THE EMERGENCE OF THE EARLY MODERN CONCEPT OF SYSTEM

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Abstract

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This study is meant to provide a means of understanding the change of philosophic perspective from the naive classical view that natures manifest themselves to mind to the modern view that they do so only as mediated by thought or speech. It does so by tracing the emergence of the early modern concept that philosophy must be presented as a system of propositions or laws in order to be scientific. It is argued that certain early moderns adopted the term system from the Stoic definition of art, and that they clearly delineated the essential characteristics of systematicity but spoke only of systems of individual sciences. Régis first applied the term to philosophy as a whole, but Hobbes before him conceived of system in Régis's sense. The conclusion is a more precise understanding of the origin of the modern use of the term and of the meaning of the early modern concept of philosophic system.
Contents

Introduction / 1

Section I: Common Meaning of Συστήμα Usually Considered the Origin of the Modern Usage / 2

Section II: Elimination of the Possibility of Latin Origin / 13

Section III: The Greek Progenitor of the Early Modern Use of the Term System / 18

Section IV: First Thematic Treatments of System / 29

Section V: Concluding Remarks on Sections I-IV / 45

Section VI: System as Approached Through Method / 46

Section VII: First Thematic Treatment of the Term and Concept of a System of Philosophy in All its Parts / 53

Section VIII: Hobbes's System / 71

Section IX: Conclusion / 83
The Emergence of the Early Modern Concept of System

The use of the term system to signify the logically coherent presentation of the series of propositions or laws constituting any individual science or discipline was a novelty of the end of the sixteenth and beginning of the seventeenth centuries. By the end of the seventeenth century, the term began to be employed to describe the entire philosophies of individual thinkers. One begins for the first time to speak of philosophical systems. The two uses of the term represented the beginning and full fruition of a change in philosophic perspective—the specifically modern change. For the first time, the presentation of a science, and eventually all philosophy itself, as a series of logically connected propositions took on a separate integrity as the artificial construct of a coherent set of laws, and the term system was used to refer to the propositional construction and not to the things those propositions were describing—not to nature itself.

The isolation of the series of propositions from the things to which they refer and the naming of such a series a system represent a significant change of perspective from the older, more naive, classical view that natures manifest themselves, to the modern view that they do so only as conditioned by thought and mediated by speech. With the modern turn, the emphasis began to be withdrawn from the natures of things and to be placed upon thoughts, upon the propositions or laws expressing those thoughts, and upon the coherence of those propositions. Given the importance of this significant change of perspective, the emergence of the term and concept of system in early modern thought deserves explicit treatment in order to provide yet another means of understanding the turn to philosophic modernity. This study provides something of that treatment.

In general, by tracing the emergence of the modern concept of a system of philosophy and the first uses of the term and thematic discussions of the concept of scientific system, this investigation offers a very fruitful approach to appreciating the modern shift of perspective from the system of things to the system of thoughts or propositions. A study of system thus charts the great conceptual revolution that occurred with modern philosophy: the change from the naive idea that natures manifest themselves to mind and that truth is an adequatio rei et intellectus to the idea that we know only what we make, and that science consists in the construction of a coherent set of laws which we ourselves bring about methodically from premises of our own device; and the change from the idea that nature as σύνος or τέκτον, that is, as an ordered whole, can be known by mind and reflected in speech to the idea that we ourselves place the order upon nature by constructing the system of nature as a system of laws.
More specifically, Sections I to IV show, contrary to the common scholarly judgment, that the most general use of the Greek term κοσμονομο to mean some sort of aggregate of physical components was not the sense that caused the early moderns to adopt the term to refer to systems to thought. Rather, a very specific use of the term in the Stoic definition of art meaning a "system" or "construct" of concepts induced the early moderns to adopt the term. This correction of the common view makes much more apparent the modern shift of perspective from things to thoughts or propositions, because the meaning in the definition of art is "construct of concepts" or "of precepts," whereas the common Greek sense is aggregate of physical, not conceptual, components. The common meaning is much more directed to things, not thoughts, and the incorrect etymological connection obscures the philosophical significance and novelty of the modern adoption of the term. Individually, Section I studies the common Greek usage. Section II shows that the term could not have been taken over by the early moderns from Latin, thus eliminating the possibility that a different meaning in Latin may have been the source of the early modern choice of terminology. In the Third Section, the specifically ancient Greek usage of the term in the Stoic definition of art, a usage singularly revelatory of the significance of the modern turn, is carefully traced and explained in preparation for its being shown in Section IV to be the true progenitor of the modern usage. Section IV traces the first modern thematic treatments of the term and concept, and proves that the latter Greek sense was the true origin of the modern adoption of the term to denote scientific disciplines or whole philosophies. Section V connects the important later medieval and early modern stress upon analytic and synthetic method with the idea of the systematic unity of all the sciences, for method is one of the necessary conditions for such unity. The Sixth Section argues that the Cartesian Pierre Sylvaire Régis was the first philosopher to use the term system for the coherent unity of all the sciences or for an entire "system" of all philosophy. He was the first to delineate clearly in a single text the characteristics of any complete system of all the sciences. In Section VII, it is argued that Hobbes, one of the quintessential moderns, was the first, even before Régis, to plan and produce a complete system of philosophy in the sense described by Régis nearly half a century later, even though Hobbes never used the word system in Régis's sense.

I

Common Meaning of λόγον Usually Considered the Origin of the Modern Usage

Octave Hamelin entitled a book, which appeared in 1920, Le système d'Aristote, and only three years ago Ulrich Weiss published his book on Hobbes, Das philosophische System von Thomas Hobbes, but interesting is the fact that neither Hobbes nor Aristotle referred to their philosophies—or anybody else's—by the term system. Not until 1690, with the appearance of the Cartesian Pierre Sylvaire Régis's Cours
entier de philosophie ou système général, do we find a use of the term and thematic treatment of the concept of a system of all philosophy or of a logically coherent presentation of all the sciences as constituting a single body of all rational knowledge. Before Régis, in the late sixteenth and early seventeenth centuries, philosophers first began to use the term system to describe the logically coherent presentation of the doctrines of an individual discipline. Hence it is perhaps easy to understand how Régis could have taken that term and applied it to the presentation of the whole of philosophy in all its parts. But why did Régis's predecessors choose the term system to describe the coherent presentation of the body of doctrines, or more precisely, propositions, constituting an individual science? The fact that for the first time a name began to be applied to the construction of an edifice of doctrine is more significant philosophically than may appear at first sight. The fact that this particular name was chosen for this particular concept, namely, the concept of an edifice of doctrines or of propositions, reveals something essential about the difference between ancient and early modern philosophy.

