

Descartes and the control of nature.

MA-thesis Philosophy.

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Introduction.

The world we live in and our way of life are thoroughly shaped by modern science and technology. We tend to think we can be the masters of nature and of our own fate through science and technology, believing in progress and a technological solution to everything. At the same time we are aware of the numerous side effects of science and technology, for example from environmental pollution, the exhaustion of natural resources and alleged climate change to the destruction of cultural and biodiversity, diseases of affluence and a perceived dehumanisation of the world we live in. The response these side effects provoke is a further progression of science and technology to tackle and solve these problems, keeping the illusion of progress alive. But every technological application generates new side effects, leading to a vicious circle in which we are held captive. In spite of this we persist in our belief in the possibility of the control of nature and in the illusion of progress and we carry on as we did before without taking into consideration this vicious circle as a possible violation of the illusion of progress.

This appears to be a paradox at the heart of our way of life and consequently of our conception of our own identity as human beings. Are we truly the masters and possessors of nature, is there really a technological solution to everything and is there indeed progress? My suspicion is that this cannot be the right conception of human nature. My suspicion is that the idea of being the master and possessor of nature is a mirage which is the result of an institution of nature itself, which makes nature rather the master and possessor of the way we think about our own identity.

Because this concerns the conception of our own identity my suspicion is *philosophically relevant*. Since Plato philosophy has been about *what is*-questions, questions about the essence and identity of what there is. How can we conceive of our own identity if on the one hand we live in the illusion of being the masters and possessors of nature through science and technology and on the other hand they bear witness to our being held captive in their vicious circle which the illusion seems to blur?

Science itself seems to provide an answer. Evolutionary biology conceives of technology as an *extended phenotype* which is the expression of the human genome as the way in which our genes organise their replication through us as their phenotypes and the technological transformation of our environment as their extended phenotype.¹ Our genes drugging us in the illusion of being the masters of our own fate is just a way of enhancing their own replication through us as their vehicles. But although science provides this answer it does not make us *experience our own identity as such*. We carry on as we did before. Our conception of ourselves has not been changed. How come? This makes me wonder if science is the right method to ask and answer the question what it means to be human. As the phenotypical expressions of our genome science and technology have already taken the conception of human nature as the master and possessor of nature for granted and so keep us captive in their vicious circle which now appears to be our inescapable fate, dictated by nature through our genome and its evolutionary history in deep time.

Although human technology has been around for as long as humans have been around it has become particularly fully fledged since the start of the Scientific Revolution in the sixteenth and seventeenth century. The philosophical focal point of the Scientific Revolution is Descartes as the one who explicitly conceives of the scientific method in which nature appears *inert*, making it possible to conceive of nature as the *res extensa* as an object for manipulation by the *res cogitans* through quantitative mathematical and mechanical reasoning. Descartes is the one who explicitly tells us *what the method, nature and human beings are*. As such he is *philosophically relevant*. His conception of method, nature and human nature makes him the origin of the idea that the method can “nous rendre comme maîtres et possesseurs de la nature”.²

Because of his philosophical relevance Descartes is the subject of this MA-thesis. I will demonstrate in my interpretation of Descartes' thought that Descartes notices that the origin of the

¹ Dawkins 1999.

² AT VI p. 62.

method has already been implanted in him as an institution of nature. The guide for my interpretation is Descartes' experience as voiced by him at the beginning of *Le Monde*:

*Me proposant de traiter icy de la Lumiere, la premiere chose dont je veux avertir, est, qu'il peut y avoir de la difference entre le sentiment que nous en avons, c'est à dire l'idée qui s'en forme en nostre imagination par l'entremise de nos yeux, & ce qui est dans les objets qui produit en nous ce sentiment, c'est à dire ce qui est dans la flâme ou dans le Soleil, qui s'appelle du nom de Lumiere.*³

The possibility of the difference he observes between the sentiment and the cause of the sentiment is the starting point of his thought as he observes no resemblance at all between sentiment and its cause:

*Car encore que chacun se persuade communément, que les idées que nous avons en nostre pensée sont entierement semblables aux objets dont elles procedent, je ne vois point toutefois de raison, qui nous assure que cela soit; mais je remarque, au contraire, plusieurs experiences qui nous en doivent faire douter.*⁴

He finds no reason at all for the resemblance, which had traditionally been postulated by Aristotelianism between the essence (eidos) and the phenomena to describe and explain them all through the method of syllogism, to be assured of the truth. On the contrary, there are many experiences which make him doubt this relation.

Instead of Aristotelian resemblance Descartes proposes another relation to conceive of the possibility of the difference between the sentiments we experience and their causes: the analogy of *language* which serves as the first example of experiences making him doubt the relation of resemblance:

*Vous sçavez bien que les paroles, n'ayant aucune ressemblance avec les choses qu'elles signifient, ne laissent pas de nous les faire concevoir, & souvent mesme sans que nous prenions garde au sons des mots, ny à leurs syllabes; en sorte qu'il peut arriver qu'apres avoir ouy un discours, dont nous aurons fort bien compris le sens, nous ne pourrons pas dire en quelle langue il aura esté prononcé.*⁵

Descartes continues to explain that words *mean* something, i.e. that sounds convey meaning, because they have been *instituted* by man without any recourse to resemblance:

*Or, si des mots, qui ne signifient rien que par l'institution des hommes, suffisent pour nous faire concevoir des choses, avec lesquelles ils n'ont aucune ressemblance: (...).*⁶

And now postulates that *nature* might have done the same as regards the signs which convey the meaning of phenomena causing the sentiment in us:

*(...) pourquoi la Nature ne pourra-t'elle pas aussi avoir estably certain signe, qui nous fasse avoir le sentiment de la Lumiere, bien que ce signe n'ait rien en soy, qui soit semblable à ce sentiment?*⁷

³ AT XI p. 3.

⁴ AT XI p. 3-4.

⁵ AT XI p. 4.

⁶ Ibid.

⁷ Ibid.

Because nature has already done something similar before:

*Et n'est-ce pas ainsi qu'elle a estably les ris & les larmes, pour nous faire lire la joye & la tristesse sur le visage des hommes?*⁸

These quotations reflect Descartes' basic philosophical experience: he experiences himself to have already been a part of a thoroughly semantic whole in which signification and interpretation have already been going on before he started to think about it. The experience has been bestowed on Descartes or rather grew from within. The unity of this semantic whole has been made possible by an institution of nature, but in such a way that this unity presents itself as a difference between the sensation and the cause of the sensation.

To make sense of this institution he explains the unity in terms of a synthesis of the mechanical body mathematically conceived of as an inert *res extensa* with the rational mind metaphysically conceived of as the active *res cogitans*. Apparently, he sees no way to philosophically explain the unity of the semantic institution of nature in its *own* terms.

By taking this experience as my guide I will interpret Descartes *in his own terms, letting him speak for himself* and not according to some scheme or design to be applied to his thought. I will demonstrate how Descartes as a thinking entity himself as instituted by nature is already involved in the object of his thought: nature.

Taking this as his starting point Descartes already uses the perception which nature has instituted. At the same time this leads to the conception of an inert nature, forgetting the very origin of the conception. The paradox which is the hallmark of our modern conception of our identity finds its origin in Descartes' thought, the very origin of modern science and technology.

As Descartes himself states: human nature can neither be conceived of in terms of the soul, i.e. metaphysics, nor of the body, i.e. mathematical physics. It can only be conceived of *unphilosophically* in terms of itself as the union it is, i.e. in terms of everyday sensual experience.⁹ A philosophical conception of *being* human as the semantic unity is impossible, because existence itself on its own does not affect us: what a being, i.e. a substance, is is known only through its attributes.¹⁰

So Cartesian thought, including the modern scientific method, is inept to conceive of the true identity of human nature. How then to philosophically conceive of human nature?

§ 1 The epistemic gap.

The experience of being part of a semantic whole which presents itself as a difference between sensation and the cause of the sensation is the core around which Descartes' thought precipitates. Desmond Clarke calls this difference an *epistemic gap* between subjective experience and their objective causes which Descartes bridges by a new scientific strategy which Clarke calls hypothesis.¹¹ What does this mean?

Descartes' thought is motivated by his experience of the world as a semantic unity displaying a difference between sensation and the cause of sensation which cannot be bridged by reference to resemblance. In other words, the nature and identity of things in the world as we experience them cannot be explained anymore in terms of resemblance like Aristotle's *eidos* did. Clarke incorrectly interprets the quoted passage from *Le Monde* as discussing "the unreliability of

⁸ Ibid.

⁹ AT III p. 690-695: Descartes to Elizabeth, 28 June 1643.

¹⁰ AT VIII p. 25.

¹¹ Cottingham 1992 p. 261.

our sensations as a basis for scientific knowledge”.¹² However, this is not Descartes’ point.¹³ According to Descartes there is nothing wrong with our everyday experience of the world.¹⁴ On the contrary, it serves as the basis for the refutation of the relation of resemblance as the rationale for explanation of our sensations.¹⁵

A gap has been opened which cannot be bridged by resemblance anymore. Descartes needs something else to explain the way in which we experience the world, because the world has grown beyond the resemblance between our sensations and their causes. Man is not at home anymore in the world in which his experience resembled the world he experienced. A micro and macrocosmos reveal themselves in the gap that has been opened. A start of the exploration of the microcosmos had already been made in the form of corpuscular mechanics by Isaac Beeckman, whose apprentice Descartes had been.¹⁶ A start of the exploration of the macrocosmos had been made by Copernicus, Kepler and Galileo and would soon get its most advanced form in the theory of gravitation of Isaac Newton, who would acknowledge his indebtedness to Descartes.¹⁷

Descartes bridges the gap by the construction of corpuscular mechanical models serving as hypotheses to explain all natural phenomena. Nature is conceived of as corpuscular matter¹⁸ and as acting according to mechanical rules.¹⁹ Mechanics is conceived of as different parts of the same whole acting in the same way upon each other. In this way all there is can be explained in terms of the speed and direction of the motion of the constituent particles.²⁰

Necessary for the mechanisation is the concept of *inertia* to ensure the *uniform* analysis of all the different parts in a reduction to speed and motion of smaller particles constituting the bigger

¹² Cottingham 1992 p. 260.

¹³ Descartes’ point is clear in the third meditation, for example AT VII p. 39 makes Descartes’ point very clear: “Ac denique, quamvis a rebus a me diversis procederent, *non inde sequitur illas rebus istis similes esse debere*. Quinimo in multis saepe magnum discrimen videor deprehendisse: ut, exempli causa, duas diversis solis ideas apud me invenio, unam tanquam a sensibus haustam, & quae maxime inter illas quas adventitias existimo est recensenda, per quam mihi valde parvus apparet, aliam vero ex rationibus Astronomiae desumptam, hoc est ex notionibus quibusdam mihi innatis elicitam, vel quocumque alio modo a me factam, per quam aliquoties major quam terra exhibetur; *utraque profecto similis eidem soli extra me existenti esse non potest, & ratio persuadet illam ei maxime esse dissimilem*, quae quam proxime ab ipso videtur emanasse.” [my italics] The point is *not* that sensations are unreliable, but that they are *incomplete*: they are to be complemented by *reason*. This will also be discussed in § 4 and 5.

¹⁴ Rather there can be something wrong with the *inclinations* (impetus) we have to draw particular conclusions from everyday experience: AT VII p. 38-39: “sed quantum ad impetus naturales, jam saepe olim judicavi me ab illis in deteriorem partem fuisse impulsam, cum de bono eligendo ageretur”, or with the *judgments* (judicia) we base on everyday experience: AT VII p. 76: “Postea vero multa paulatim experimenta fidem omnem quam sensibus habueram labefactarunt; (...) & talibus aliis innumeris in rebus sensuum externorum judicia falli deprehendebam”. Again, see also § 4 and 5.

¹⁵ AT XI p. 3-4: “mais je remarque, au contraire, plusieurs experiences qui nous en [que les idées que nous avons en nostre pensée sont entierement semblables aux objets dont elles procedent] doivent faire douter” and Descartes continues to give some everyday examples, like language (as already quoted above: AT XI p. 4), the tickling sensation caused by a feather (AT XI p. 5-6) and the sensation of a strap by a soldier (AT XI p. 6).

¹⁶ Van Berkel 2013.

¹⁷ Gleick 2004 p. 100 quotes Newton’s letter to Hooke dated February 5, 1676: “What Des-Cartes did was a good step. (...) If I have seen further it is by standing on the shoulders of Giants”. And Cohen and Whitman 1999 p. 43-48 where it is explained that the title of Newton’s *Philosophiae naturalis principia mathematica* is an allusion to Descartes’ *Principia philosophiae* and how Newton derived many of his concepts and phrasings from Descartes, including the important concept of inertia which will be discussed below.

