



Universiteit
Leiden
The Netherlands

Explanation and teleology in Aristotle's Philosophy of Nature

Leunissen, M.E.M.P.J.

Citation

Leunissen, M. E. M. P. J. (2007, June 26). *Explanation and teleology in Aristotle's Philosophy of Nature*. Faculty of Philosophy, Leiden University. Retrieved from <https://hdl.handle.net/1887/12093>

Version: Corrected Publisher's Version

License: [Licence agreement concerning inclusion of doctoral thesis in the Institutional Repository of the University of Leiden](#)

Downloaded from: <https://hdl.handle.net/1887/12093>

Note: To cite this publication please use the final published version (if applicable).

**Explanation and Teleology
in Aristotle's Philosophy of Nature**

Mariska Elisabeth Maria Philomena Johannes Leunissen

Universiteit Leiden
2007

EXPLANATION AND TELEOLOGY
IN ARISTOTLE'S PHILOSOPHY OF NATURE

PROEFSCHRIFT

ter verkrijging van
de graad van Doctor aan de Universiteit Leiden,
op gezag van de Rector Magnificus Prof. Mr. P.F. van der Heijden,
volgens besluit van het College voor Promoties
te verdedigen op dinsdag 26 juni 2007
klokke 11.15 uur

door

Mariska Elisabeth Maria Philomena Johannes Leunissen

geboren te Heerlen
in 1979

PROMOTIECOMMISSIE:

Promotor:

Prof. dr. F.A.J. de Haas

Referent:

Prof. dr. D. Charles (Oriël College, Oxford University)

Overige Leden:

Prof. dr. K.A. Algra (Universiteit Utrecht)

Dr. E.P. Bos

Prof. dr. R.J. Hankinson (University of Texas at Austin)

Dr. J.B.M. van Rijen

Καὶ γὰρ ἐν τοῖς μὴ κεχαρισμένοις αὐτῶν πρὸς τὴν αἴσθησιν κατὰ
τὴν θεωρίαν ὅμως ἡ δημιουργήσασα φύσις ἀμηχάνους ἡδονὰς
παρέχει τοῖς δυναμένοις τὰς αἰτίας γνωρίζειν καὶ φύσει φιλοσόφοις.

Aristotle, *PA.I.5*, 645a7-10

Cover:
The Youth of Aristotle, c. 1875
Charles Degeorget (1857 - 1888)
Paris. Musée d'Orsay.
©Kathleen Cohen
frs04084
Shown at the Salon of 1875

ACKNOWLEDGEMENTS

Many people have guided, inspired, supported, and laughed with me during the four years I worked on my dissertation, both in Leiden and in Austin, and I would like to thank them all for a great experience.

My first debt of gratitude must go to the members of the Faculty of Philosophy at Leiden University, which has sponsored my doctoral work. I have especially appreciated the opportunities they have offered me to further develop my research and teaching skills both in Leiden and abroad, and their support for my job search in the U.S. Complying with the formal limits imposed on expressing one's gratitude in the foreword of a dissertation (see the Promotie Reglement), I would like to thank the following people: Lies Klumper, for being my guardian angel; Pauline Kleingeld, for her sound advice in many matters; Eric Schliesser, for volunteering to act as my placement officer; Marije Martijn, for kindly 'mentoring' me through the ups and downs of my project; and Wout Cornelissen, for coming back to Leiden and making the department more lively with his good-humor.

I would also like to thank the faculty and doctoral students of the Department of Classics at Leiden University: my decision to continue my studies in philosophy 'across the canal' never affected their hospitality towards me. Among them, I would like to single out two extraordinary people: Ineke Sluiter, who through the example of her endless energy and high standards for academic performance has inspired me to become the best scholar I possibly can and to continue setting new goals. Her work for the National Research School of Classical Studies (OIKOS) cannot be overestimated. Having been able to participate in the OIKOS graduate program has contributed significantly to my academic training as well as to my personal well-being. I would also like to thank Peter Stork, who is the best and kindest teacher of Ancient Greek I have ever had. He has always stimulated my interest in ancient philosophy and showed great support for my work. His generosity has opened doors for me that would have otherwise remained shut.

I have also been very fortunate to have had the opportunity to learn from and discuss my dissertation work with the members of the Joint Ancient Philosophy Program of the Department of Philosophy at the University of Texas at Austin. Special thanks are due to one person in particular who I cannot mention, but without whose support, friendship, and belief in me this dissertation would never have been completed. I am also grateful to Alex Mourelatos, Stephen White, and my fellow students and ‘straight-thinkers’ Mina Fei-Ting Chen, Alleyne Rogers, and Blinn Combs for providing a welcoming and stimulating environment for me in the Spring semesters of 2005, 2006, and 2007. In addition, I would like to thank the visiting students at the Department of Philosophy I met during my subsequent visits – Krist Vaesen, Katie Steele, and Nick Fawcett – for their friendship and philosophical companionship. I am grateful for the financial support I received for these visits from the Faculty of Philosophy at Leiden University, the Leiden University Fund, and OIKOS.