As the predecessors of Descartes began to search for greater certainty in science, they began to shift their emphasis from the things themselves to the presentation of the things themselves, that is, to the propositions about the things and to the relations among those propositions or their "construction" into a whole. They began to emphasize the special integrity of the system of propositions over and against the system of things. This shift in emphasis is seen most clearly in the early modern takeover of the term σύστημα, for that term had a peculiar and definitely identifiable usage which corresponded exactly to the new emphasis upon the construction of doctrine into a series of logically coherent propositions. Until now it has been assumed, for example, by Rescher, Klein, and others, that the early moderns chose the term system because of its most common Greek etymological sense meaning "aggregate," that is, aggregate of physical components. But this explanation does not get at the heart of the matter, and obscures the significance of the philosophical change that occurred in early modernity in the very adoption of the term. It was not the most common, but the most peculiar sense of the

term which caused the early moderns to adopt it. Only the latter meaning and the connection between it and the concept of a scientific system makes clear the conceptual beginnings of the shift from the things themselves to the presentation, or perhaps more accurately, re-presentation, of the things themselves in propositional discourse.

We necessarily begin, then, with a study of the term **system** as one of the best means of approaching the problem of the concept of system. The term itself has for about three hundred years had the privileged status of denoting a logically coherent, most specifically synthetically presented, series of propositions constituting a unified doctrine about the whole of reality, that is, the ideal of unified science which began during the seventeenth century. In the late sixteenth and early seventeenth centuries, the term was first applied to science, but in the more restricted sense of the presentation of a body of knowledge in a particular discipline. Systematicity became a condition for the presentation of scientific knowledge, as we shall document below. One approach to a concept is through the terms often used to designate it, but our focus is upon the concept of system through the name, not upon the more history of the term and its various uses. Since the term itself began to be used in the late sixteenth century to denote precisely the attempts by scholars to present doctrines in a subject matter in orderly, logical, and demonstrative fashion, a reasonable first approach to the system concept is through an analysis of the uses of the term itself, before it began to be employed in the sense we wish to study, in order to determine what in its previous uses convinced sixteenth and seventeenth-century authors of its appropriateness for their use in designating the proper presentation and structure of science. What becomes clear from the earliest users of the term who considered system a condition for science is that the concept that mediated the application of the term system to science was the concept of art, within the definition of which the term system plays the part of the genus. In the seventeenth century, this definition continued to be cited after two thousand years. The early modern connection of system with science through the concept of art or construction provides a means of setting the early modern concept of science as construction into relief against the premodern concept of science as manifestation on the side of the known and assimilation on the side of the knower. Clearly, then, the whole historical-philological analysis proposed here is essential to understand the modern emphasis upon system and the meaning of modern systematicity.

Euclid's systematization of geometry is generally considered the paradigm of scientific systems. But the writer of the paradigmatic
deductive system never immortalized the core, strictly scientific and rigorously limited sense of the term system by either defining the word itself or applying it to his work on geometry, which he called Elements. Although modern philosophers before Régis did not use the term system in the sense defined by Régis, Hobbes called his three-part work on all philosophy the Elements of Philosophy, and Spinoza said in the subtitle to his Ethics that the work was demonstrated "in geometric order." Had Euclid so benefitted posterity by defining or using the term system in contexts by which a clear definition could be gleaned, perhaps Hobbes and Spinoza could have used the term, and perhaps present confusions resulting from its wide rather than strict employment could have been avoided. "What kind of system are we talking about?" is a necessary preliminary question for any reasonable discourse about a philosopher's "system."3 Reference to a primary sense, as defined by Euclid, that is, pros hen reference, would thereafter have allowed the continual possibility of clarification or reclarification, similar to the way the word idea can be, and has long been, clarified or reclarified, by reference to its Greek, especially Platonic, usage.4 As it is, we must study carefully later attempts to connect what Euclid did in geometry with a special sense of the word oğnua and to apply that term and model to all the other scientific disciplines.

what we nowadays call a 'system' of knowledge was certainly alive in classical antiquity— with the Euclidean systematization of geometry providing a paradigm for this conception" (Nicholas Rescher, "Leibniz and the Concept of a System," p. 114). See also Rescher's Cognitive Systematization, p. 3. Copi notes that "Euclidean Geometry is the oldest example of systematized knowledge or science. . . . The systematization of geometry culminated in the Elements of Euclid. . . . Geometry was cast . . . into the form of a deductive system . . . the first deductive system ever devised, and so great was the achievement that it has served as a model for scientific thought down to the present time" (Irving Copi, Symbolic Logic, 4th ed. [New York: Macmillan, 1973], pp. 153-54). This smattering of examples is, of course, the common judgment. Important to note is Copi's comment on p. 154 that the best and most rigorous of the sciences are those which most closely approximate the deductive form of Euclid's Elements.

On the general problem of the equivocal character of the term system and on the care that should be exercised when applying the term to the work of a philosopher, see W. H. Greenleaf, "Hobbes: The Problem of Interpretation," in Reinhart Koselleck and Roman Schnur, eds., Hobbes-Forschungen (Berlin: Duncker and Humblot, 1969), p. 28.

In tracing the uses of the term system as a means of entering into the problem of the concept of system as it emerged in the modern period, we of necessity turn to those who gave us the term in the first place—to the Greeks, who provided thereby not only the terminological but also the conceptual beginnings of our present use of the term. The Greeks' special meaning of the term system to mean "construction" in the terminology of art provides the basis upon which the early modern concept of a system of doctrines depends. As we shall see, contrary to the view of Klein and Rescher, the Greeks meant quite specifically a construction of thoughts or understandings.

One finds that in extant Greek documents, modern scholarship has detected no use of the term σύστημα in any of its meanings prior to the time of Hippocrates (ca. 460-ca. 377 B.C.) and Plato (427-347 B.C.). For nearly one thousand years following the death of Plato, the word is found hundreds of times in extant literature, Greek and Latin. Although much of ancient literature perished, of Latin, for example, possibly as much as 94 percent, reasonable conjecture from numerous extant sources of the term would indicate that its use was relatively frequent in literature. These available instances offer a random sample of all the uses to which the term was probably actually put. Yet not a single use specifically intends the modern scientific sense of a body of rigorously connected truths.

A random sampling of hundreds of extant ancient uses shows that almost every usage refers to some organized whole of concrete sensible elements. For example, Plato uses a form of it (σύστημα σύνθεσις) to refer to craftsmen uniting elements into a unified whole. He also uses it to mean an alliance of cities as well as to mean a combination of intervals between notes or the scale in musical theory, which is one of its most frequent occurrences in literature, ancient and

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5 Cf. above, n. 1.