¹⁸ AT XI p. 33-34 and p. 37.

¹⁹ AT VI p. 54: “selon les règles des mécaniques, qui sont les mêmes que celles de la nature”.

²⁰ AT VIII p. 52-53 and AT XI p. 34.

parts constituting the whole.²¹ Inertia ensures that no final recourse is needed to qualitatively different Aristotelian eidè which natural phenomena as the objects of study resemble. Inertia ensures that *every* particle can be treated in the *same* quantitative way, because the difference is not in the nature of different particles, but in their amount of speed and their amount of direction in the three spatial dimensions of motion.

The essential thing about inertia is that it deprives particles of an active quality of their own as their own source of action or principle of motion (eidos as archè tès kinèseos).²² Inertia only admits an external force to activate particles, i.e. particles acting on each other through direct contact to transfer the motion, and so only admits the efficient cause. Through mechanics the significance and purpose of a functional whole can be explained in terms of the different parts acting effectively on each other, so the traditional final cause is eliminated in its reduction to the efficient cause. Conceived of as mechanised, corpuscular, material and inert nature is deprived of its own meaningful and purposeful activity. The identity and essence of nature has become inertia. The identity of the ultimate external power source, the very origin of all motion imposed on matter, has become something *supernatural*, i.e. *metaphysical*: God.²³ To bridge the epistemic gap Descartes has opened another gap: an ontological one in the essence of nature: between nature as inert mechanised corpuscular matter and nature as God the supernatural power source.

The conception of inert nature should not be confused with the Aristotelian-Scholastic notion of the prima materia. The prima materia of Aristotelian Scholasticism is matter deprived of its imprinted qualities and forms without an essence of its own. Descartes positively conceives of corpuscular matter as a true body which can be *geometrically* conceived according to its length, breadth and depth.²⁴ The geometrical conception of the body implies its infinite divisibility in ever smaller particles.²⁵ As such the essence of matter can never be found in a certain indivisible particle or atom with qualities of its own. Its essence is to be found in its being an infinitely divisible body occupying the geometrically analysable space. The essence of corpuscular, material nature is to be found in its geometrical conception as a *res extensa*. This is where inertia and geometry meet as the two cardinal aspects of mechanised nature. At this junction of inertia and geometry we can ask ourselves what the origin is of Descartes' idea of the mechanisation of nature.

²¹ Descartes was not an atomist in the strict sense and argues against atomism in article 20 of the second part of the *Principia* (AT VIII p. 51-52), because of the divisibility of the *res extensa*, but acknowledges it as a means to the mechanical understanding of natural phenomena. The real existence of atoms is not essential to the understanding of natural phenomena, only the uniform divisibility of particles *as res extensa* is, in order that all natural phenomena can be uniformly analysed. Particles *being res extensa* implies the impossibility of being atoms (“Cognoscimus etiam fieri non posse ut aliquae atomi, sive materiae partes *ex natura sua* indivisibiles, existant. Cum enim, si quae sint, *necessario debeant esse extensae*, quantumvis parvae fingantur, possumus adhuc unamque ex ipsis in duas aut plures minores cogitatione dividere, ac proinde agnoscere esse divisibiles.” [my italics]). This does not exclude the hypothesis of atomic particles to function “for the occasion” in specific scientific questions to be solved, as long as they only function as the basic unit to which speed and direction of motion are to be assigned needed to explain a specific bigger structure.

²² I will not engage in a thorough discussion of the concept of inertia from Beeckman through Descartes to Newton, because this paper is a philosophical thesis and not one of history of science. The essence of the concept of inertia is the same for Beeckman, Descartes and Newton, though phrasings differ. For in depth discussions as regards Descartes see Cottingham 1992 chapter 10 (by Daniel Garber), Gaukroger 1980 chapter 10 (by Alan Gabbey), Gaukroger 1995 p. 237-249 and 368-369 and Schmalz 2008 chapter 3.

²³ AT VIII p. 61-62 and AT XI p. 34.

²⁴ AT XI p. 33: “Et ne pensons pas aussi d’ autre costé qu’ elle soit cette Matiere premiere des Philosophes, qu’ on a si bien dépouillée de toutes ses Formes & Qualitez, qu’ il n’ y est rien demeuré de reste, qui puisse estre clairement entendu. Mais concevons-la comme un vray corps, parfaitement solide, qui remplit également toutes les longueurs, largeurs, & profondeurs (...).”

²⁵ AT VIII p. 51- 52 (see note 20), p. 59-60 and AT XI p. 33-34.

§ 2 Mathematics as rhetorics.

The world has outgrown man and a gap has opened between man and a vast universe revealing itself as an infinite micro and macrocosmos not resembling man's ideas about it anymore. But being part of this infinitely bigger new world Descartes still senses the unity, though it cannot be expressed as resemblance between human experience and its causing phenomena in the world anymore. The fundamental experience of the gap is the fundamental motivation of Descartes' thought. Descartes' answer to this existential challenge²⁶ is *counting and calculating thought*, i.e. *mathematics*. This is not something he made up himself, no *creatio ex nihilo*. According to Descartes it was already there: in his *inborn natural constitution* (*ingenium*), the seeds of true knowledge waiting to be developed in the right *methodical* way. Nature as the infinite cosmos may have outgrown man, but has also given man the means to grow and to try to keep up with nature's growth through the development of man's inborn natural constitution. This is what Descartes senses due to the natural light (*lumen naturale*) illuminating his inborn natural constitution.

Descartes finds the language and demonstrations of mathematicians much clearer than the language and syllogisms of the Scholastic philosophers who are supposed to explain what things really are, but never seem to agree about anything and losing themselves in endless disputes.²⁷ Descartes takes this simple finding at face value: apparently mathematics is much more illuminated by a natural light than Scholastic philosophy and is to be considered as a spontaneous gift of nature to the human mind.²⁸ Then we should not follow the Scholastic philosophers, but follow the natural light illuminating our inborn human constitution and think according to this light and leave the School philosophers and their language to themselves. This naturally illuminated way of thinking is *ordering* everything by *counting* and *calculating*, considering everything according to its *order and measure* (*ordo vel mensura*; rapport ou proportion; en nombre, en pois, & en mesure), just like mathematics, irrespective of the nature of the subject at hand, whether we are dealing with stars or humans.²⁹ In this way *everything* can be considered *in the same methodical way*.³⁰ What things are should not be explained by their essences or other occult qualities through lengthy syllogisms, but according to a progression in which one thing is known through another.³¹ The identity of things should be classified through their *knowability* and not through their essence. Thenceforth traditional ontology will be replaced by epistemology. In this way Descartes forges a new method for the search of truth by the formulation of rules for the cultivation of the human mind.³²

These rules are not designed to prescribe the mind *how* to think, because the way in which the mind thinks, i.e. performs inference, is *inborn* and has come *naturally* to the mind: which is the whole point of Descartes' criticism of Scholasticism and its syllogisms which strike him as unnatural and unproductive. Descartes wants to demonstrate how the human mind *naturally* thinks. The rules *formalise* what naturally happens when humans start to think, *formalising* the nature of

²⁶ That it is an existential challenge indeed to Descartes will be discussed in § 6.

²⁷ AT VI p. 7-8; AT X p. 362-366; AT XI p. 39.

²⁸ AT X p. 373 and p. 376; AT XI p. 47.

²⁹ AT VI p. 7-8 and p. 17-20; AT X p. 377-378; AT XI p. 47.

³⁰ Initially Descartes conceived of this as a "universal mathematics" (*Mathesis universalis*; AT X p. 378), but never used this term again, because soon afterwards he realised that there was much more to it than just a new mathematical discipline: it signifies nothing less than a complete and fundamental reform and transformation of science and human knowledge by the newly found method, as discussed in depth by John Schuster in Gaukroger 1980 chapter 3 and by Stephen Gaukroger in Gaukroger 1995 chapter 4; also compare AT VI p. 19-21 and AT X p. 179.

³¹ AT VI p. 18-21; AT X p. 381.

³² Initially the extended *Regulae ad directionem ingenii*, but later presented in much more compact form in the four rules of the *Discours de la Méthode*: AT VI p. 18-19.

truth in clarity and distinctness of conception and aiming at the continuous *cultivation* of the human mind from its *natural* origin.³³

What is so special about mathematics that Descartes takes this as the paradigm of human knowledge illuminated by the natural light? The basic concepts of mathematics are clearly and distinctly known through their illumination by the natural light and as such known in an indubitable way. This being the case, so are the chains of reasoning resulting from them, if performed correctly. When one understands a mathematical concept or follows a chain of correct mathematical reasoning one cannot but consent to it, forestalling any doubt about them and any endless dispute about the truth (in which the School philosophers revelled). Mathematical concepts and reasoning convey *certainty* by means of clear and distinct concepts and reasoning.

Mathematics can be applied to inert corpuscular nature, because the clear and distinct conception of it in its geometrical guise *is* in mathematical form. All particles and so all bigger functional structures which they constitute can be mathematically expressed according to their order and measure as regards speed and direction of motion.

It is important to note that the certainty *itself* which is conveyed by mathematical reasoning is *nothing mathematical*, but something *empirical*, i.e. something that is *felt, perceived*. Descartes' point is that the *clarity and distinctness* of a mathematical concept or deduction is the illumination by the natural light.³⁴ Once you have hit the ground with a clear and distinct intuition³⁵ it is amenable to mathematical deduction conveying the illumination by the natural light to everything that is rigorously deduced from it.³⁶ Mathematics is just the medium for conveying certainty, i.e.

³³ AT X p. 372-373. Here I largely concur with Gaukroger 1995 p. 116-117, though perhaps I state the case more explicitly than he does by calling the rules a formalisation and not just "[the] capture [of] an internal process".

³⁴ AT X p. 366-370. Again, I largely concur with Gaukroger 1995 p. 123, though again I state the case more explicitly than he does by calling mathematics a medium and not just a model like he does. Certainty being nothing mathematical is also demonstrated by the fact that mathematical truths and concepts can be called into doubt: see AT VII p. 20-21 and AT VIII p. 6, and by the empirical-perceptual and non-mathematical nature of truth as certainty: see note 35.

³⁵ According to Descartes the ultimate unshakeable ground and indubitable intuition is the clear and distinct insight i.e. illumination that *I* am the one illuminated by the natural light, whatever the status of the intuited insight is, indicating that at least *I am something*: the (in)famous *cogito sum* (AT VI p. 32-33; AT VII p. 24-25; AT VIII p. 8). As the truth of this intuition is guaranteed by nothing else than being a clear and distinct perception clarity and distinctness serve as the criterion for truth (AT VII p. 35: "Nunquid ergo etiam scio quid requiratur ut de aliqua re sim certus? Nempe in hac prima cognitione nihil aliud est, quam clara quaedam & distincta perceptio ejus quod affirmo; quae sane non sufficeret ad me certum de rei veritate reddendum, si posset unquam contingere, ut aliquid, quod ita clare & distincte perciperem, falsum est; ac proinde jam videor pro regula generali posse statuere, illud omne esse verum, quod valde clare & distincte percipio."), again underlining the non-mathematical, but empirical nature of truth as certainty. The guarantee that every insight I have remains true when I do not attend to it (which means that propositions I have clearly and distinctly intuited keep their identity as such, which means that the natural light always illuminates the human mind in the same way, which means that nature can be counted on to be *regular*) is God who is not a deceiver (quod Deus non sit fallax: AT VII p. 80 and 90; AT VIII p. 21). See also § 7.