Finally, I would like to thank my family and friends: My parents, for always believing in me; my dearest friends: Carolien Trieschnigg, Joris Stolwijk, Juliette Kars, Maithe Hulskamp, Joyce Landheer, Susannah Herman, Michel Buijs, Pieter den Hollander, Robin Buning, Wouter Groen, Saskia Peels, Jacqueline Klooster, Frederik Bakker, and Casper de Jonge, for sharing in all my laughs and tears, and for their continuous support, I could not wish for better friends; Stéphanie Bakker, for taking care of Laika; and Richard Bemelmans, for starting me on my path of studying Aristotle.

My deepest expression of gratitude goes to Jeff, for his love, emotional support (e.g. dealing with my occasional grumpiness), and invincible optimism regarding the completion of my dissertation over the past few years. You mean the world to me.

TABLE OF CONTENTS

INTRODUCTION	1
1	ARISTOTLE'S DEFENSE OF NATURAL TELEOLOGY
	SETTING THE STAGE FOR TELEOLOGICAL EXPLANATIONS IN THE <i>PHYSICA</i>
1.0	Introduction
1.1	The theory of causal explanation of the <i>Physica</i>
1.1.1	Four ways to answer the question 'why?'
1.1.1.a	Knowledge, explanation, and causation
1.1.1.b	Nature defined by the four causes
1.1.2	Final causes in causal explanations
1.1.2.a	Types of final causes in <i>Pb.II</i>
1.1.2.b	Material potentials and function
1.1.2.c	The efficient cause as the producer of end products
1.1.2.d	Forms are realized for the sake of activities
1.2	Three models of teleology: artistic production, deliberative action, and natural processes
1.2.1	The analogy between nature and art in teleological explanations
1.2.1.a	Preliminary overview of Aristotle's uses of the concept of art in the <i>Physica</i>
1.2.1.b	The importance of the teleological model of artistic production
1.2.1.c	The four main points of analogy between the workings of art and nature
1.2.1.d	The non-intentional model of art and nature
1.2.2	The teleological model of deliberative action
1.2.2.a	Deliberative action contrasted to nature
1.2.2.b	Deliberative action in the analysis of luck
1.3	Aristotle's defense of natural teleology
1.3.1	Problems involved in Aristotle's defense of natural teleology in <i>Pb.II.8</i>
1.3.1.a	Teleology versus necessity; intrinsic versus incidental causation
1.3.1.b	Problems in the analogy between rain and an Empedoclean theory of generation
1.3.2	The nature and scope of natural teleology
1.3.2.a	An Empedoclean theory of the origin of species and the actions of nature according to Aristotle
1.3.2.b	The Rainfall Example and the Scope of Natural Teleology
1.4	Conclusion
2	ARISTOTLE'S BIO-FUNCTIONAL ACCOUNT OF THE SOUL
	ESTABLISHING THE STARTING POINTS OF TELEOLOGICAL EXPLANATIONS IN <i>DE ANIMA</i>
2.0	Introduction
2.1	Teleology in the analysis of the nature of the soul
2.1.1	Soul, functions, and ends

2.1.1.a	Teleological notions in the preliminary characterizations of the soul in <i>DA.I.1</i>	89
2.1.1.b	Function in Aristotle's account of the soul of a natural body in <i>DA.II.1</i>	98
2.1.1.c	Aristotle's conception of the soul as a final cause of natural bodies	106
2.1.2	Aristotelian teleology versus modern functionalism	110
2.1.2.a	The problem of the unity of body and soul and modern functionalism	110
2.1.2.b	Does matter matter? Functions and definitions	113
2.1.2.c	The principle of homonymy	120
2.1.2.d	The conditionally necessary relation of function and matter	124
2.1.2.e	Functional analogy	133
2.2	Teleology in the analysis of the capacities of the soul	137
2.2.1	Teleology and the general capacities of the soul	137
2.2.1.a	The hierarchy of the capacities of the soul	138
2.2.1.b	The teleology of the capacities of the soul	143
2.2.2	Teleology in the explanation of animal locomotion	155
	Appendix: Two types of teleological explanations of locomotion	165
2.3	Conclusion	172
3	EXPLAINING PARTS OF ANIMALS THE PRACTICE OF TELEOLOGICAL EXPLANATIONS IN ARISTOTLE'S BIOLOGY	175
3.0	Introduction	175
3.1	Aristotle's biological method	178
3.1.1	Biology as a demonstrative science	178
3.1.2	A preliminary picture of Aristotle's explanatory project in <i>PA</i>	183
3.1.3	General outline of Aristotle's methodology in <i>PA</i>	196
3.1.4	Aristotle's heuristic strategies in <i>PA</i>	202
3.1.4.a	Heuristic pattern I: identification of widest class	203
3.1.4.b	Heuristic pattern II: identification and grouping of correlating differentiae	206
3.2	Explanations in biology: references to form, matter, and function	209
3.2.1	Three ways of classifying explanations in <i>PA</i>	209
3.2.2	Explanation by reference to formal causes	211
3.2.3	Explanation by reference to material causes	220
3.2.4	Explanation by reference to final causes	226
3.3	Teleological principles of explanation	242
3.3.1	The use and function of principles in Aristotle's biology	242
3.3.1.a	Principles of 'balanced distribution'	245
3.3.1.b	Principles of 'economical assignment'	248
3.3.1.c	Principles of 'optimal production'	252
3.3.2	The scientific status of teleological principles	257
3.4	Teleology and necessity in biological explanations	263
3.4.1	The problem of the relation between teleology and necessity	263
3.4.2	Theoretical discussions of teleology and necessity	268