7 In Hippocrates it refers to the sediment which appears in the urine when it is allowed to stand in a vessel: κατ' ἐν σύστημα σύνηθεσιν ἐν τῷ χρυσῆς, as cited in Henricus Stephanus, Thesaurus graecae linguae, vol. 7, ed. Ch. Benedictus Hase (Paris: Firmin Didot, 1829), col. 1543D, s.v. σύστημα. The article on the word in Liddell and Scott concludes that "The word first occurs in Hippocrates, and only in later prose" (Henry George Liddell and Robert Scott, A Greek-English Lexicon [1940; reprint ed., Oxford: The Clarendon Press, 1961]).

modern. The Septuagint translation of the Bible, which as complete can be dated with definitude to 132 B.C., refers to the seas as τα υδάτα in its translation of Gn. 1.10, a usage Athanasius (A.D. 296-373) imitates at least over 500 years later in referring to how water holds together to constitute a whole: τα υδάτα το ο έσωστα. The spurious Aristotelian work De mundo, probably written between 50 B.C. and A.D. 100, opens in its second chapter thus: υδάτας έσωστεν εἰς ὀδομάς καὶ τὰς ως τῶν ἐν τούτω φοινικῶν. This is one of the early instances where the word refers to the universe as a system. Citing Posidonius's definition of the cosmos, Diogenes Laertius (early third century) writes: ώς ὁ τίνς υδάτας ... ὁδομάς εἰς ὁδομάς καὶ τὰς ως τῶν ἐν τούτω φοινικῶν καὶ τῶν οὐρανῶν τούτων ἔκαστον. These uses are extremely important because they show that the cosmos as a whole was also referred to as a system, thus extending to the whole universe the con-

Concerning the use in the Gorgias, Wolf calls this the first "philosophischer Verwendung" of the term, because it refers to the structural and functional composing of a whole from parts (Friedrich O. Wolf, Die neue Wissenschaft des Thomas Hobbes: Zu den Grundlagen der politischen Philosophie der Neuzeit [Stuttgart: Friedrich Frommann, 1969], p. 21). But this usage is more philosophical than many of the other uses in non-philosophical writers delineated here in the following paragraphs. The most philosophical use, if by this one means abstract or formal, is found in Plato concerning mathematics. See below, page 10. The use meaning "alliance" occurs in Laws 686b, and the musical employment can be found in Philebus 17c-d. The latter use in music theory was for centuries from ancient until modern times the dominant usage. There are well over seventy-five such uses in C. Jan, ed., Musici scriptores graeci et melodiarm veterum quidquid extat (Leipzig: B. G. Teubner, 1895). In a modern source, thirty-two pages are devoted to this use alone (Encyclopédie ou dictionnaire raisonné des sciences, des arts et des métaîes, par une société de gens de lettres, vol. 32, ed. Denis Diderot and Jean Le Rond d'Alembert [Berne: Sociétés typographiques, 1780], s.v. système, pp. 387-419).


cept of an aggregate of real or sensible elements. Plutarch (ca. A.D. 46-ca. 120) calls the original senate chosen by Romulus ότνυα. In some very special uses, Apollodorus Damascenus (first century A.D.) uses the word to mean a machine or apparatus, and Galen (ca. A.D. 130-200) calls the pulse beats taken collectively a system. The

12 Immanuel Bekker, et alii, eds., Aristotelis graece in Aristotelis opera, 5 vols. (Berlin: George Reimer, 1831-70), vol. 1, p. 391. See below, pp. 15-16. This is one of the earliest uses referring to the universe as a system. This, of course, is to be distinguished from its later use referring to the hypothesis by means of which the movements of the stars and planets is explained, as in the Ptolemaic or Copernican "system." The reference to Posidonius in Diogenes Laertius may be found in R. D. Hicks, trans. Diogenes Laertius: Lives of Eminent Philosophers, vol. 2, The Loeb Classical Library (hereafter LCL) (1925; reprint ed., Cambridge, Ms.: Harvard University Press, 1970), pp. 242-43, nec. 7.138 of the Lives. Hicks translates: "Again, the cosmos is . . . a system made up of heaven and earth . . . a system constituted by gods and men and all things created for their sake."

13 Romulus 13.1. "In the second place, he treated the remainder (those not selected as warriors) as a people, and this multitude was called 'populus'; a hundred of them, who were the most eminent, he appointed to be councillors, calling the individuals 'patricians,' and their body, a 'senate' (οτνυα)" (Bernadotte Perrin, trans., Plutarch's Lives, vol. 1, LCL [New York: G. P. Putnam's Sons, 1914], pp. 123-25).


15 Galen, as cited in Stephanus, s.v. οτνυα, col. 1515A-B.
Church Fathers continued to use the term widely in the same way in Greek. Irenaeus (ca. 130-ca. 200) uses it for the organization of the ancient Church in Adversus haereses,\textsuperscript{16} and Clement (ca. 150-ca. 220) uses it to mean an assembly or community.\textsuperscript{17} Chrysostom (ca. 305-407) employs it in this way in Contra Anomoeos 11.1 in referring to the communities of the Jews: τοῦ Ἰουδαίου στοάτα τὰ συνόδια.\textsuperscript{18}

The word was used from the most ancient times to the time of the fall of the Western Roman Empire to mean various groups of human beings from a mercenary force in Polybius (ca. 205-125 B.C.),\textsuperscript{19} to a crew of pirates in Alciphron (second or third century A.D.),\textsuperscript{20} to any following, sect, or party in Basil of Seleucia (d. ca. 459 A.D.). All of the above uses are instances of concrete or sensible things considered as constituting wholes.\textsuperscript{22}

\textsuperscript{16} PG 7.1077B.

\textsuperscript{17} Stromatēs, PG B.1381A, referring to the city ruled by law as an upright community or assembly, in comparison to the Church ruled by the Word.

\textsuperscript{18} PG 48.797.

\textsuperscript{19} Speaking of the war between Rome and Carthage and those mercenaries allied with Rome and their inhumane treatment of Carthaginian prisoners: "All these conditions [that is, conditions causative of their becoming inhumane] were present in this mercenary force [η ἄστιμα τῶν μετοχῶν as a whole and especially in their chiefs," The Histories, 1.81.11, as it appears in W. K. Paton, trans., Polybius: The Histories, vol. 1, LCL (1922; reprint ed., Cambridge, Ms.: Harvard University Press, 1960), pp. 220-21. Polybius uses the term at least nine times in the Histories referring to such things as the royal stud farms (τοῦ βασιλικοῦ στενοχώρου τῶν ἱπποδρομίων, 10.27.2), the phalanx of an army (5.53.3), a college of priests (21.13.11), and an alliance of cities (6.10.14, 9.78.2).

\textsuperscript{20} "Now that boat . . . is a Corycian craft and its crew [οὗτοι] are . . . pirates" (Letters of Fishermen 1.8.2., in Allen Rogers and Francis H. Fobes, trans., The Letters of Alciphron, Aelian and Philostratus, LCL [Cambridge, Ms.: Harvard University Press, 1949].)

\textsuperscript{21} Oratio 34.2 (PG 85.372B). Basil is referring to Lk 7.21: "Illum oportet crescre, me autem minui," as the Vulgate has it, which he interprets to mean that, by these words, John wished to avoid any following under his own name, but rather to lead others to Christ.

\textsuperscript{22} This range of usage von der Stein refers to as "vorwiegend natürliches," that is, predominantly natural usage. This "natural" usage apparently contrasts with what Wolf calls the "philosophical" usage (see above, n. 9), where natural means material or concrete or referring to some material whole, and philosophical means formal or abstract or structural.
In contrast to such concreteness, a use of the term occurs in the spurious Platonic dialogue Epinomis, where in referring to the reduction of many things to a one, the author calls the reduction of the many numbers to a unity "the system of numbers" (άλλα τα υπάρχοντα).