³⁶ Gaukroger complains about Descartes' treatment of the distinction between intuition and deduction as being "rather puzzling" (Gaukroger 1995, p. 117), because the concepts of intuition and deduction themselves are not clearly and distinctly distinguished by Descartes. I do not agree: it is clear from AT X p. 370 that deduction is the medium to convey the evidence (*evidentia*) of the intuition by means of a sequence (*successio*). So there cannot be a clear and distinct difference between the two, because as a medium to transmit and propagate the natural light they are both of the same kind and the difference between them can only be gradual and not discrete. The intuitions represent the first contact with the truth, not mediated by a sequence of deductions stored in memory. The deductions represent the transmission and propagation of the natural light of the truth. In this way it is perfectly clear what Descartes means by "Ex quibus colligitur, dici posse illas quidem propositiones, quae ex primis principiis immediate concluduntur, sub diversa consideratione, modo per intuitum, modo per deductionem cognosci; ipsa autem prima principia, per intuitum tantum; & contra remotas conclusiones, non nisi per deductionem." Asking for a sharp distinction between intuition and deduction would thus be contradictory to rule 7 (AT X p. 387). Ultimately, Gaukroger also reluctantly concludes "that deduction is ultimately modelled on intuition, and that in the limiting case it becomes intuition." (Gaukroger 1995 p. 118.)

truth. Mathematics is the medium for the transmission and the propagation of the natural light. As such it is a medium for *rhetorical persuasion*.³⁷

As the medium of the natural light mathematics is able to display concepts and deductions with such clarity and vividness that one cannot but consent to it. The clarity and vividness of a presented image illuminated by the natural light is the ultimate rhetorical persuasion for Descartes, as argued by Stephen Gaukroger. He draws attention to two central features as regards Descartes and his concept of truth. The first is historical in pointing out the important role rhetorics, especially that of Quintilian, must have played in Descartes' education at La Flèche and how rhetorics as conceived by Quintilian depends on exhibiting images in a vivid way to convince another of the truth.³⁸ The second is philosophical in the idea of an image-forming power being at the centre of cognition as the dominant one for Descartes.³⁹

Again, it is important to realise that mathematics itself is *not* the source of knowledge and the truth, just as certainty being the mark of truth is nothing mathematical. Mathematics is the *medium* to transmit the truth by propagating the natural light. The source of knowledge is the image-forming force (*vis imaginationis*) which educes the divine seeds of knowledge which are in us like the sparks educes from a flintstone. The image-forming force is primarily attributed to poetry by Descartes as being brighter than philosophy and called enthusiasm.⁴⁰ Philosophy educes the seeds through reason (*ratio*).⁴¹

Though Gaukroger draws attention to the all-important rhetorical aspects of Descartes' concept of truth in clear and distinct ideas being absolutely certain as the expression of the image-forming power as the source of knowledge he does not explain the connection between philosophical reason and poetic imagination. In what way is the image-forming force at the centre of cognition and is philosophical reason an expression of it as well?

§ 3 Algebra as formalisation.

My suggestion is, like Gaukroger's, that Descartes realised that the image-forming force is also at the heart of reason. However, the force is ultimately not forming images to constitute a concept by a relation of resemblance. My next suggestion, beyond Gaukroger's, is, that Descartes realises how a form can *signify* something it does *not* resemble, as explained in the introduction and which he already realises very early on as evidenced by his early manuscript *Cogitationes privatae* as copied by Leibniz:

*Vt imaginatio vtitur figuris ad corpora concipienda, ita intellectus vtitur quibusdam corporibus sensibilibus ad spiritualia figuranda, vt vento, lumine: vnde altius philosophantes mentem cognitione possumus in sublime tollere.*⁴²

³⁷ AT VI p. 7: "Ceux qui ont le raisonnement le plus fort, et qui digèrent le mieux leurs pensées, afin de les rendre claires et intelligibles, peuvent toujours le mieux persuader ce qu' ils proposent, encore qu' ils ne parlissent que bas breton, et qu' ils n' eussent jamais appris de rhétorique."

³⁸ Quintilian, *Institutionis oratoriae* VIII, III, XLI: "Ornatum est quod perspicuo ac probabili plus est. Eius primi sunt gradus in eo quod velis exprimendo, tertius qui haec nitidiora faciat, quod proprie dixeris cultum. Itaque enargeian, cuius in praeceptis narrationis feci mentionem, quia plus est evidentia vel, ut alii dicunt, repraesentatio quam perspicuitas, *et illud patet, hoc se quodam modo ostendit*, inter ornamenta ponamus." [my italics] Quoted in English translation by Gaukroger in Gaukroger 1995 p. 123.

³⁹ Gaukroger 1995 p. 119-124.

⁴⁰ Enthusiasm is a significant term in the history of philosophy, Plato's account of it in *Phaedrus* 244a-249d being the classic one and extending beyond Descartes to Nietzsche. I will not explore this topic for reasons of restrictions in subject and size.

⁴¹ AT X p. 184 and p. 217.

⁴² AT X p. 217.

But though Descartes suspects this possibility very early on he does not *fully* realise it from the beginning: it will take him some years to conceive of its full potential and develop the method accordingly, as will be explained in § 5.

Because Descartes rejects the relation of resemblance he conceives of the possibility of *abstract symbolic representation* as a way of conception. In other words: the true nature of reason as animated by the image-forming force is its *formalising power*, i.e. its ability to represent knowledge in an abstract formalised way. Aristotelian logic in the guise of syllogism knew only one way of formalised thought which could be applied to nature: by means of the relation of resemblance between my ideas and the things in the world generating these ideas through the senses. Descartes abandons resemblance in the formalisation and opens up the possibility of abstract symbolic representation of nature in the guise of algebraic mathematics, eventually reducing figurative geometry to algebra.⁴³

In this way it is possible to abstract from the particular natures of the objects of knowledge to their common and most general aspect: order and measure, as already explained in § 2. It is this most general aspect of things which should be considered in science in distinction to the variety of things (*varietas rerum*), if one wants to know the truth (*veritas rerum*), because only this most general aspect is amenable to mathematical treatment and so known with certainty. This most general aspect of all there is is what constitutes the unity of human knowledge.⁴⁴

The *unity* of human knowledge is not to be found in the resemblance between my ideas and the world anymore, but in the *uniform methodical way of thinking* all there is through *the equality expressed through algebraic equations expressing the quantitative relations between different quantities*. The quantitative relations expressed through algebraic equations represent the causal-mechanical structure of nature in which all natural phenomena are quantitatively analysed and expressed in terms of speed and direction of motion. The conception of the mechanical structure of nature as causality is matched by the conception of the mechanical structure of scientific knowledge as algebra.⁴⁵

Human knowledge is not changed by the variety of the objects of knowledge, but remains one and the same, like the light of the sun is not changed by the things it shines upon. The unity of human scientific knowledge is *universal* and its importance is in its contribution to the universal wisdom (*universalis Sapientia*) and not in its contributions to particular specialist sciences.⁴⁶ So the human mind is a *universal instrument* (*instrument universel*), not dependent on the particular corporeal dispositions to exercise a particular art or trade.⁴⁷ As such the human mind, considering

⁴³ As evidenced by *La Geometrie* in which geometry is expressed through algebraic equations for the first time in the history of mathematics and by Descartes' introduction of a new algebraic notation replacing the old Cossic notation. Gaukroger also suggests that Descartes' fully developed conception of the limits of figurative representation by means of geometry (as opposed to the much more powerful possibilities of a symbolic calculus, i.e. algebra) led him to abandon the completion of the *Regulae*: see Gaukroger 1995 p. 172-181. See also § 5.

⁴⁴ AT VI p. 19-21; AT X p. 359-379.

⁴⁵ The mechanical character of algebra is fully realised by Leibniz who was amazed to find how complicated calculations did not need any thinking at all, but automatically propagated themselves through algebraic notation. This led him to the idea of an *Encyclopaedia* of human knowledge which could be formalised into a *Characteristica universalis* to which a *Calculus ratiocinator* could be applied to solve all scientific problems. A *Machina arithmetica* could do the job, so human beings would be delivered from the slave labour of calculation and could solely engage in creative thought. See Davis 2011 chapter 1, Hoffmann 2013 p. 32 and G 7 p. 200: "Quo facto, quando orientur controversiae, non magis disputatione opus erit inter duos philosophos, quam inter duos Computistas. Sufficiet enim calamos in manus sumere sedereque ad abacos, et sibi mutuo (accito si placet amico): *calculemus*."

⁴⁶ AT X p. 359-360.

⁴⁷ AT VI p. 56-59; AT X p. 359-360.

everything there is in its universal aspect according to order and measure by means of calculating thought expressed in algebraic equations, is a *universal computer*.⁴⁸

But universal wisdom is not a purpose in itself. Scientific knowledge is not designed to solve some school problems by arm-chair scholars, but to provide the knowledge necessary to know what choices should be made in life. To achieve this the natural light of reason must grow.⁴⁹ The rules and their expositions in the *Regulae* and the three *Essais* and their accompanying introduction about method, the *Discours*, are the means by which Descartes shows the way how to make the natural light grow by cultivating the naturally inborn human constitution which already harbours the divine seeds of knowledge. In this way man can master his own life and overcome nature.

§ 4 Representation.

The causal structure of nature is *represented* by the algebraic structure of human thought. What does “representation” mean? At the beginning of *Le Monde* Descartes already mentions the representation by the mind of the ideas of natural phenomena as the place where the meaning which is signified by the action of the natural phenomena on our senses is to be found:

*Mais vous direz, peut-estre, que nos oreilles ne nous font veritablement sentir que le son des paroles, ny nos yeux que la contenance de celuy qui rit ou qui pleure, & que c'est nostre esprit, qui ayant retenu ce que signifient ces paroles & cette contenance, nous le represente en mesme temps. A cela je pourrois répondre que c'est nostre esprit tout de mesme, qui nous represente l' idée de la Lumiere, toutes les fois que l' action qui la signifie touche nostre oeil.*⁵⁰

But Descartes merely touches upon the topic and does not want to lose time by discussing it:

*Mais sans perdre le temps à disputer, j' auray plutost fait d' apporter un autre exemple.*⁵¹

Le Monde is primarily a work explaining his new corpuscular physics in a popular way, i.e. in French instead of Latin and like a story (Fable) instead of by mathematical analysis and demonstration. His sole intention here is to point the way by which everyone can find the exact mathematical demonstrations of natural phenomena himself.⁵² So ultimately *Le Monde* has the same function as the *Regulae* and the *Discours* and its *Essais* (for the same reasons written in French rather than Latin⁵³ and, in the case of the *Discours*, but not its *Essais*, like a story (comme une histoire; comme une fable)⁵⁴): to show the way how to make the natural light grow, i.e. the cultivation of the ingenium.

⁴⁸ Descartes foreshadowed the work of Alan Turing by almost exactly 300 years (Descartes' *Discours* was published in 1637, Turing's *On computable numbers* in 1936). The connection between Descartes and Turing is of paramount importance and has scarcely been explored so far in philosophical and mathematical literature.

⁴⁹ AT VI p. 9-10; AT X p. 361.

⁵⁰ AT XI p. 4.

⁵¹ AT XI p. 4-5.

⁵² AT XI p. 31 and p. 48.

⁵³ AT VI p. 77-78.

⁵⁴ AT VI p. 4.

But this does not eliminate the problem at hand: what is representation? One way or the other and one time or the other Descartes is obliged to explain what representation is. The problem of representation is the problem of the contact between the world and its natural phenomena and the human mind through the senses. Descartes is obliged to explain why man is a semantic being in the first place, i.e. is in the world and experiences the world, interpreting the significations of phenomena.

Descartes cannot use his corpuscular and mathematical physics to account for this. His physiology, including his description and explanation of the process of cognition⁵⁵, is thoroughly mechanistic and as such can only explain the *process* of cognition in causal-mechanical terms, ultimately to be expressed in mathematical form. It does not show *what* thought *is* and *how* one knows it *to be true*. Accepting the mechanistic conception of nature and its algebraic expression is taking the basic fact of this conception and its expression already for granted, no questions asked. A *scientist* can do this and rather *should* do this to succeed in the endeavour of scientific research, but a *philosopher* cannot do this and has to consider the basic fact that causality *itself* is already a *conception* and so cannot be used to explain what conception *is*. Descartes realises the impossibility of a mechanical reduction of thought which can be mathematically expressed when he realises that the truth is nothing mathematical, but clarity and distinctness of conception due to the illumination of the mind by the natural light.⁵⁶

Man as the focal point of thought reveals himself to Descartes as a unity of something which can be mechanically and mathematically conceived of as an extended thing (*res extensa*) and non-mechanically and metaphysically as a thinking thing (*res cogitans*). So the unity that man is is, for Descartes, fundamentally a *synthesis*. This begs the question: who or what put both together? Descartes merely calls the synthesis an institution of nature (*institution de la Nature*)⁵⁷ or constituted by God (*natura hominis a Deo sic constitui*)⁵⁸, but that begs the question what kind of nature Descartes has in mind here, because, for obvious reasons, it cannot be the mechanistically conceived and mathematically expressed inert nature. Invoking God merely shifts the problem, for now Descartes has to explain the relation between the non-mechanical nature of God as the ultimate power source and mechanical nature.

The question concerning human nature as a synthesis will later be dealt with. For now it is important to bring to attention that Descartes uses representation to explain how natural phenomena signify themselves through the senses to the mind. Descartes discusses representation in the context of his first proof of the existence of God in the third meditation, but his point is to find a way to discuss how things distinct from me can cause my ideas, including God causing my idea of a supreme being. Proving the existence of God and him not being a deceiver is the foundation of corporeal things causing my ideas, because God has created me in such a way as a composite being capable of knowing the truth through illumination by the natural light.⁵⁹ Of course, in the context of the subject of this thesis I will not concentrate on the proof of God's existence in the third meditation and this serving as the foundation for corporeal things being the cause of my ideas in the sixth meditation, but I will concentrate on the way something different from the thinking substance can cause the ideas of the thinking substance.