3.4.2.a	Four types of necessity: unqualified, conditional, material, and enforced	268
3.4.2.b	Aristotle's criticism of his materialist predecessors	285
3.4.3	Teleology and necessity in the biological explanations of <i>PA</i> .II-IV	288
3.4.3.a	Necessity is spoken of in many ways	288
3.4.3.b	Primary teleology and conditional necessity	293
3.4.3.c	Secondary teleology and material necessity	297
3.4.3.d	Material necessity	303
3.5	Conclusion	305
	Appendix: Typology of Parts and Explanations in <i>PA</i>	308
4	MAKING SENSE OF THE HEAVENS	309
	THE LIMITS OF TELEOLOGICAL EXPLANATIONS IN ARISTOTLE'S <i>DE CAELO</i>	
4.0	Introduction	309
4.1	Teleological principles and the explanation of the presence of cosmological features	312
4.1.1	Cosmology as science of nature	312
4.1.2	Leggatt on teleology in <i>De Caelo</i>	316
4.1.3	Explaining what is present in an empirically underdetermined domain	317
4.1.4	Stating the phenomena by the use of teleological principles	321
4.1.4.a	Why there are several locomotions of the heavens	322
4.1.4.b	Why the heavens move in the direction they do	326
4.1.4.c	Why the heavenly bodies move with different complexities	330
4.2	Teleological principles and the explanation of the absence of cosmological features	335
4.2.1	Explaining what is absent in an empirically underdetermined domain	335
4.2.2	Explaining what is not there through the principle that nature does nothing in vain	338
4.2.2.a	Why there is no motion contrary to motion in a circle	339
4.2.2.b	Why the heavenly bodies do not move on their own (or, why stars have no feet)	340
4.2.2.c	Why the absence of the harmony of the spheres shows that heavenly bodies do not move on their own	348
4.3	Conclusion	350
5	DEMONSTRATING TELEOLOGY	353
	THE THEORY OF TELEOLOGICAL EXPLANATIONS IN ARISTOTLE'S <i>ANALYTICA POSTERIORA</i>	
5.0	Introduction	353
5.1	Causes, explanations, and middle terms	354
5.1.1	The problem: the middle terms of the examples in <i>APo</i> .II.11 do not pick out all four causes	354
5.1.2	The hypothesis: the causality of the explanation and of the explanatory middle term can be different	356
5.1.3	The semantic distinction between <i>hê aitia</i> and <i>to aition</i>	358
5.2	Towards a new reading of <i>APo</i>.II.11	360

5.2.1	Making sense of the opening statement and the examples in <i>APo</i> .II.11	360
5.2.2	Examples of different types of explanations	361
5.2.2.a	The example of material explanation	363
5.2.2.b	The example of formal explanation	364
5.2.2.c	The example of efficient explanation	365
5.2.2.d	The example of final explanation	366
5.2.3	Teleological Explanations and what it means to <i>metalambanein tous logous</i>	368
5.2.3.a	Why walking is for the sake of health	368
5.2.3.b	Two possible interpretations of <i>metalambanein tous logous</i>	370
5.2.3.c	Ends cannot be picked out by middle terms	374
5.3	Teleological explanations in theory and practice: evidence from <i>PA</i>	376
5.3.1	Demonstration in the natural sciences and conditional necessity	376
5.3.2	The place of final causes in actual teleological explanations	378
5.3.2.a	The explanation of the presence of parts: final cause is subsumed under the formal cause	378
5.3.2.b	The explanation of differentiations of parts: differentiae are causally basic	380
5.3.2.c	The explanation of luxurious parts: secondary teleology	381
5.4	Conclusion	383
	Appendix: Translation of Aristotle's <i>Analytica Posteriora</i> II.11, 94a20-94b26	385
6	CONCLUSION	387
	BIBLIOGRAPHY	399
	SAMENVATTING	423
	CURRICULUM VITAE	433