But even this notion of the reduction of the many numbers to a unity is not merely formal and does not lack real content, since in Greek mathematical thinking the generation of number is dependent upon the recognition of unities which serve as the condition of possibility for counting. Even if, as in the Platonic view of real things and real mathematical things, that which makes a thing what it is as distinguished from other things is nonsensible, it is nonetheless the permanent necessary core, that is, the essence of the thing, without which the thing would no longer be what it is, or would, in fact, no longer be: this essence is what is real in a thing. In man, it is his nature, the same for all men. In number, it is the unit itself, as opposed to an individual unified object. Similarly, in geometry, when one speaks of a triangle, he means not a particular one, but "triangle" in the abstract. When one speaks of number, the determinate reality is the unity or countable, which when added to others, generates the numbers in succession, first two, then three, etc. One is never dealing in Plato or in Greek mathematics in general with totally formal objects devoid of any real content, for the very condition of counting is the recognition of the difference between real beings or the recognition of pure, but just as real, units. "Great as the difference between this limiting case [that is, the pure unit] and all others is, the character of the arithmos as a 'definite number of . . .' is preserved even there. This means that a number is always and indissolubly related to that of which it is the number. . . . Even a 'pure' number, that is, a number of 'pure' units, is no less 'concrete' or 'specified' than a number of apples."24 The meaning of arithmos is always fundamentally reduced to counting, "or more exactly, the counting-off, of some number of things. These things . . . are taken as uniform when counted; they are, for example, either apples, or apples and pears which are counted as fruit, or apples, pears, and plates which are counted as 'objects.' Insofar as these things underlie the counting process they are understood as of the same kind."25 The general meaning of arithmos, namely, an aggregate of concrete elements, throughout its Greek usage in the ancient and early Christian period is thus preserved even in this mathematical example.

Another use of the term which to at least one scholar appears abstract or formal is that of the naming by Sextus Empiricus (ca. A.D. 239-200).

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23 Ibid.


25 Ibid., p. 46.
200), in his criticism of Stoic logic, of the combination of the premises and the conclusion of a syllogism as a \( \alpha \) \( \delta \) \( \iota \) \( \pi \) \( \tau \) \( \mu \) \( \nu \). August Messer in his review of Otto Ritschl's important monograph on the system concept\(^\text{26}\) takes the term in Sextus to mean the embodiment of the parts of a logical argument.\(^\text{27}\) He cites Outlines of Pyrrhonism 2.173, which reads: "For they will describe as proof either the system (\( \tau \) \( \alpha \) \( \chi \) \( \iota \) \( \nu \) \( \omicron \) \( \eta \) \( \omicron \) \( \tau \) \( \iota \) \( \iota \) \( \alpha \) \( \omicron \) \( \iota \) \( \varsigma \)) made up of the premises and the inference or only the system of premises; but neither of these is proof."\(^\text{28}\) Admittedly, the words alone: "they will describe as proof . . . the system made up of the premises and the inference" implies that the system there described is the logical structure or form of the relationship between the premises and the conclusion, as Messer takes it. This would be to make the system equal to the logical structure determined by the rules of logic or thinking in general, and thus to make "system" the formal aspect of the syllogism. But the expression following the term inference, namely, "or the system of the premises," as well as the context in sections 174-76, clearly show that system means simply "aggregate," that is, the aggregate of the premises and the conclusion merely considered all together, for he uses the very same word to speak of the aggregate of the premises alone, without the conclusion. The latter "system" would indeed be a mere aggregate or lumping together of separate elements, namely, the premises, which, before the catalytic action of mind in its generation of a conclusion from them and thus its generation of a syllogism, retain their integrity as merely separate elements. Therefore, the usage is not formal in that it does not refer to the logical tie between the premises and the conclusion, but merely to a number of elements taken together.

Consequently, as far as extant evidence indicates, the ancient Greek uses of the term discussed so far do not offer a clear, delimited, core sense likely to have provided the ground or source for the later modern abstract and formal usage we seek, and these uses so

\(^{26}\) Otto Ritschl, System und systematische Methode in der Geschichte des wissenschaftlichen Sprachgebrauchs und der philosophischen Methodologie (Bonn: Carl Georgi, 1906).

\(^{27}\) August Messer, Review of O. Ritschl, System und systematische Methode, Göttingische gelehrte Anzeigen 169 (1907): 661.

far discussed are quite representative of extant uses. In general, the term is limited to noting combinations of sensible elements or what can be reduced to or dependent upon sensible elements, or at least to what can be reduced to what is considered a concrete or real entity whether or not sensible. Others, we have seen, think that this common Greek sense was the motivation for the early modern takeover of the term to refer to the scientific presentation of a discipline or of all of philosophy. There is another ancient usage, though, almost as ancient as the earliest of those already noted, which alone bears the core formal sense we are searching for. But before returning to that usage, it would be better to discuss the Latin uses of the term that stem from the above. The latter will eliminate the possible consideration that the usage we are after in the early moderns could have been derived from Latin.

The evidence so far given above has proven wrong von der Stein's comment, referring to the above-mentioned natural uses: "Damin hat der griechische Sprachgebrauch schon die vollständige Basis für den Systembegriff geschaffen," "System als Wissenschaftskriterium," p. 100. There is one other very special usage of the adjective form of the word that is much worth noting. Clement of Alexandria in Stromateis, in considering the very reason for writing the work and for couching it in the particular organized form that he does, refers to it as *xwé̂sctiv òptov* (Otto Stählin, ed. Clemens Alexandrinus, vol. 2, Stromata Buch 1–6, Die griechischen christlichen Schriftsteller der ersten drei Jahrhunderte [Leipzig: J. C. Hinrichs'sche, 1906], p. 10). This is rendered by Migne's Latin translator: "expositionem certis capitis constantem" (PG 80:103B), in the French translation by Marcel Caster, "une exposition classée par chapitres" (Marcel Caster, trans., Clement D'Alexandrie: Les Stromates, vol. 1, Stromate 1, [Paris: Editions du Cerf, 1951], pp. 53–54) and in the English translation of The Ante-Nicene Fathers, "a systematic arrangement of chapters" (Clement of Alexandria, The Stromata or Miscellanea, Alexander Roberts and James Donaldson, eds., Fathers of the Second Century, The Ante-Nicene Fathers, vol. 2 [New York: Charles Scribner's Sons, 1905], p. 302). The usage is significant because it verges on the concept of system as a form of presentation, the usage specifically taken up by the early moderns. But even here, the meaning does not escape the natural use in that Clement is merely referring to the fact that he has taken various writings, organized them into chapters in some form, and has placed them all together, thus forming a systematic exposition, that is, one composed of parts placed together. The usage is still concrete and not formal in the high sense as referring to the logical structure including the connections that catalyze the parts into a whole.
Elimination of the Possibility of Latin Origin