⁵⁵ As evidenced in both the second part of *Le Monde (Traité de l'Homme)* and *Les passions de l'âme*.

⁵⁶ Even when Turing reduces calculating thought to a mechanical process performed by a universal machine (in *On computable numbers*) in which thought can be algebraically expressed as instructions to be performed and so opens up the possibility of understanding organic intelligence and thought as a mechanical process (in computer science (artificial intelligence) and in neurophysiology: for a nice overview see Dennett 1993) this still concerns a *certain conception of what might be called thought*, namely the *counting and calculating* one. It still does not say what thought *is as such*. To say it Descartes-like: the light that illuminates Turing's mind and which enables him to experience the world and see its phenomena for what they are is nothing mechanical, but something semantic and eludes every reduction. However, if one would like to speak of it one needs another method of expression than the mathematical one.

⁵⁷ AT VI p. 130 and p. 137; AT XI p. 357 and p. 369.

⁵⁸ AT VII p. 88

⁵⁹ AT VII p. 71-90.

Again, the motivating experience for Descartes is the difference between my ideas and their causes and the breakdown of resemblance. After establishing beyond doubt me being a thinking substance (ego sum res cogitans) in the second meditation Descartes establishes perceptions as modes of thinking as being beyond doubt.⁶⁰ But though I am certain of my perceptions I cannot be certain about there being things distinct from me producing these ideas and resembling them in every way.⁶¹ I might be of such a nature (created by God) that I could be wrong all the time, but even if that would be the case I cannot go wrong when I turn to the things I clearly and distinctly perceive themselves and being convinced by them perceive that even if I might be deceived I cannot be deceived in the perception that *I am something as long as I think I am something*.⁶² This being the case Descartes has to investigate whether God exists and if he does if he could be a deceiver, which amounts to the question whether the naturally inborn human constitution could be erroneously created by nature, thus rendering the illumination by the natural light as misleading.

To answer this question Descartes distinguishes two kinds of ideas to discover which kind can be true or false. Ideas can be divided into images of things (rerum imagines) and having other forms as being volitions, emotions or judgments. He establishes judgments (judicia) as the ones which can be falsified. The most frequently made false judgment consists in thinking that my ideas resemble things distinct from me.⁶³ What is the reason (ratio) for thinking this? Apparently, nature has taught (doctus a natura) us to think this way and it has not been shown by the natural light to be true.⁶⁴ But what has been shown by the natural light is true (as established by the cogito sum) whereas the judgment made on natural impulses taught by nature can push us in the wrong direction.⁶⁵ For example, we can have two different ideas of the sun: one drawn from the senses by which the sun appears very small and one from astronomical reasoning by which the sun is shown to be larger than the earth. Both ideas cannot resemble the sun and reason persuades us that the idea which seems to be drawn from the sun most directly bears no resemblance to it at all.⁶⁶ Ideas are not formed on the basis of the senses alone (per organa sensuum), but also on the basis of reason (ratio), because something more than just resemblance is involved (aliquid etiam amplius quam istius rei similitudinem cogitatione complector).⁶⁷ But how can one investigate this?

Here Descartes sees another way of investigating whether the things of which I have ideas exist distinct from me. In so far as ideas are considered as modes of thought I cannot recognize any inequality among them, but in so far as ideas *represent* different things they differ widely.⁶⁸ Descartes proceeds to explain this by differences in the amount of reality contained in ideas according to what ideas represent: ideas representing substances contain more reality than the ones representing attributes. To make his point he seems to invoke several technical Scholastic distinctions, which might strike the reader as odd, because Descartes is the philosopher who criticizes Scholastic philosophy for not being a natural and productive way of thinking. It has led to controversy and confusion, from the first readers, like Thomas Hobbes in the third set of objections

⁶⁰ AT VII p. 34-35.

⁶¹ AT VII p. 35: *similes* translated as *semblables* in the French translation authorized by Descartes (AT IX p. 28), the same word used by Descartes in *Le Monde*.

⁶² AT VII p. 36.

⁶³ AT VII p. 37: again *similes* translated as *semblables* (AT IX p. 29).

⁶⁴ AT VII p. 38: again *similes* translated as *semblables* and *similitudo* as *ressemblance* (AT IX p. 30), also used by Descartes in *Le Monde*.

⁶⁵ AT VII p. 38-39 and see note 14.

⁶⁶ AT VII p. 39 and see note 13.

⁶⁷ AT VII p. 37 and 40.

⁶⁸ AT VII p. 40.

to Descartes' *Meditationes*⁶⁹, to modern commentators like Bernard Williams who calls it "a piece of scholastic metaphysics" which is "unblinkingly accept[ed]" by Descartes though "a barely comprehensible principle as self-evident in the light of reason".⁷⁰

The question is whether it is that simple. Undoubtedly, Descartes took care to present his philosophy in the *Meditationes* in the most acceptable way to the traditional Aristotelians of Scholastic philosophy and the officials of the Roman Catholic Church,⁷¹ at pains to escape Galileo's fate.⁷² Invoking traditional philosophical distinctions might do the trick, but what trick is Descartes exactly pulling here?

First, Descartes uses the old principle that something cannot come from nothing (*nec posse aliquid a nihilo fieri*): if an idea representing something contains reality the reality must come from somewhere, i.e. its cause, and if one idea represents something containing more reality than another thing represented by another idea it is due to their respective causes. According to Descartes this is the case for effects containing 'actual or formal reality' as well as ideas considering their 'objective reality'.⁷³

Then, based on this principle, Descartes explains that the reality of an idea *as an idea* is derived from my thought, but as an idea *representing something* its reality is derived from something else. Though the *cause* of this idea representing something else is not transferring *its own* reality to my thought in the idea (*ista causa nihil de sua realitate in meam ideam transfundat*) it must not be thought that it must be less real (*non ideo putandum est illam minus realem esse debere*). An idea's *own* nature is such that it derives its reality from thought as being a mode of it, but being a *representation* of something it derives its reality from some other cause.⁷⁴

What is Descartes doing here? Is he really unblinkingly accepting some unintuitive and incomprehensible principle and reanimating Scholasticism? The basic thing about Descartes is that he experiences the gap between the world and his thinking about it. My ideas do *not* resemble the phenomena they convey to my mind. Descartes realises: I am *not*, or rather: my thought is *not* of the same kind, or rather: of the same *substance* as the world and its phenomena, though I am evidently already *in* the world and part of it, because I experience myself as being such due to the natural light illuminating me. Me being of another substance than the world does not mean that the world is less real than I am or not real at all. Me already being *in* the world there already *is* a connection between my thought and natural phenomena, though we are not of the same substance and as such are a different *res*, i.e. of different reality. So my ideas as modes of thought cannot be of the same substance and have the same reality as the phenomena in the world: my ideas *represent* the phenomena, for they *are not the same* as them *in substance*.

Now it becomes clear that Descartes' invocation of traditional Scholastic distinctions is nothing very essential to his own way of thinking: rather, he seems to turn Scholasticism inside out and putting the traditional distinctions to his own use, demonstrating his *independence* of rather than dependence on Scholasticism.⁷⁵ But this can only become clear in the natural light illuminating the experience of the world being a divided unity of two different things: my thought and the natural phenomena it thinks. Williams has missed Descartes' basic experience as the

⁶⁹ AT VII p. 185.

⁷⁰ Williams 2005 p. 120.

⁷¹ See the introductory letter of Descartes in the *Meditationes* to the theologians of the Sorbonne: AT VII p. 1-6.

⁷² Galileo's condemnation by the Inquisition had a profound impact on Descartes and made him abandon the publication of *Le Monde* and considering not to publish anything anymore, unless the Church would approve of it: see AT I p. 270-272 (Descartes to Mersenne, November 1633) and p. 285-289 (Descartes to Mersenne, April 1634).

⁷³ AT VII p. 40-41.

⁷⁴ AT VII p. 41.

⁷⁵ Descartes discusses the same topic in article 27 of the *Principia* (AT VIII p. 11), though in a more concise manner. Significantly, in the by Descartes authorized French translation all Scholastic terminology has been omitted (AT IX p. 32).

methodical principle for reading Descartes and so has to dismiss this part of the third meditation as unintelligible: that is Williams' shortcoming, not Descartes'.⁷⁶

So representation is the way in which thought is naturally connected to natural phenomena and both the senses and reason contribute to it through the image-forming force. In order to get the right representation of natural phenomena man needs to cultivate his naturally inborn constitution and make the divine seeds of knowledge grow and yield fruits through the right use of reason.

§ 5 The method as language reform.

Descartes bears witness to the experience that the world has outgrown man, revealing the infinite micro and macrocosmos. There is no resemblance anymore between man and the world he lives in. Man is not at home anymore in this world, which is an uncanny experience.⁷⁷ In a very literal sense man cannot believe his eyes anymore, as they do not convey the truth about things anymore, at least not completely. Descartes' answer to this challenge is the *method*.⁷⁸ The method is the right use,⁷⁹ which is a *regulated* use,⁸⁰ of our reason⁸¹ which is equally naturally inborn to all humans⁸² to augment and complement our naturally inborn senses, so man can grow up, in pursuit of the world that has outgrown him. Reason is the ability to judge in the right way and so distinguish the truth from falsehoods.⁸³

The first article of the *Principia* voices it in this way:

*Quoniam infantes nati sumus, & varia de rebus sensibilibus iudicia prius tulimus, quam integrum nostrae rationis usum haberemus, multis praeiudiciis a veri cognitione avertimur; quibus non aliter videmur posse liberari, quam si semel in vita de iis omnibus studeamus dubitare, in quibus vel minimam incertitudinis suspicionem reperiemus.*⁸⁴

Man is an *infant* which needs to grow up, i.e. acquire the full use of his reason, so he can acquire true knowledge. In order to get started man needs to deliver himself of all the childish prejudices he has about the world which keep him from knowing the truth and this deliverance is brought about by doubting everything once in your life. That accomplished, man can start to grow up and *learn how to talk*, not being an infant anymore. The *method* points the way how to learn to

⁷⁶ In my opinion this is an illustration of the general mistake much secondary literature of Descartes (for example Williams 2005, Schmalz 2008 and certain contributions in Gaukroger 1980 and Cottingham 1992 and much of the French literature on Descartes) employs: stressing a *continuity* rather than the abyssal *caesura* between Descartes and Mediaeval Scholasticism. How *historically* correct a continuity may be, the caesura should, in my opinion, be the *philosophical* methodical principle guiding the interpretation of Descartes, because Descartes' thought is driven by his fundamental experience which is completely different from Aristotle's carrying Scholasticism. I will not elaborate on this not only for reasons of restrictions in size, but also because the aim of this thesis is not to be a contribution to Descartes-scholarship, but a preparation for the philosophical question what a human being *is*.

⁷⁷ That it is an uncanny experience indeed for Descartes will be discussed in § 6.

⁷⁸ AT X p. 371, rule four: "Necessaria est Methodus ad rerum veritatem investigandam."

⁷⁹ Full title of the *Discours de la Méthode pour bien conduire sa raison et chercher la vérité dans les sciences*.

⁸⁰ Full title of the *Regulae ad directionem ingenii*.

⁸¹ AT VI p. 2: "Car ce n'est pas assez d'avoir l'esprit bon, mais le principal est de l'appliquer bien".

⁸² AT VI p. 1-2: "Le bon sens est la chose du monde la mieux partagée (...) le bon sens ou la raison, est naturellement égale en tous les hommes."

⁸³ AT VI p. 2: "la puissance de bien juger, et distinguer le vrai d'avec le faux, qui est proprement ce qu'on nomme le bon sens ou la raison."

⁸⁴ AT VIII p. 5.

talk about the world and order thought in this way in representing the world in the right order in order to know the truth to deliver oneself of the bonds of nature.⁸⁵

In the *Discours* Descartes makes it clear that the method is a *reform of language* in two interconnected ways. First, he wants to get rid of the language of Scholastic philosophy. The language of Scholasticism is the language of the study of letters and as such unfit for the study of the book of the world (le grand livre du monde),⁸⁶ because there is no testing in the real world involved. It is the language of arm-chair scholars. The language of the study of letters *does not matter* when it comes to real life questions.⁸⁷ Second, he wants to get rid of it by implementing a new way of talking about nature in which one thing is known through another in an order of knowledge which is a mathematical progression which can be algebraically expressed as the quantitative relations between quantities, instead of qualitative relations between essences stitched together in non-sensical syllogisms, as has been explained above. Briefly, he wants to *algebraise* language.

