None of this implies that the attribution of natural ends serves merely as a placeholder for efficient causal explanations, something to be dispensed with once the full efficient causal story is in place. The attribution of ends does a different kind of explanatory work that runs along side efficient causal explanation. When Descartes attributes a job or function to the respiratory system, he is answering a question about why the human body has a respiratory system by telling us what its contribution is to the survival of the human body. Similarly, when he attributes a self-preserving end to the sensory system in general, and a food-monitoring end to the gustatory system in particular, he is answering questions about why the human being has the sort of sensory and gustatory system it has by telling us what contributions they make to the survival of the human being. Efficient causes answer a different kind of question: How (by what process) does the respiratory system do what it does? And how (by what process) does the sensory system perform its function? Efficient causal and teleological explanation work side by side in his investigation into the human sensory and physiological systems.

Descartes’ commentators have rightly observed that he is at pains to argue that the only real causes are efficient causes. Descartes’ attack on final causes serves this argumentative end. Since the primary job of the natural philosopher is to offers causal explanations of natural phenomena, the natural philosopher should seek efficient causes. What commentators have failed to appreciate is that Descartes does not argue that all explanation is causal explanation. Teleological explanation that appeals to reasons and ends is not in itself problematic, even as applied to the natural world. It becomes problematic when it is conflated with or substituted for causal explanation. And that is
precisely the charge that Descartes levels against his predecessors. Descartes does not conflate ends and efficient causes; he does not posit final causes. Nor does he allow teleological explanation to substitute for causal explanation. In his work, we find an example of teleological and (efficient) causal explanation working together: functional analysis of the sensory system places useful constraints on the his hypotheses about the casual mechanisms by which it operates.  

VI. Concluding Remarks  

Descartes is often portrayed as having, as Dennis Des Chene has recently put it, “an unbending opposition to finality.” I have argued that his target is not finality per se, but forms of explanation that employ ends improperly: (a) explaining something by guessing at God’s purpose or end in creating it; (b) explaining something corporeal by attributing rational agency (or mentality) and

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25 I have been chiefly concerned with the latent teleology of Descartes’ psycho-physiology. It is necessary, however, to mention a passage from Descartes’ physics that has been thought to cause problems for his proscription against teleology. In his letter to Clerselier of 17 February 1645, Descartes introduces what Garber has called the principle of “least modal change” according to which any change resulting from the collision of two bodies will be the most minimal change possible (Descartes, AT IV 185; Garber, Descartes’ Metaphysical Physics, 292). The worry is that this principle presupposes God’s (or Nature’s) intention of minimizing change. I do not think that the principle is teleological and so I do not think it constitutes a violation of Descartes’ proscription. There is no reason to suppose that Descartes intended the principle to be anything more than an empirical and purely descriptive generalization of the changes that one observes in nature: where we find change, we find the least possible change. Garber suggests a different non-teleological interpretation. The principle, he argues, is just a consequence of God’s immutability: “surely an immutable God would cause the least possible change” (Garber, 292). As Garber recognizes, this is not an entirely satisfying inference, for it is not clear how an immutable God can allow for any change at all. This problem, however, is not a problem about illicit teleology.  

26 Des Chene, Physiologia, 170.
intentional action to it; and (e) explaining something corporeal by ascribing active and basic goal-directed powers to it. Above all, he opposes the way in which the appeal to ends serves to put a stop to explanation and thereby interferes with the natural philosopher’s enterprise of seeking the underlying and largely insensible mechanical causes of observable natural phenomena. His own work on the human sensory system, while teleological in the sense that it involves the ascription of ends and functions to it and its parts, commits none of these errors. To the contrary, the sort of functional analysis in which Descartes engages amounts to the first step toward (what he views to be) a proper investigation of some of the underlying mechanical causes of sensory perception. There is, then, a proper place for teleology even in Descartes’ natural philosophy.  

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