The ancient Latin uses of the term are restricted primarily to the previously mentioned Greek use in music theory, and consequently do not provide us with an ancient source for our modern usage. Chalcidius (fourth century A.D.), the Latin translator of and commentator upon Plato's Timaeus, uses the word in its musical sense.\(^\text{30}\) Martianus Capella (fl. A.D. 410-39) in De nuptiis philologiae et mercurii libri 9, Book 9, De harmonia, uses the term at least nine times that way. Another instance of the term is found in Fulgentius the grammarian (A.D. 467-532), Mythologiae 3.9.\(^\text{31}\) The usage of the term systema in ancient Latin is so remarkably rare that the new Oxford Latin Dictionary has no entry at all for the term. Other important dictionaries of the ancient period, pagan and Christian, give only those definitions cited thus far.\(^\text{32}\) In the period between the fourth century B.C. and

\(^\text{30}\) Commentarius 44, as cited in Albert Blaise, Dictionnaire latin-français des auteurs chrétiens (Turnhout: Brepols, 1954), s.v. systema. See also, above, n. 9.

\(^\text{31}\) Adolf Dick, ed., Martianus Capella (Leipzig: B. G. Teubner, 1925), 500.18; 504.9; 507.8; 509.6.10; 514.15,17; 516.3.

\(^\text{32}\) Karl Ernst Georges, Ausführliches lateinisch-deutsches Handwörterbuch (Hannover: Hannsche Buchhandlung, 1913), s.v. systema.
seventeenth century, there is an interesting phenomenon of usage. The number of reasonably available extant uses is almost nonexistent until the late sixteenth century. At that time, the usage of the term blossoms, and the meaning which becomes a predominant meaning is that use, most formal, that leads directly to the full-blown concept of system as a formal structure of doctrines about the whole of reality. In the period between Plato's death and 1552, given the victory of Latin in science and the arts, one can limit the search for uses to Latin uses. None of the major Latin dictionaries covering the period of medieval and postmedieval Latin gives any instance of the term other than those which could be contained under the meanings so far cited. Du Cange cites only Martianus Capella. The entry adds: "Hist Astronomie primum constitutione et formam usurpatur." This usage goes back to ancient Greek times. The entry then has: "Theologis vero pro complexus articulorum fidei." There is no date or reference to the latter usage, but the usage is important for our purposes. Latham cites two dates, 950 and 1200, and says that the word means "harmony." After the entry for the substantive use of the term, he notes the adjective form occurring in 1620 and interprets it as meaning "constitutive." Other important Latin dictionaries such as Laurentius Diefenbach's Glossarium latino-germanicum mediae et infimae latinitatis, and Albert Blaize's Lexicon latinitatis mediæ ævi, praestant ad res ecclesiasticas investigandas pertinentes give no reference to systema.

Since the major dictionaries provide little help, another way of bridging the gap of apparent uses during the Middle Ages would be through Latin translations of Greek writers who use the corresponding term in Greek. This method is inadequate as a means of tracing the concept as we wish to find it, but offers some insight into the ten-


35 See above, n. 12.

36 See below, pp. 29-45.


38 Frankfurt: Joseph Baer, 1857.

dency of Latin scholarship not to adopt the word by mere transliteration, and thus some insight into the reasons for its virtual non-appearence before the late 1500's. Apparently the only major use common to Greek and Latin in the ancient period is its use in music. Other than this Latin use of the original Greek term, instances from the ancient period are not readily available to prove the takeover by the Latin language of any significant sense of the Greek term. Although Du Cange does cite the use of *system* in Latin to refer to the composite of the parts of the universe, he offers no citation. Where the Greek of the Pseudo-Aristotelian *De mundo* reads ἡ κόσμος ἢ ὁ ἱερὸς τοῦ παστού τοῦ κόσμου, certainly an available possibility for transliteration if Du Cange is correct, Apuleius (b. ca. A.D. 123) writes: "Mundus omnis societate caeli et terrae constat et eorum natura quae utriusque sunt." Jumping many centuries, one finds that the translation of the same text, attributed to Bartholomew of Messina and made during the reign of King Manfred of Sicily (1258-66), reads thus: "Mundus quidem igitur est consistentia ex coelo et terra et naturarum quae continetur in hoc." Another medieval translation attributed to a certain Nicholaus, dating possibly to the mid-thirteenth or early fourteenth century, reads: "Est igitur mundus constitutio ex coelo et terra et naturis quae in continentur," while still another later translation, that of Guillaume Budé (1467-1540), has: "Mundus est compages e coelo terraque coagimentata, atque ex ipsis naturis quae intra ea continentur." Such a striking instance of the use of the term in Greek referring to the cosmos, and the refusal of Latin translators from the ancient and medieval periods to translate the term by transliteration as *systema*, preferring instead *societas*, *consistentia*, *constitutio*, and *compages* respectively, lead one tentatively to conclude that, as far as this usage is con-

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40 See above, n. 34.
41 See above, pp. 7-8, and n. 12.
cerned, *systema* is not universal Latin cosmological jargon by the time of the Renaissance.45

Aristotle uses the term *odontina* several times. It is interesting to check the translations of "one of the most competent and influential translators of Greek philosophical texts in the Middle Ages,"46 namely, William of Moerbeke (1215-86). In *De generatione animalium* Aristotle refers to the heart as the first principle of the animal or organism, *τὸν ὁφεῖ πολλοὶ συστημάτων*, where *odontina* is translated by Moerbeke as *compactio*.48 In another place in the same text, Aristotle talks about the "conglomerated mass" that results from eggs boiled together in a receptacle, *τὸ ἐν τῷ Ῥῆμα ἐν συστήμα*.49 In this case, Moerbeke translates *constitutum* in one version and *systema* in another. Still another place in the same text refers to the fertilization of internally viviparous animals as *odontina*, and Moerbeke translates *constitutio*.50 Of these instances, note the use of the term *systema*. It is nonetheless still quite clear that the term as transliterated from Greek into Latin was not common.

Another accessible source for Latin translations of Greek is Migne's *Patrologia series graeca*. Migne often employed translations dating back to the early seventeenth century.52 Even where the translations

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45 For another confirmatory instance, see below, p. 17.


49 752a7.

50 See Lulofs, ed., *Aristoteles latinus*, vol. 17, 2.v., p. xix, for the different editions.

51 758b3.