But how is the algebraic language to be implemented? It is significant that Descartes still needs natural colloquial language rather than formal mathematical language, i.e. stories in French rather than rigorous algebraic analysis and proof, to exhibit his point. Apparently, colloquial language has a natural rhetorical force of its own to convey the truth and to persuade people to adopt the new philosophy and concomitantly algebraically transform their language. The new language and new way of thinking do not start from scratch: nature had already bestowed on humans their mother tongues and the use of their inborn senses and reason, which, however, need to be cultivated, i.e. algebraically transformed.

Initially, Descartes seems to be reserved at the prospect of transforming language and reforming thought. He discusses the proposal for a universal language in a letter to Mersenne in 1629, deeming it possible to invent one on the one hand, but not expecting to see its usage on the other, because it presupposes such a great change in the order of things, that it would be necessary that the world would become a terrestrial paradise, which would only be a good suggestion in fairy land.⁸⁸ But in his *Discours* of 1637 he thinks that the method will render us the masters and possessors of nature which will turn our earth into a terrestrial paradise.⁸⁹ Between 1629 and 1637 he seems to have found a way along which to actually transform thought and language, which is the method *as algebraisation*.

Descartes very early on conceived of the method as an answer to the existential challenge and uncanny experience of the emergence of the new world as the infinite cosmos. Rule four represents very early material in Descartes' thinking, probably originating around the same time as he had his famous dreams in November 1619.⁹⁰ But his conception of what the method exactly is developed over the years, originating with the *Regulae* (probably written in an intermittent and

⁸⁵ This is the programme of the Enlightenment which has profoundly shaped our conception of our own identity. Compare Kant who writes approximately 150 years after Descartes in his *Beantwortung der Frage: Was ist Aufklärung?* in the same vein as Descartes: "Aufklärung ist der Ausgang des Menschen aus seiner selbstverschuldeten Unmündigkeit. Unmündigkeit ist das Unvermögen, sich seines Verstandes ohne Leitung eines anderen zu bedienen. Selbstverschuldet ist diese Unmündigkeit, wenn die Ursache derselben nicht am Mangel des Verstandes, sondern der Entschliessung und des Mutes liegt, sich seiner ohne Leitung eines andern zu bedienen. Sapere aude! Habe mut, dich deines eigenen Verstandes zu bedienen! ist also der Wahlspruch der Aufklärung." (Aufklärung p. 20.)

⁸⁶ AT VI p. 9.

⁸⁷ AT VI p. 9-10: "Car il me sembleroit que je pourrais rencontrer beaucoup plus de vérité, dans les raisonnements que chacun fait touchant les affaires qui lui importent, et dont l'événement le doit punir bientôt après, s'il a mal jugé, que dans ceux que fait un homme de lettres dans son cabinet, touchant des spéculations qui ne produisent aucun effet (...)." Which is also the reason why he writes in French rather than Latin in the *Discours*: literally ridding himself here of the language of his teachers to make natural reason come out more purely and his new philosophy easier understood: AT VI p. 77-78.

⁸⁸ AT I p. 80-82: Descartes to Mersenne, 20 November 1629.

⁸⁹ AT VI p. 61-62.

⁹⁰ Gaukroger 1980: chapter 3 by John Schuster.

discontinuous fashion between 1619 and 1628)⁹¹ and culminating in the *Discours* and its *Essais* (1637).

Already in the *Regulae* it is clear that true knowledge must be exposed as an enumerable mathematical progression instead of references to the essence of things like Scholastic philosophers did,⁹² but the way in which Descartes conceives of the exposition of the progression in the *Regulae* is still geometrical, i.e. figurative in terms of line lengths and geometrical figures,⁹³ and it breaks down when mathematical problems become more and more complex; significantly, it is the point where the *Regulae* break off.⁹⁴ Initially, Descartes wants there to be a one-on-one correspondence between geometrical figures and algebraic expressions to found the clarity of the latter on the clarity of the former, but here Descartes realises that if the clarity and distinctness of which mathematics is the medium is restricted to literal images, i.e. geometrical figures, mathematics will be very restricted in representing nature and exposing knowledge. The clarity of mathematics has nothing to do with sensual images: the clarity of *sensuality* is its *rationality*, i.e. the fact that I *conceive* something to be what it is and *perceive* that to be clear and distinct, as he later explains in the *Meditationes*.⁹⁵ Perception and conception as driven by the image-forming force have nothing to do with images conveyed through the senses, but are, as *formalisation*, a way of *thinking*, which is, however, at the same time a way of *feeling* (as *perceiving* something to be clear and distinct). Again, the point here is the *empirical* nature of truth as the illumination of the inborn constitution by the natural light.⁹⁶ The senses are already pervaded by rationality. The perceiving mind already dwells in the sensing of the senses, conceiving of something *as* something.⁹⁷ In the *as* of the conception dwells the formalising force, the *as* being the representation.⁹⁸

Nature is conceived of by Descartes in a mathematical way, but this implies abstract, non-figurative algebra *also* representing nature and being even better at it than geometry. The mathematical conception of nature is nothing geometrical, i.e. sensual, but something algebraic, i.e. mechanical. In tracing this development of Descartes' thinking about mathematics, nature and method and his gradually leaving resemblance behind in ever ascending steps of abstraction one can see the reform of thought at work in Descartes' thought itself. Descartes' thought *embodies* its *own* restructuring in its transformation in the same algebraic-mechanical nature of the nature it is trying to capture in its conceptions.

Descartes' letter to Mersenne of 20 November 1629 signals that Descartes knows that in order to reform thought and language to obtain true knowledge the clarity and distinctness of counting and calculating, i.e. how numbers, their enumerability and arithmetic c.q. algebraic

⁹¹ Ibid.

⁹² AT X p. 359 (rule one), AT X p. 362 (rule two), AT p. 366 (rule three), AT X p. 381 (rule six and its exposition): "monet enim res omnes per quasdam series posse disponi, non quidem in quantum ad aliquod genus entis referuntur, sicut illas Philosophi in categorias suas dividerunt, sed in quantum unae ex aliis cognosci possunt." And AT X p. 387 (rule seven), which is mirrored by the fourth rule in the *Discours* (AT VI p. 19 and Gilson p. 488). Note Descartes' explicit use of the word 'enumeratio' in Latin and 'dénombréments' in French.

⁹³ AT X p. 461-468 (rule 18 and its exposition).

⁹⁴ AT X p. 468-469 (rules 19-21 dealing with higher-order root extractions) and Gaukroger 1995 p. 172-181.

⁹⁵ AT VII p. 30-31: explaining the true nature of extended things with the example of the wax: "Superest igitur ut concedam, me nequidem imaginari quid sit haec cera, sed sola mente percipere (...) Atqui, quod notandum est, *ejus perceptio non visio, non tactio, non imaginatio est (...), sed solius mentis inspectio.*" [my italics] The extendedness of things which is conceived by the mind and perceived by it as being clear and distinct is illuminated by the natural light.

⁹⁶ See § 2.

⁹⁷ In this way rationality and sensuality are thoroughly intertwined and driven by the same formalising force, which is reflected by Descartes' remark that the rational soul is not lodged in the body like a pilot in his ship, but that they are joined and unified in an intimate way in order to experience sentiments (AT VI p. 59).

⁹⁸ See § 4.

operations convey the natural light, has to be transferred to language. He deems it possible to invent a universal language which would be very easy to learn if the primitive words and their symbols could be composed in the same order as the natural one between numbers and their infinite enumerability, so all other words necessary to express the things which occur in the mind could be written down in the same way as one counts. The invention of such a language would depend on the true philosophy putting thoughts in order and enumerating them and sorting out the clear and simple ones of which all thoughts are constituted, which is the great secret for acquiring true knowledge. The universal language will distinctly represent all things, making it almost impossible to mistake oneself and so aiding one's judgment. As it is, however, the words in the natural languages have confused meanings and the human mind is so accustomed to them that there is virtually nothing which one can understand perfectly. It will take a huge change in the order of things to transform language into a universal one, nothing less than the earth becoming a terrestrial paradise.⁹⁹

So Descartes has to find a way to transform the order of things which will concomitantly transform the order of thoughts. He has found it exactly here: in the algebraisation of thought, treating thoughts in the same way as numbers, treating them as enumerable, generated from primitive ones, and combining them in the same way as numbers are combined in arithmetic operations. *Thinking is counting and as such thoughts are enumerable*. The order of knowledge is enumerable like the natural numbers.¹⁰⁰

Descartes is not inventing the algebraisation of thought from nothing: he follows the *natural* order of numbers which cannot be but a representation of the natural order of things: the seeds of the right order are already out there as the seeds of true knowledge are already within us, which is one and the same thing as an institution of nature. The right order can implement itself in the world through the mind exercising the method which is the application of mathematics to nature and mechanically transforming it through technology and vice versa: a positive feed-back system between mind and nature, being in the same boat, but neither of them being the pilot. This is the cultivation of our inborn constitution which is as much a cultivation of the world.

⁹⁹ AT I p. 80-82. Descartes' considerations in this letter to Mersenne are in effect the germ for Leibniz' idea of the enumerability of all human thoughts in an *Encyclopaedia* to be expressed in a *Characteristica universalis* as the universal language to aid the judgment by means of a *Calculus ratiocinator*: compare note 45. This in its turn contains all the ingredients of all the problems in the foundations of mathematics sparking the tradition of analytic philosophy from Frege and Russell to Wittgenstein and triggering the work in formal logic and the foundations of mathematics by Hilbert, Gödel and Turing. These problems concern the *completeness* and *decidability* of formal calculi like mathematics. This ultimately concerns "the extent and the limitations of mechanistic explanations" (Max Newman writing about Turing's work, quoted in Copeland 2004 p. 3) and as such the extent and limitations of the human scientific conception and technological control of nature. The central concept here is *enumerability* and the (im)possibility to count and order everything according to the set of natural numbers, ultimately pairing off all complex higher order structures to natural numbers and so being able to enumerate and order everything, which is what Descartes is suggesting to Mersenne. Descartes implicitly suggests that the algebraic representation of nature is *complete* and by means of the criterion of primitive notions constituting all representations being clear and distinct *decidable*. Descartes suggests the cosmos to be a clock-work universe, which was taken to its ultimate consequences by Laplace (*Essai philosophique sur les probabilités* (1795)), and his method to be a proto-Hilbert programme for nature. This was to be proved impossible by resp. Cantor's proof of diagonalisation in 1891 demonstrating the set of real numbers to be non-enumerable, Gödel's proof of incompleteness of contradiction-free formal systems in 1932 and Turing's proof of undecidability in 1936. This formal work is mirrored by the empirical work of Darwin (evolution by natural selection), Boltzmann (thermodynamics) and Planck, Bohr, de Broglie, Pauli c.s. (quantum mechanics) destroying the clock-work universe. Due to restrictions in size it is not possible to pursue this in detail in this thesis, but it is important to realise that though these formal and empirical developments have taken place *we* still act like *we* can completely understand and control nature, as argued in the introduction. Somehow *we* cannot *feel* the consequences of these developments and turn a blind eye to our *own* transformed identity and place in the cosmos. Or rather: there seems to be a *lag* between these events and our reception, perception and conception of them. Nietzsche points to this lag when speaking of us as being shone upon by the light of stars that have died a long time ago, but whose light is still on its way to us: KSA 3 p. 303 and p. 481-482, KSA 4 p. 121 and KSA 5 p. 232. See also § 7.

¹⁰⁰ AT VI p. 18-19 (the four rules) and 21: "Car enfin la méthode qui enseigne à suivre le vrai ordre, et à dénombrer exactement toutes les circonstances de ce qu' on cherche, contient tout ce qui donne de la certitude aux règles d' arithmétique."

In the next years Descartes will develop his method, cultivate the seeds and expose his new science and philosophy in the works he publishes as the fruits to reap.¹⁰¹ The considerations of Descartes in the letter to Mersenne of 20 November 1629 are the link between the *Regulae* and the *Discours* and its *Essais* which constitute the core of Descartes' thought.

The method is an *answer* to something that vexes Descartes, but to what exactly? Why should there be a cultivation of nature anyway? What is the *origin* of the method?

§ 6 The origin of the method.

Descartes' criticism of Aristotelian Scholastic philosophy consists in it being an unnatural way of thinking and as such being sterile. If this is the case: why did it take philosophers so much time to figure this out? There are almost two millennia between Aristotle's death and Descartes' birth. And why did Aristotle come up with such an unnatural way of thinking in the first place? Or has something changed in the way human beings are in the world, changing their relationship with nature and their identity and place in the cosmos? And is this change driving Descartes' thought?