52 For example, the Latin translator of a good deal of Chrysostom is Fronton du Duc, who himself edited works of Chrysostom in 1609 and between 1636 and 1642. See Paul W. Harkins, trans., *St. John Chrysostom: Discourses Against Judaizing Christians*, FOTC 68 (Washington, D.C.: The Catholic University of America Press, 1979), pp. 11, 111, lx. Speaking of *De incomprehensibili dei natura*, Harkins states that "the Migne reprint has Latin translations printed on pages facing the Greek... Fronton du Duc did the translations for *Homilies 7-10*" (On the Incomprehensible Nature of God, also translated by Harkins as FOTC 72 [1983], paragraph 94 of the introduction, p. 36).
do not date back to later medieval or Renaissance times, their proximity to the time of the first emergence of the term system in the sense this study is meant to elucidate makes them reasonable sources to judge the tendency of Latin to carry the word over in transliterated form from Greek. Where Irenaeus speaks of ἡ ἐκκλησίας ὁμοία, Migne's Latin translator says Ecclesiae status. 53 Clement refers to the state as ὁ σύστημα της ὁμοίας, which is translated into Latin as homaeus aliquis coetus. 54 Also in Paedagogus, Clement says, referring to Christian life, ὁ σύστημα τω ἑστι λογικον κατεδέχεται, which is rendered quaedam rationalium quasi actionum companges. 55 Referring to the whole universe of heaven and earth, Origen (ca. 185-254) has: "καὶ ὁ σύστημα τω ἑστι ἐπὶ τοῦ ἄνω καὶ τοῦ χώματος;" the Latin translator writes omne globum ex coelo et terra. 56 Further confirmation of the above instances from the translations of the Pseudo-Aristotelian De mundo to show that systema was not the common Latin translation of the corresponding Greek term, even where it refers to the cosmos. 57 Again in Origen where the reference is to the gospel as the σύστημα ἀληθινον ἱεράν ὁμοίων ὑπόστασιν τε τοτε κατεδέχεται in his Commentaria in evangelium Joannis, the translation is coacervatio antiquorum utilem ei quidem adjungit. 58 Athanasius' naming water holding together της ὕδατος in Epistula ad Serapionem 59 is rendered, paraphrastically, quomodo consistam aquare. 60 Basil's (ca. 330-ca. 379) reference to the πόλις as σύστημα is turned into Latin as coetus civitas hominum coetus est. 61 The Latin translator of Basil, who is speaking of a conglomeration of evil thoughts as συνέστησα τον ομολογημένου, translates pravarum cogitationum conventus. 62 Gregory Nazianzus (329-89) praises the assemblies and religious practices of his people, ἡ εκκλησία.
Gregory of Nyssa (ca. 330-ca. 395) speaks of the Churches as constituentiae, which is rendered by the paraphrase, constitutus ecclesiæ. John Chrysostom speaks, as we have seen, of the communities of the Jews as constituentiae, which is translated into Latin as coetus.

This selection of instances from Latin literature and from the period of medieval translations of Aristotle through the Renaissance and early modern translations of the Greek Church Fathers points out sufficiently for our purposes the reluctance of the Latin language as a whole, until the sixteenth century, to use the term system for uses other than in music theory. This is not a superfluous discovery for our purposes, since to determine precisely the sense of the term system that caused the early moderns to consider it the most appropriate word to describe an organized and scientific presentation of doctrines about the whole of reality, it is first necessary to eliminate the senses of the term which in no way contributed to their adoption of it, and it is clear from the above that Latin offered no contributory sense. We have also seen, in Section 1, the Greek senses not contributory to the early modern adoption of the term. This process of elimination puts into relief more exactly the most essential elements of the particular sense of the term, to be discussed in the next section, that the early moderns did find most attractive. Being careful even about the reasons the early moderns had for the name provides the basis for a more accurate understanding of what they thought the essential characteristics of a system of science than merely assuming, from the point of view of later modern usage, what the originators of system thinking meant by system. After such an exercise, we are better positioned to understand even those who chose not to use the term, or simply did not use it, but who shared with those who considered systematicity thematically, and even used the word system, the ideal of a rigorous deductive science of the whole. After honing away irrelevant senses of system used in pre-modern speech and writing, senses not contributory to the early modern adoption of the term to describe a scientific system, we are now left with the privileged sense which for the early moderns most exactly fit the meaning they were after.

III

The Greek Progenitor of the Early Modern Use of the Term System

The particular technical usage, which is the true progenitor of the modern sense of system as the coherent presentation of doctrine, be-

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63 Oratio 41 in Pentecosten, PC 46 994C.
64 De vita sancti Gegorii Thaumaturgi, PC 994C.
65 Contra Anomoeos 11.1, PC 48.797. See above, p. 9, n. 18.
gins in extant Greek literature at a time almost as ancient as that of the first extant uses of the term. This only truly formal use of the term refers to the principles of connection between parts of a particular branch of knowledge, that is, to the connectedness between the precepts of art. The concept of system is traceable in Latin writings, where the word *systema* is not used, through the concept of art and the definition it enjoyed for two millennia until the seventeenth century. Von Arnim attributes this early definition of art to Zeno of Citium. Beginning with the citation as we have it in Zeno, we can list many of the repetitions of the definition as it occurred in Greek and Latin in the centuries following.

1) **Zeno (ca. 336-265 B.C.)**

τὰ ἄδεια ὑπὸ τοῦ σύστημα ἐκ καταλήψεως ἑαυτῶν ἐπιγνώσεως τῶν ἑαυτῶν τῶν ἐν τῷ τέλει

Art is a system of understandings exercised together for some end useful in life.

2) **Scholia to Aristophanes’ The Clouds (no later than third century A.D.)**

οὕτω γὰρ ἄριστον εἰς τὴν ἱεράν, οὕτω σύστημα εἰς καταλήψεων

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Throughout this text, translations of Greek passages could not have been done without the help of Hermigild Dressier, former Editorial Director of *The Fathers of the Church*, a series of scholarly translations of Greek and Latin Patristic writings. Where translations are available, although references are cited, modifications have often been made for consistency and accuracy. The somewhat stilted translation of *καταλήψεως* in the plural as “understandings,” that is, individual mental graspings, rather than as “concepts,” is justifiable because it naturally elicits one to think concretely of individual acts of understanding by mind, rather than to think about the more abstract and logical connotations of a term like concept. Also, as a means of making the English translation of the Greek and its Latin translation, *perceptio*, consistent, understanding(s) is better, since the word *perceptio*, the third meaning of which is given in OLD as “mental grasp,” is not accustomed to being rendered “concept.” And confirming this is the fact that the first meaning in Webster’s *New Collegiate Dictionary*, 8th ed., of understanding is “a mental grasp.”
Thus we define art as a system of understandings exercised together, etc.

(3) Scholium on Dionysius the Thracian (Alexandrian grammarian, second century B.C.)

άγγελον έστει σύστημα εκ καταλήψεως συγγεγυμνάσματος τούδ ιλ τέλος ευχαριστον τών εν ίψ θύω.

Art is a system of understandings from experience exercised together for some end useful in life.

(4) Cicero (106-43 B.C.)

Ars est praecessionum exercitatarum constructio ad unum exitum utilem vitae pertinentium.71

Art is a system of precepts exercised pertaining to some end useful to life.

(5) Cicero

Ars vero quae potest esse nisi quae non ex una aut duabus sed ex multis animi perceptionibus constat?72

But what art can there be that is not made up of not one nor two


70 H. von Arnim, Stoicorum veterum fragmenta, vol. 2, no. 94.


but many understandings of the mind?\(^3\)

(6) **Cicero \(^3\)**

Artis etiam ipsas propter se assumendas putamus, tum quid sit in iis aliquid dignum assumptione, tum quod constent ex cognitionibus et continent quidam in se ratione constitutum et via.\(^74\)

The arts themselves, also, we consider should be taken up for their own sakes, partly because there is in them something worthy of taking up, partly because they consist of cognitions and contain something in themselves brought about by reason and method.\(^75\)

(7) **The Rhetorica ad Herennium** (anonymous; written ca. 86–82 B.C.)

Ars est praeceptio, quae dat certam viam rationemque dicendi.\(^76\)

Art is a precept, which gives a certain method and rationale of speaking.

(8) **Seneca** (ca. 6 B.C.–A.D. 65)

Omnis scientia atque ars aliquid debet habere manifestum sensuque comprehensum, ex quo oratur et crescat.\(^77\)

Every science and every art should possess an element that is evident and grasped by sensation, from which it arises and grows.\(^78\)

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\(^73\) H. Rackham, trans., Cicero: *De natura deorum; Academica*, LCL (Cambridge, Ms.: Harvard University Press, 1951), pp. 496–97. As with translations cited from the Greek, modifications have been made where necessary.


\(^78\) Ibid., p. 439, but with severe modifications.
(9) Quintilian (b. ca. A.D. 35-40)

Art consists of understandings [see above #6: Cicero #2] cohering together and exercised together to an end useful to life.

(10) Lucian (b. ca. A.D. 120)

An art, as I remember to have heard a learned man say, is a system of understandings [see #s #8, and esp. #1] exercised together for some end useful to life.

(11) Galen (ca. A.D. 130-200)

Art is a system of understandings exercised together for some end useful in life. Or thus: art is a system of understandings exercised together having reference to one end.

(12) Sextus Empiricus (ca. A.D. 200) #1

And an art, they say, is 'a system of understandings exercised together,' and these understandings arise in the ruling principle.


80 A. M. Harmon, trans., Lucian, vol. 3, LCL (New York: G. P. Putnam’s Sons, 1921), p. 246. The full title of the work by Lucian, one of others in this volume, is Leptidea or The Parasite, Parasitic an Art.

81 Ibid., p. 247.


83 Outlines of Pyrrhonism 3.188. R. G. Bury, trans., Sextus Empiricus, vol. 1, Outlines of Pyrrhonism, LCL (New York: G. P. Putnam’s Sons, 1933), p. 454. See also Outlines of Pyrrhonism 3.241 (pp. 484-87) and 3.252 (pp. 492-93).
(13) Sextus Empiricus 2

σύστημα γὰρ ἓν καὶ ἄθροισμα καταλήψεων.

For [art] is a system and aggregation of understandings.

The essential notions contained in the concept of art as system can easily be extracted by comparing the above ancient definitions. The connection between the Greek and Latin definitions of art is evident even though the Latin term for σύστημα is not a mere transliteration. In the most general sense, the concept of art is therefore recognized to contain the following principle notions, as generally contained in the words cited:

<table>
<thead>
<tr>
<th>genus: system, construct</th>
<th>σύστημα [θ's 1,10,11,12,13]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ἄθροισμα [θ:2]</td>
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<tr>
<td></td>
<td>constat [θ's 5,6]</td>
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<tr>
<td></td>
<td>constructio [#4]</td>
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<tr>
<td></td>
<td>contineant [#6]</td>
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<tr>
<td></td>
<td>habere [#8]</td>
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<tr>
<td></td>
<td>constare [#9]</td>
</tr>
<tr>
<td></td>
<td>constent [#6]</td>
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</tbody>
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<table>
<thead>
<tr>
<th>difference: of understandings, that is, of things assumed, grasped, apprehended by mind arising from sensation</th>
<th>καταλήψεων [θ's 1,2,10,11,12,13]</th>
</tr>
</thead>
<tbody>
<tr>
<td>difference: of understandings, that is, of things assumed, grasped, apprehended by mind arising from sensation</td>
<td>praecceptio (-nibus) [θ's 4,7] = &quot;precepts&quot;</td>
</tr>
<tr>
<td></td>
<td>perceptionibus [θ's 5,8]</td>
</tr>
<tr>
<td>exercised together or coordinated together by experience for an end</td>
<td>aliquid manifestum sensuque comprehensum ex quo oriatur et crescat [#8]</td>
</tr>
<tr>
<td>exercised together or coordinated together by experience for an end</td>
<td>συγγεγυμνασμένων [θ's 1,10,11,12]</td>
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<tr>
<td>exercised together or coordinated together by experience for an end</td>
<td>ἐγγεγυμνασμένων [θ:2]</td>
</tr>
<tr>
<td>exercised together or coordinated together by experience for an end</td>
<td>exercitatarum [#4]</td>
</tr>
<tr>
<td>exercised together or coordinated together by experience for an end</td>
<td>consentientibus et coexercitatis [#8]</td>
</tr>
<tr>
<td>exercised together or coordinated together by experience for an end</td>
<td>ἐξεισέρχοντα [θ:3]</td>
</tr>
<tr>
<td>exercised together or coordinated together by experience for an end</td>
<td>ἐς τὸ τέλος τὴν ἀνάφορὰν ἐξῆλθεν [#11]</td>
</tr>
<tr>
<td>exercised together or coordinated together by experience for an end</td>
<td>τεράτα τὸ τέλος [θ's 1,10,11]</td>
</tr>
</tbody>
</table>


86 Ibid., p. 199.
Directly or indirectly all but 87 of the definitions cite the genus either by using the term *system* or *construction* or by using a verb denoting art as "containing" or "having" certain parts and therefore a fortiori being a whole or construct, namely, of understandings or concepts or apprehensions, or more generally, things grasped by mind. The uncertainty in the text tradition in Latin about whether praecipio is a mistake for perceptio (compare Cicero 8's 4 and 5, and see 8's 7 and 9) merely enriches the parameters of the art concept in the tradition, because the perceptiones become praecceptiones, thereby begetting universal statements or statements of art, when they become unified, coordinated, or exercised together. All these understandings which beget art ultimately depend on sensation, "ex quo oriatur [ars] et crescat." The understandings are brought about by experience (εμπειρίαν) or are from experience. But this kind of understanding is not yet art.87 The understanding or notion of any kind brought about by experience is a kind of natural prudence, like a young girl's knowing how to handle dogs or horses. This kind of "know-how" is not yet art, which makes more universal statements about things, based upon judgments made upon the understandings. The understandings must therefore be coordinated together or practiced together to beget art. Knowing that approaching yet untamed animals slowly or with gentleness has worked in the past is different from knowing that all animals of a certain type or condition should be approached in such a manner. Mind is involved in a judgmental or discursive way in the latter (for all x, x is A), whereas in the mere understandings brought about by experience there is more of a "lived through" or "not thought out" ability begotten by much familiarity and based on what "feels" best. This latter is a kind of insight or exercise of nous, but it is not art. Mind's organizing these kinds of understandings into a coherence that limits conjecture or hope pro-