To be precise, Descartes thinks the Scholastic philosophers employ unnatural methods of thought and losing themselves in endless disputes, based on Aristotelian philosophy. Aristotelian philosophy itself is not so much unnatural as it is *naive, childish*. Aristotle is more like an *infant*, someone who does not quite have the entire use of reason (*usus integrus nostrae rationis*) and averted from true knowledge by prejudices (*avertitur a veri cognitione multiis praejudiciis*) generated by the senses (*varia iudicia de rebus sensibilibus*). Man has to grow up and use his reason to augment and complement the senses, because he has discovered that the world is much bigger than he thought it was, *infinitely* bigger, to be precise, but *fortunately*¹⁰² this infinity seems to be *enumerable* and as such the vast cosmos can be represented according to order and measure. Nature as the enumerable infinity becomes the domain of causal relations between inert particles represented by a mechanical algebra. This enables man to mechanically interfere with the course of nature and so domesticate and cultivate it for his own good.

Is it possible to trace Descartes' experience of the infinite cosmos and to trace his own child-like fear for a world he discovers to be infinitely bigger than he thought it was? Descartes' thought emerged after an existential crisis and is driven by an uncanny experience of nature.

There are several instances in his work where Descartes mentions *doubting everything once in your life* (*semel in vita; une fois en sa vie*) in order to deliver oneself of the prejudices which keep one from knowing the truth.¹⁰³ The doubt is formalised in the first meditation in the guise of a malignant spirit (*genius malignus*)¹⁰⁴ in order to find the Archimedean Point of truth.¹⁰⁵ Both the malignant genius and the Archimedean Point are of note here.

In both the *Discours* and the *Regulae* Descartes explains how his predisposition for mathematics set him on the right path pointing the way to truth, but how did he come to associate mathematics with truth? Why does the natural light illuminate him through the medium of mathematics?

There was a time when mathematical physics was just a game for Descartes. His mentor Beeckman scolds him for not being serious about it,¹⁰⁶ though they are virtually the only ones

¹⁰¹ AT VI p. 3: "Car j' en ai déjà recueilli de tels fruits (...)."

¹⁰² This good fortune will be discussed below.

¹⁰³ AT III p. 695; AT VII p. 17; AT VIII p. 5; AT X p. 392-400.

¹⁰⁴ AT VII p. 22.

¹⁰⁵ AT VII p. 24.

¹⁰⁶ AT X p. 167-169: Beeckman to Descartes, 6 May 1619, and Cole 1992 chapter 6.

understanding this physico-mathematics and exploring its possibilities.¹⁰⁷ Instead of writing the treatise about mechanics which Descartes had promised to Beeckman¹⁰⁸ he sets out to travel through Europe and wander about.¹⁰⁹

During his wanderings through Europe Descartes settles down somewhere in Germany in November 1619 and here the true significance of his and Beeckman's physico-mathematics hit him. Thanks to Baillet's account of it we can reconstruct what happened.¹¹⁰ Baillet quotes Descartes:

XI. Novembris 1620, coepi intelligere fundamentum Inventi mirabilis,

And:

*X. Novembris 1619, cum plenus forem Enthousiasmo, & mirabilis scientiae fundamenta reperirem &c.*¹¹¹

Descartes claims to have been *enthousiast, philosophically manic, possessed*¹¹² and to have found the foundations of the wonderful science. He finds it after literally removing all the prejudices and doubting everything he seems to know. It was like his imagination presented his mind as completely nude. Nothing remained but the love of truth, the pursuit of which would be the occupation of his life. Fatigued by his philosophical exercises Descartes' brain seemed to catch fire and he became enthousiast, which disposed his mind to receive dreams and visions. After falling asleep in this condition he receives three dreams which, according to himself, could not have come to him but from above (d'enhaut).¹¹³

I will not try to interpret Descartes' dreams, for I am no psychologist,¹¹⁴ but I would like to point out the similarities between certain themes and phrases Descartes c.q. Baillet uses in the description of the dreams and the situation surrounding them on the one hand and their recurrence in his later work on the other in order to suggest that Descartes' thought is driven by an uncanny experience and existential challenge.

In his first dream Descartes is blown off his feet by a violent wind which makes him spin. He cannot stand on his feet and walk properly and is about to fall down with every step he takes, which makes him feel embarrassed. When he tries to reach a church for shelter he passes an acquaintance without saluting him and wanting to turn back and greet him he is violently pushed

¹⁰⁷ AT X p. 52 (which corresponds to *Journal tenu par Isaac Beeckman de 1604-1634*. Tome I: 1604-1619 [Beeckman's *Tafelboeckje*] p. 244): "Physico-mathematici paucissimi".

¹⁰⁸ AT X p. 162: Descartes to Beeckman, 23 April 1619.

¹⁰⁹ AT X p. 165: Descartes to Beeckman, 29 April 1619.

¹¹⁰ I will not discuss the question of the authenticity of Baillet's account, Descartes' original notebook being lost, which has been discussed in depth by John Cole in Cole 1992, making a very convincing case that Baillet's account is authentic and trustworthy. The core of the argument is that Baillet's shortcomings as an historian are our luck, because he seems to have literally and uncritically translated Descartes' original Latin text into French. Some parts of it have been copied by Leibniz and can be compared to Baillet's account and some key phrases of Descartes are quoted by Baillet in Latin.

¹¹¹ AT X p. 179.

¹¹² Compare Plato *Phaedrus* 244a-249d (mania and enthousiazoon).

¹¹³ AT X p. 180-181.

¹¹⁴ Their content seems to be relevant in connection to his relationship with his father, which was problematic, and Beeckman, who was a father figure to him, and how that shaped his life and career as a philosopher and scientist: see Cole 1992.

against the church by the wind.¹¹⁵ Descartes himself interprets the wind as being an evil spirit who forces him to go somewhere where Descartes intended to go voluntarily.¹¹⁶

To describe the way in which the wind makes him spin on his feet Baillet uses the French expression *tourbillon*. Exactly the same expression, but in Latin: *turbatus*, is used by Descartes in the second meditation to describe the effect of the first meditation: throwing him in doubt, being spun around and not being able to find a place for his feet to stand properly,¹¹⁷ which reminds us also of the dream. Just like in the dream Descartes attributes this all to a malignant spirit. In the description of the dream Baillet uses the French *mauvais genie*, but also quotes Descartes' original Latin: *Spiritus malus*. Just like in the dream Descartes tries to find a place for his feet to stand properly, which is the Archimedean Point mentioned in the second meditation, and walk with assurance through his life, as he mentions in the *Discours*,¹¹⁸ because he feels embarrassed by insecurity.¹¹⁹ Finally, the dream came to Descartes in a heated chamber in Germany, like the *Meditationes* are situated in a heated chamber where he doubts everything and sees the wax transformed by the heat of the fire. This parallel situation is no coincidence, for he alludes to it himself in the *Discours*.¹²⁰

After waking up from the first dream Descartes prays to God and considers his sins which he thought were serious enough to draw the lightning from the skies onto his head. He falls asleep again and gets his second dream in which he is suddenly awakened by a thunder clap and opening his eyes he sees a lot of sparks of fire about in his chamber.¹²¹ This reminds us of the divine seeds of knowledge educed from our inborn constitution by reason like the sparks from a flint.¹²² Descartes interprets the thunder clap as the signal of the Spirit of Truth descending upon and possessing him.¹²³

These first two dreams are accompanied with fear, but the fear disappears with the third dream which has Descartes' course of life as explicit theme as it features a quotation from Ausonius: "Quod vitae sectabor iter?" Also, both the original poem itself as well as Descartes' dream allude to Pythagoras' *nai kai ou*.¹²⁴ The course Descartes' life will take is at stake: no more wandering about, but taking the right way of truth and certainty.

Descartes' course of life has to become *regular* and *methodical* in order to acquire true knowledge. The true significance of the physico-mathematics that hit him is its fundament in absolute certainty as the Archimedean Point from which to move the earth¹²⁵ and that due to this certainty mathematics can be used to regulate life in a methodical way, so life can be productive and yield fruits. The natural light shines through the certainty and regularity of a certain way of thinking, i.e. the counting and calculating one. The natural light shines through numbers and

¹¹⁵ AT X p. 181.

¹¹⁶ AT X p. 185-186.

¹¹⁷ AT VII p. 23-24.

¹¹⁸ AT VI p. 10.

¹¹⁹ AT VI p. 4.

¹²⁰ AT VI p. 11.

¹²¹ AT X p. 182.

¹²² AT X p. 184 and p. 217. Also compare AT VI p. 64 ("certaines semences de vérités qui sont naturellement en nos âmes"), AT X p. 373 ("Habet enim humana mens nescio quid divini, in quo prima cogitationum semina ita jacta sunt") and p. 376 ("prima quaedam veritatum semina humanis ingeniis a natura insita").

¹²³ AT X p. 186.

¹²⁴ AT X p. 182-185.

¹²⁵ According to Pappus Archimedes once said: "Dos moi poo stoo kai kinoo tèn gèn" when talking about levers (Pappi Alexandrini Collectionis VIII p. 1060).

arithmetic operations and so they can be used to regulate life: this is what hits Descartes and provides the firm place and the lever to lift the world from its hinges.

The inconstancy and irregularity of wild nature is what vexes Descartes and inspires his fear of it, expressed as the *Spiritus malus*. He has experienced this himself in the inconstancy of his adolescent life, not knowing what to do, his wandering about and the physico-mathematics of him and Beeckman demonstrating the untrustworthiness of thinking that our ideas resemble the world. The world is not like what our natural aptitude, as constituted by our bodily senses and our inborn natural use of reason, makes it seem. Traditional Scholastic philosophy has no answer to it, for it is unnatural and unproductive in its methods and based on infantile Aristotelian thought. Infantile Aristotelian thought has no answer to the experience that our natural aptitude to be in and deal with the world does not completely convey the truth about things. He is vexed by the fact that nature contains the divine seeds of knowledge, but they only yield fruits *spontaneously*, not *regularly*, and that Scholasticism is more of a hindrance than of assistance.¹²⁶ Nature and our naturally inborn constitution need *cultivation* in order to yield fruits regularly.¹²⁷ In order to accomplish this man must stop wandering about, start finding the truth in a methodical way¹²⁸ and make progress and set his hope on the future.¹²⁹ This cultivation is accomplished through the method showing the right way (*le droit chemin; rectum veritatis iter*).¹³⁰

Briefly, things are not what they seem to be. Significations and identities differ and express natural variation. The unity of what is is divided in what it naturally seems to be and what it rationally can be. This is what Descartes experiences. This divided unity and divergent identity should be regulated: the method promises to accomplish just this.

Descartes fortunately¹³¹ found the method due to his natural aptitude¹³² and the diverging ways on which he found himself in his life.¹³³ It was a *good fortune* for him to find the method in which his natural talents blended with his walk of life.¹³⁴ The origin of the method as a good fortune and spontaneous fruit of nature is, however, not exactly regulated and methodical itself.

Descartes' method as the cultivation of nature is the cultivation of *just one aspect* of nature: its *enumerability and computability enabling the articulation of it according to order and measure enabling the mechanical intervention in it*. The irregular, spontaneous and non-enumerable aspect is conspicuously left out, though it is exactly *this* aspect of nature which enabled the emergence of the method. Descartes' cultivation is the *domestication* of nature and as such a philosophical Neolithic Revolution, cultivating the earth and weeding out unwanted natural growth, ultimately resulting in the Scientific, Industrial and Information Revolution, the consequences of which we can

¹²⁶ AT VI p. 7 ("dons de l' esprit" versus "fruits de l' étude"); AT X p. 373: the divine seeds of knowledge can produce spontaneous fruits, as long as they are not neglected and suffocated by the wrong studies.

¹²⁷ AT X p. 371-378: rule four and its exposition: note the organic terminology Descartes uses (*ingenium, ingenitus, nasci, natura, fructus, semen, excolere, cura, maturitas*) as opposed to the mathematical-mechanistic terminology used throughout the rest of the *Regulae*; compare the organic terminology of Descartes' introduction to the French translation of the *Principia* representing philosophy and science as developed by the method as a *tree* with metaphysics being the roots, physics the trunk and medicine, morals and mechanics the branches from which the fruits are plucked (AT IX p. 14-15): Descartes does not mention the *soil* in which the tree is rooted, which is the *ingenium* as the institution of nature in which the divine seeds of knowledge have been sown). This difference in terminology is relevant: see conclusion.

¹²⁸ AT X p. 371.

¹²⁹ AT VI p. 3; AT VII p. 80.

¹³⁰ AT VI p. 2; AT X p. 366.

¹³¹ AT VI p. 3 (beaucoup d' heur).

¹³² AT X p. 403-404.

¹³³ AT VI p. 3 (certains chemins).

¹³⁴ Gilson 1987 p. 92: "On notera surtout dans ces textes [*Discours* and *Regulae*] le caractère spontané de la méthode cartésienne, dont les règles ne feront que codifier les démarches d'une raison exceptionnellement heureuse."

hardly fathom. With Descartes the true significance of the Neolithic Revolution, which took place after the last Ice Age, is perceived with a time lag of 10.000 years.¹³⁵ The true significance of the Neolithic Revolution is the idea of man becoming the master and possessor of nature, but nature itself has already set the stage for the emergence of this idea in a way which is incalculable by man and only perceived after a significant time lag, if it is perceived at all.

The evolution and nature of our species, *H. sapiens*, and its way of life have thoroughly been shaped by the occurrence of the Ice Ages.¹³⁶ No philosophy, science and technology without the Neolithic Revolution, no Neolithic Revolution without the Ice Ages and no Ice Ages without certain cosmic constellations and cycles. The occurrence of the Ice Ages is determined by certain cosmic cycles in deep time.¹³⁷ This is the infinitely greater cosmos that Descartes experiences: *deep space*, the cosmos and its cycles determining our nature and our way of life.

Apparently, we are not able to immediately perceive and completely survey the consequences of these cosmic cycles determining our nature and way of life, though we can compute the cycles themselves, giving us some idea of our cosmic situation. On the one hand nature may be computable, but on the other it is determining us and generating infinitely many consequences and spontaneous new significances in an incalculable way. These two aspects of nature cannot be brought together by the essentially *discursive* nature of the human mind.¹³⁸ The significance of things may be perceived by us, but always lagging behind their natural causes. Things take time. The world as a semantic whole in which Descartes experiences himself to be a part will always be innumerable many steps ahead of man.¹³⁹

Ultimately, Descartes' method and our science and technology sprouting from it are borne by the cosmos in a way we cannot possibly survey. Man becoming the master and possessor of nature is a mirage. Rather, in chasing this mirage man is the plaything of some of nature's outgrowths: counting and calculating thought and a semantics of command and control, propagating themselves through human evolution. Keeping this in mind: what is man's place in the world according to Descartes? What *is*, according to Descartes, a human being?

¹³⁵ Compare note 99: Nietzsche and time lag. The first people making the transition from hunting-gathering to farming felt the cosmic cycle and its consequences to which the earth is subject (see note 137) to which this evolutionary adaptation bears witness, but not until Descartes the significance of this cosmic cycle sparking this evolutionary event becomes clear. Descartes' method in its turn sparked the development of mathematical physics which is able to articulate and compute the cosmic cycle itself, enabling us a view on our cosmic situation.

¹³⁶ Wilson, Drury and Chapman 2000 (part 2).

¹³⁷ The *Milankovich Pacemaker*.

¹³⁸ Descartes would say that only God can survey everything completely at one glance.

¹³⁹ This is perceived shortly after Descartes by Rousseau, answering to Descartes' perception of the Neolithic Revolution in the method in his *Essai sur l'origine des langues* pointing out the cosmic perspective being greater than man can survey: "Celui qui voulut que l'homme fut sociable toucha du doigt l'axe du globe et l'inclina sur l'axe de l'univers. À ce léger mouvement je vois changer la face de la terre et décider la vocation du genre humain: j'entens au loins les cris de joye d'une multitude insensée; je vois naître les arts, les loix, le commerce; je vois les peuples se former, s'étendre, se dissoudre, se succéder comme les flots de la mer: je vois les hommes rassemblés sur quelques points de leur demeure pour s'y dévorer mutuellement, faire un affreux desert du reste du monde; digne monument de l'union sociale et de l'utilité des arts." (OC V p. 401.) In the same text, especially in chapter V: *De l'écriture*, Rousseau acknowledges the evolving algebraic character of language, but as opposed to Descartes who conceives of the algebraisation as cultivation, though of seeds sown by nature in the human constitution, and has a time horizon stretching to the Ancient Greeks (in the *Regulae* Descartes locates the seeds and their first spontaneous fruits in Ancient Greek mathematics), Rousseau conceives of the algebraisation as part of a natural progression in a far longer time span, stretching beyond Herodotus, Homer and the Bible book of Genesis to the Neolithic Revolution itself (OC V p. 385-388). Rousseau is the first to suspect something that Descartes did not: *deep time* in which natural progressions take place. For reasons of restrictions in size this connection between Descartes and Rousseau will not be explored in this thesis.

§ 7 Human nature.

In the *Discours* Descartes conceives of the human mind as a universal instrument and as such a universal computer, not depending on particular corporeal dispositions.¹⁴⁰ Human use and understanding of language bear witness to this, as Descartes infers from his comparison between machines and creatures endowed with reason.¹⁴¹ Implicitly in the *Discours*, the extent of the human mind is limited to computability and so to mechanistic explanations. Descartes is more explicit about it elsewhere: man should only seek efficient causal explanations, no final causal ones, for neither is he a party to God's council and decisions nor has insight in divine Providence been granted to him.¹⁴² So it is exactly the computing-mechanistic way of thinking that should be cultivated in order to know the truth. Does this way of thinking help Descartes in conceiving of the human being?

The very fact that the mind as a *universal* instrument does not depend on *particular* corporeal dispositions demonstrates its non-corporeal and non-mechanical nature.¹⁴³ So it is obvious that mathematical physics is not apt to describe and explain the nature of the mind. In danger of stating the obvious: it is important to realise that the confinement of the human mind to computing and mechanistic explanations concerns its dealing with *nature* in its aspect of being inert and corpuscular and subject to efficient causality. Now that Descartes has demonstrated the non-mechanical nature of the mind he obviously needs another method of dealing with the soul than algebraic mathematics. This is where metaphysics steps in.

It is no coincidence that Descartes finds the metaphysical foothold in language like he finds a way to articulate his criticism of Aristotelianism in the analogy of language at the beginning of *Le Monde* as quoted. Understanding the meaning of words does not involve resemblance: the *cause* of the idea does not resemble the resulting *idea* in the mind. The meaning of words, including formal mathematical language, is *not causally* conveyed to the mind, but by means of *representation*, as we have seen. Representation, as we have seen, involves formalisation by the image-forming force. So the image-forming force is something different from the mechanical force involved in efficient causality.

But what is metaphysics? Obviously, it should be something different from mathematics, but, like mathematics, it should convey the natural light illuminating the human mind through clear and distinct concepts in order to state the truth. Nowhere in his work Descartes gives a clear definition of metaphysics, but rather defines it by its subject-matter: the demonstration of God's existence and the soul's being distinct from the body.¹⁴⁴ In the *Meditationes* this demonstration is accomplished by examining the basic concepts by methodical doubt and testing them according to their certainty. The sticking point for Descartes (*haereo tamen*) is the *way* in which he thinks, whether the thoughts are true or not: there is thinking going on and since *I* am doing the thinking, even when an evil spirit is deceiving me, I also must *be something*.¹⁴⁵ This is Descartes' Archimedean Point.

Descartes demonstrates this way of thinking to be *judging*:¹⁴⁶ every thought about something, true or not, has the structure of judgment (A is B) and ultimately every judgment

¹⁴⁰ AT VI p. 56-60; see § 3.

¹⁴¹ Which actually is the *proto-Turing Test*. Compare Turing's *Computing machinery and intelligence* (1950), though Descartes infers the exact opposite conclusion of Turing's. Again, the connection between Descartes and Turing can hardly be overemphasized. Descartes uses his proto-Turing Test in a variant form in the *Meditationes*: AT VII p. 32.

¹⁴² AT VII p. 55; AT VIII p. 15.

¹⁴³ AT VI p. 56-60; "elle [l'âme raisonnable] ne peut aucunement être tirée de la puissance de la matière" (p. 59).

¹⁴⁴ Full title of the *Meditationes de Prima Philosophia in quibus Dei existentia & animae a corpore distinctio demonstrantur*.

¹⁴⁵ AT VII p. 24-25.

¹⁴⁶ AT VII p. 32.

implicitly contains the first one of me thinking and therefore being something (I think, that A is B). But this is not the end of the story: judgments come with *feelings, perceptions*.¹⁴⁷

In exploring the nature of the ego after establishing it as his Archimedean Point Descartes still cannot separate it distinctly from corporeal things according to the order of knowing and decides to give his mind a free reign in order to tighten it to the limits of truth better afterwards.¹⁴⁸ He considers a corporeal thing, a piece of wax, like we commonly consider corporeal things: as if we distinctly understand it as we touch and see it. Initially, it seems that what the senses convey about it contains everything to understand it distinctly: its smell which still retains the scent of flowers, its taste which still retains the taste of honey, its colour and shape as taken from the honeycomb. But it is easily transformed by the heat of the fire, eliminating the scent of flowers and taste of honey, changing the colour, making it liquid. Still, the same wax remains, so maybe its identity consists in it being a body which appeared to me in a certain shape a little while ago and which now exhibits another. But then again: the changeability of the wax is not conveyed by my imagination of the shapes of wax, because it can take on innumerable shapes and I cannot run through all of them. So what the wax truly is is not conveyed by the senses or imagination, but only perceived by the mind (*sed sola mente percipere*). The perception has nothing to do with vision, touch or imagination, but only with an inspection of the mind (*sed solius mentis inspectio*), which can be confused or clear and distinct, depending on how much attention is paid to it.¹⁴⁹

This inspection of the mind is neither something mystical nor a scrutiny of the mind as some kind of vessel containing perceptions. The inspection is an *insight* by the mind in what the wax *is* as an extended thing with attributes. This insight reveals itself to be a perception, no sensation or imagination, by which Descartes means it to be something *semantic*, not mechanical, i.e. a *representation*. Descartes perceives that what the wax *is* is nothing resembling that what causes his sensation of it conveyed by the sense organs or his imagination. The wax *is* what the mind *feels* it to be. This feeling has nothing to do with emotions or tenderness, but with the basic experience of the world as voiced by Descartes at the start of *Le Monde*.¹⁵⁰ This is not something arbitrary, something made up by Descartes, but a reflection of the way in which the human mind is attuned to the world, i.e. a reflection of the institution of nature. This is demonstrated by the exposition of the wax, because Descartes erases the original world from which the wax is taken: the familiar and intimately nearby world of flowers and beehives, i.e. the familiar everyday world of the senses. Instead of this world he reveals the world of the algebraic mind behind it surveying the micro and macrocosmos. The infantile world of the senses submerges and the cosmic world of microscopic particles to telescopic galaxies emerges.

The perception of natural phenomena is the mind feeling natural phenomena being causal-mechanical phenomena which can be algebraically represented. Based on this perception of nature causality shows itself already to be a conception. Descartes recognizes causality already to be something semantic, i.e. a representation of nature, and so knows that as a conception it cannot be explained in causal-mechanical terms itself. The cause of the conception of causality itself cannot be something resembling causality, because that is not the way Descartes feels that things work, as voiced by Descartes at the start of *Le Monde* and explained in the third meditation. But Descartes feels, i.e. perceives, it anyway, whatever the nature of perception is, though it is certainly not causal-mechanical, but rather an insight by the mind. So Descartes feels himself to be part of a thoroughly semantic whole instituted by nature, which is the world in which he is, but at the same time feels that he, as a thinking thing (and thinking is first of all feeling, i.e. perceiving, and based on that conceiving by the image-forming force), is not of the same substance as the things, as extended things, he thinks, though as an extended thing, a body, he is also of the same substance.

¹⁴⁷ See § 2, esp. note 35; see also AT XI p. 346 (article 23 of *Les passions de l'âme*).

¹⁴⁸ AT VII p. 27-30.

¹⁴⁹ AT VII p. 30-31.

¹⁵⁰ Again, see also AT XI p. 346: our perception of something is not just our sensation of the movement of our sense organs by its cause, but also what we *suppose* to be its cause and *think* to see, hear, etc.

No wonder Descartes is confused and perceives himself as a confused unity of two different substances. In order to perceive and conceive of his own human nature in a clear and distinct way he needs to clearly and distinctly separate the two substances, because this is the only way in which he feels the truth about human nature can be acquired, because only in this way the natural light can illuminate the human mind. The essence of being human is to feel, i.e. perceive, the world of which he himself is already a part as the confused unity he is. Then this essence is located by Descartes in the thinking substance, but this is a metaphysical act of violence, for the mind can only be what it is being in the world in a confused unity with the body. In order to know Descartes separates what cannot be separated and takes the Alexandrian solution to this Gordian knot: just cut it. This impossible separation is driven by the mirage that the mind might overcome nature - and therefore should be independent of it: have its own Archimedean Point from which to move the entire cosmos - and be its master and possessor, but the mind is what it is *as a natural phenomenon*, i.e. being in the world of which it is a part as the ingenium.

The difficulty is in Descartes' conception of a thing (res) or substance itself: this is already basically confused, as he acknowledges in the *Principia*. He defines a substance as something which we cannot understand but as a thing which exists in such a way that it does not need anything else in order to exist.¹⁵¹ Taking this in a strict sense the definition is applicable to God only. We perceive (percipimus) all other substances in need of His cooperation (ope concursus Dei) to be able to exist. Therefore the name *substance* does not convene to God and the other substances *univocally* (univoce). So there is no signification of this name which can be conceived distinctly (potest distincte intellegi; French translation: nous concevions distinctement) which is common to both God and His creatures.¹⁵²

Descartes needs the concept of substance to understand the world, for it is the only way in which he can clearly and distinctly conceive of himself and the things in the world being there in the first place and being a different substance in the second place, which is one aspect of his basic perception, as argued before. But now the problem emerges that this concept cannot be univocally used, for Descartes has another perception: both he and the things in the world cannot sustain their own existence: they are in need of God's cooperation, for they are *creatures*.

It is possible to conceive of substances, the thinking and the extended one, in so far as they are both *created* and need God's cooperation. Because that which is an existing thing on its own does not affect us (res existens nos non afficit): we know it through its attributes. This follows from the common notion that properties and qualities are not attributed to nothing. So if we perceive (percipiamus) the attributes we conclude there necessarily is something (aliquam rem existentem) to which they can be attributed.¹⁵³

Afficere should be read in conjunction with *percipere* and in the light of Descartes' basic experience: he does not *feel* what it means to exist, because he is not *affected* by existence on its own. If he wants to know what it means to exist he has to conclude it from the properties and qualities of that which exists, because he does perceive these attributes. The first attribute he perceives of that which exists is its being *created*. Only after this he perceives its being *thinking* or being *extended* as the principal attributes which constitute the nature and essence of a substance and of which all other attributes are modes.¹⁵⁴

Does this actually solve anything for Descartes? Man is a confused unity of existing extended (as a body) and existing thinking (as a mind). Descartes cannot clarify this confusion referring to existence itself, for he claims it does not affect him, so he cannot perceive it as such. In order to clarify this confusion and to know himself and the world he has to turn to what does affect him and what he does perceive: the attributes of truly existing things, i.e. substances: being thought or extension and both being created. The clarification is bought at a price: separating what

¹⁵¹ AT VIII p. 24: "Per *substantiam* nihil aliud intellegere possumus, quam rem quae ita existit, ut nulla alia re indigeat ad existendum." Compare AT VII p. 44: "substantiam, sive esse rem quae per se apta est existere".

¹⁵² AT VIII p. 24 and AT IX p. 46-47: article 51.

¹⁵³ AT VIII p. 24-25: article 52.

¹⁵⁴ AT VIII p. 25: article 53.

cannot be separated. What remains in the dark is *what it actually means to be the unity a human being is*, i.e. feeling the signification of things while you are already a part of this semantic whole. Descartes' solution sacrifices the true essence of being human in order to know and so manipulate the world, which is, in fact, him being true to his own rules:

*monet enim res omnes per quasdam series posse disponi, non quidem in quantum ad aliquod genus entis referuntur, sicut illas Philosophi in categorias suas diviserunt, sed in quantum unae ex aliis cognosci possunt (...).*¹⁵⁵

What things *are* is irrelevant with an eye to knowledge, as knowledge is just a means to another end: command and control of things. This is the Neolithic mirage again. The mirage is hidden in the perception of things as being *created* in the first place. Perceiving everything as being created harbours an essential ambiguity itself, as 'creation' has the twofold connotation of being made, being of a certain make, on the one hand and of growth on the other (*crescere*: to grow). Creation loses its ambiguity with Descartes' Alexandrian cut of the Gordian knot and becomes cultivation and domestication: taming something from what it *naturally is* to what *you* think it *should be*. You and your wellbeing are the ratio for domestication. But you can only conceive something rationally to be something else than it naturally is if you have already perceived the gap between the two. With an eye to the immense micro and macrocosmos it is irrelevant what things naturally seem to be in your nearby earthly environment. With an eye to the rationally conceivable possibilities to understand and manipulate nature it is irrelevant what things naturally are. This is what Descartes realises and what drives his thought. The price he has to pay is *forgetfulness*. The perception of being an integral part of the world and of nature is cast into oblivion. One has to forget that it was nature in the first place who set the stage for the experience of the gap due to cosmic cycles generating geophysical events having impact on the evolution of life. One has to forget that we ourselves are essentially natural phenomena and that all our machinations affecting natural phenomena, including ourselves (from socio-economic experiments like socialism to biological ones like genetic manipulation), will always have innumerable effects we cannot possibly compute and command. Nature takes its own course, whether we understand it or not and whether we like it or not and whatever we do to remedy the defects we experience. What humans naturally are and what they rationally aspire to be is always determined by nature in a way they cannot possibly survey.

Descartes is aware of the price he has to pay when he explains to Elizabeth that the primitive notion of the unity of body and soul can only be known through the senses. The primitive notions must be met on their own terms. The primitive notion of the body as an extended substance is best known through pure reasoning aided by the imagination and so clearly and distinctly conceived of by mathematics. The primitive notion of the soul as a thinking substance is best known through pure reasoning alone and so clearly and distinctly conceived of by metaphysics. As a consequence those who abstain from mathematical and metaphysical studies conceive of the unity of body and soul in the best possible way by only making use of the ordinary facts of life itself. The unity is the unity every human being experiences in himself without philosophising.¹⁵⁶

To ask Descartes for a mathematical or metaphysical demonstration of the unity would be to ask the impossible of him, for the primitive notions must be met on their own terms, like also neither the soul can be exposed in a mechanical-mathematical fashion, nor the body in a metaphysical fashion as something behaving rationally, i.e. not being inert. Descartes would consider this a methodical mistake, something going against the rules for the direction of the mind.

Descartes explains to Elizabeth to conceive of the unity in the traditional Aristotelian fashion: in terms of inherent qualities accounting for the meaningful and purposeful behaviour of bodies. Inherent heaviness conjoined to a body accounts for it falling by pushing it purposefully to its natural place at the centre of the earth. In this way one can effortlessly conceive of the soul moving the body. This notion of inherent qualities and their final causality has been traditionally

¹⁵⁵ AT X p. 381.

¹⁵⁶ AT III p. 690-695: Descartes to Elizabeth, 28 June 1643.

misused to explain natural phenomena, like efficient causality in its turn is misused to explain the interaction between body and soul. The Aristotelian conception is however quite apt for the unity of body and soul.¹⁵⁷

Descartes' point is to show Elizabeth the inaptitude of efficient causality to explain the unity of body and soul behaving in a meaningful and purposeful, i.e. rational, way. A mechanical reduction of human rationality is impossible.¹⁵⁸ Trying to take this reduction as far as possible is exactly his method in *Les passions de l'âme* to see what properly belongs to the soul.¹⁵⁹ The sticking point for him is, as we have seen, the perception not just being a mechanical, i.e. natural, phenomenon (as a sensation of movement of the sense organs), but also being a judgment, i.e. rational phenomenon (as an insight by the mind).¹⁶⁰ Rationality implies semantics: the unity of body and soul senses and interprets the signs surrounding it and thinks what things are what it feels them to be.

Being human means being semantic.¹⁶¹ This is the most basic fact of life, as far as Descartes is concerned. But the only way in which he can clearly and distinctly conceive of it is by separating the mechanical and the rational aspects of semantics, because this is what he feels the unity to be: a synthesis of two separate creations. Them being put together is the true institution of nature and this institution as such cannot be philosophically surveyed, as far as Descartes is concerned. The unity is first and foremost a *res existens* and as such *creata* and this on its own does not affect him and so is not perceived by him. What does affect him and what he does perceive are the separate attributes of the *res existens*: being either extended or thinking and what is only extended he feels to be of another substance than he himself is. This is the way in which he himself, i.e. his *ingenium*, is created: feeling the gap between himself and the world, though feeling himself being a part of this world at the same time. So the institution of nature has already determined what the *ingenium* is. There is no way in which it is possible to survey and manipulate the institution of nature. As the basic fact of life it cannot be undone or changed.

Conclusion.

In various ways I have tried to demonstrate how nature through its institution of the inborn constitution (*ingenium*) has already determined what a human being is (*res creata: res cogitans*) and how he perceives the world (*res extensa*) and deals with it (the method). However, it is impossible for man to survey and control nature, already being its institution. At the same time man is led to believe that he can and in chasing this mirage of the control of nature man is forgetting what he and nature truly are: the whole of which he already is and always has been a part, the whole by which he has already and always been borne. Man is a seedling of nature that thinks it can survey and control the earth in which it is rooted, forgetting that it is this very earth that supports it while looking into the vast skies.

¹⁵⁷ AT III p. 663-668: Descartes to Elizabeth, 21 May 1643.

¹⁵⁸ Recall my remark in § 1 that “through mechanics the significance and purpose of a functional whole can be explained in terms of the different parts acting effectively on each other”, but this is not a contradiction to my remark above, because Descartes would say that the *mind* perceives and conceives of the significance and purpose of any mechanical structure. In the end it is always necessary to invoke the mind perceiving meaning and purpose, i.e. rationality, so the structure can be conceived of and explained in a mechanical fashion.

¹⁵⁹ AT XI p. 328-330: articles 2-5.

¹⁶⁰ See especially AT VII p. 23-52 (second and third meditation) and AT XI p. 346 (article 23).

¹⁶¹ Of course, being semantic does not limit itself to human beings, but extends itself to all living beings, since they all display meaningful and purposeful, i.e. rational, behaviour. Descartes also knew this. The popular belief is that Descartes regarded animals as machines and lacking a soul, but there are indications in his work that he actually regarded animals as having a soul, but just not the kind of soul humans have. For reasons of restrictions in size I will not discuss this topic in this thesis.

The mechanical-algebraical way of thinking is something that comes naturally to humans, as Descartes explains. But as an institution of nature it cannot mechanically-algebraically reduce nature. Descartes bears witness to this when he uses organic instead of mechanical-mathematical terminology to point at the domestication and cultivation of the seeds of the method and the science growing from it yielding fruits.¹⁶² Nature is more like growth than like a machine.

We still chase the mirage, believing in progress and, following our rational nature, seeking technological solutions to everything. The most basic fact of life, that we are an institution of nature, does not seem to affect us and is not perceived by us. We still think that our rationality places us somehow outside of nature in an Archimedean Point from which to move the world, although our rationality is our nature. We cannot perceive our rationality as a natural phenomenon itself, even in the face of empirical and formal scientific developments bringing home the point. Our own identity is unknown to us: we do not know who we are and do not even know that we do not know it.

We are who we are and live the way we live due to the same cosmic events that made us live like hunter-gatherers for 100.000 years and ignited the Neolithic Revolution and its sequelae 10.000 years ago, but we cannot perceive ourselves as transformed and marked by geophysical events due to cosmic constellations. As long as we chase the mirage of control of nature we will keep forgetting what we truly are.

It will take a radically new way of thinking, a new method, to rethink our human identity and what it means to be in the world and be a part of nature. But this is essentially not something we can deliberately accomplish and technologically manipulate into being, because the very nature of a new way of thinking will be constituted by the perception and experience of the control of nature as a mirage, nature being something impossible to survey and being that by which we are borne. Somehow it will have to grow from within.

Epilogue.

This MA-thesis hopes to convey what I have written in the introduction and conclusion. Descartes feels nature to be inert. Natural phenomena have no identity and significance of their own, just the one I, as the ego cogito, feel them to have. But me feeling the identity and significance of phenomena is, as Descartes also says, already an institution of nature and as such a natural phenomenon. So I cannot be the ego cogito in control of everything, because myself perceiving to be the ego cogito is bearing witness to me already being a participant in the game of nature, the rules of which were not written by me. Descartes' thought is the road along which I tried to clarify it and tried to make it felt. As such this thesis is not so much meant as a very small contribution to Descartes-scholarship, but as a very modest attempt at original thinking. Whether I have succeeded or not is not for me to decide. I also acknowledge that there are many loose ends in this thesis, many footnotes bearing witness to this, pointing out many relations to other thinkers only sketchily. I have said virtually nothing about the Ancient Greek experience of the world versus the Modern one and why exactly Aristotle's thought came into decay and so cleared room for Descartes', as I have said virtually nothing or just sketchily something about the philosophical consequences of Descartes, for thinkers like Nietzsche, Yorck von Wartenburg and Heidegger sense the problems of the method in understanding what life, nature and human beings are, while the analytic tradition of Frege and Russell c.s. and the work in the foundations of mathematics by Hilbert, Gödel and Turing c.s. rather seem to radicalize it. I would very much like to extend this MA-thesis in a PhD-thesis, working out the loose ends and beyond in exploring new ways of thinking.

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¹⁶² See note 127.

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