duces art. The latter exercise of mind is more similar to epistēmē, but differs in its object which is not necessary and is something produced, in accordance with Aristotle in Metaphysics 1.1 and Nicomachean Ethics 6.3-4. The understandings must be "practiced together" or "coordinated together" (συγγραμματοζητικώς) or made to agree or cohere together (consentientibus) for there to be art, and this coherence is brought about by reason, that is, the order in which the understandings of art are used and taught depends on what is most logical or efficient, and this is a judgment of reason. This is fundamentally the same doctrine as Aristotle's in Metaphysics 1.1 (980a22-81a28). "Art is produced when from many notions of experience (ἐξ πολλῶν τῆς ἐμπειρίας ἑπνοιακῶν) a single universal judgment is formed with regard to like objects." The many "notions" here are the "understandings" in the definition of art. There is in art a congealing of the notions, a "coordinating" or "practicing together," a qualitatively different thing from the mere individual understandings. Aristotle gives an example. "To have a judgment that when Callias was suffering from this or that disease this or that benefited him, and similarly with Socrates and various other individuals is a matter of experience; but to judge that it benefits all persons of a certain type, considered as a class, who suffer from this or that disease . . . is a matter of art." The fact that Aristotle lumps art and science together in the lines immediately preceding these is instructive because both art and science have a universality to their judgments that the mere possession of "know-how" in the sense exemplified in the girl handling horses does not. The judgments of art and science constitute a coherent "system" of propositions; the intuitions of the young girl do not constitute such a system.

Hobbes exemplifies this similarity between art and science along the lines of universality in Leviathan chapter 5 paragraph 21, where he speaks of the difference between prudence and sapience using the example of the art of fencing. Prudence is much experience, or prudence is like the natural understandings gained by dealing with things. Sapience is what one has when he has science, that is, he has universal judgments, or as Hobbes states it, sapience as opposed to prudence is "infallible." His example is also instructive of the difference between his and Aristotle's doctrine on these points. Hobbes says that the difference between prudence, or the possession of the natural understandings acquired from experience which we have mentioned above, and science, is like the difference between the man who knows naturally how to defend himself with a sword, and the one who possesses the ability of the "master of Fence," namely, science. Notice that there is no attempt to distinguish art from science here, as the commonly acknowledged "art" of the foil is called "science" by Hobbes. "But to make their difference appear more clearly, let us suppose one man endued with an excellent natural use, and dexterity in handling his arms; and another to have added to that dexterity, an acquired Science, of where he can offend, or be offended by his adversary, in every possible posture, or guard: The ability of the former, would be to the ability

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of the later, as Prudence to Sapience, both useful; but the later in- fallible." One who knows by his "excellent natural use" is never a match for one with technical knowledge. Given the size of the human body, of the weapons, and the finite number of postures two opponents can take with respect to each other, and given the amount of time it takes to execute the various attacks and parries, the master fencer, knowing scientifically the sequence of all the guards, and generalizing to every possible case, can by immediate mental inspection of his situation in regard to his adversary deduce a finite number of possible strategies to use against his opponent. For example, such a master, caught against a wall and knowing by science that parry two and counter six cover all possible target areas and frustrate any attempt on the part of the attacker to disengage around any parry and perhaps successfully strike a blow, and knowing also that such a defense can be executed quickly, is more likely to escape than the fencer with natural skill trapped in the same position but not having such knowledge. Hobbes makes art and science equivalent because both generate universal precepts, and both are infallible. Anything less than science is a mere form of natural prudence. Aristotle would seem to disagree, for he notes that at times experience has a natural superiority to art in the case of actual use. "It would seem that for practical purposes experience is in no way inferior to art; indeed we see men of experience succeeding more than those who have theory without experience." Aristotle does not say "who have theory added to experience," as Hobbes says, "to have added to that dexterity, an acquired Science." The point of disagreement between Hobbes and Aristotle on this point vanishes. Another point Hobbes would agree upon is made just afterwards by Aristotle: knowledge and proficiency belong to the man of art rather than to the man of natural wit because the artist knows the causes, as in fencing, while the other does not.

At any rate, the sequence in the generation of the universal precepts or the coordinated understandings or the "practiced together" understandings of art or science is as follows: sensation, memory (mentioned in Aristotle but not in the definition of which we have been following the history), experience, understandings (natural skill or prudence), art/science. What is important to notice in all this is the qualitative difference between the uncoordinated natural notions or understandings and art: the former being particular, the latter universal. It is implicit in the notion of "coordination" or "practicing together" that something more than mere natural intuition or insight brings this about: it is reason and method (ratio et via [see #'s 6 and 7]) that bring this about.

Finally, in addition to the coordination of the understandings, the understandings must be directed to a goal, namely, the useful in life, meaning that art in all its forms must belong to the highest of the three kinds of goods singled out by Socrates and Glaucon at the beginning of Book 2 of the Republic, that is, those things good for themselves as well as for their consequences.88 Philo (first century

88 Republic 357a-358a.
B.C.-first century A.D.) in his *De congressu eruditionis gratia* makes an issue of the necessarily utilitarian character of art.

The definition of art is as follows: a system of understandings exercised together for some useful end, "useful" being a very proper addition to exclude mischievous arts.

The generic term system, then, when applied to art, has the above specific characteristics. Since, as we shall see, certain sixteenth and seventeenth-century thinkers, whom we shall discuss in the sequel, chose the term system precisely because of the appropriateness of the usage in art to the usage to which they wished to put it in science, it is clear that the differentiating characteristics of art as system were important in inducing the first modern theoreticians of system to use the term. They saw in the definition of art characteristics applicable to what they considered the proper rigorous presentation of scientific doctrine, which they named system. These early modern thinkers connected their notion of the proper logical presentation of science with the term system because of the appropriateness of the word to signify their concept. So the concept of system was already part of the intellectual milieu of the late sixteenth and early seventeenth centuries. The term system was chosen, as we shall see, because the ancient definition of art most closely corresponded to their notion of constructing the body of propositions most likely to present clearly to the learner the actual things themselves as the subject matter of science.

It is unnecessary to trace the gradual movement toward the use of the term system from the time of the ancients to the seventeenth century by following the gradually more rigorous attempts to put knowledge of a single subject matter together into a single whole with logically connected parts. It is sufficient to say that these gradual attempts at more sophisticated systematization occurred primarily in theology under the names summa, corpus integrum, loci communes, and finally, the immediate predecessor of the term σύστημα, the word σύστατον. All these terms imply the attempt to construct a coherent and demon-

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91 For the history of this progression in thinking, see Ritschl, *System und systematische Methode*, pp. 5-24, and August Messer's review of this monograph in *Göttingische gelehrte Anzeigen* 169 (1907):659-62;
strative presentation of doctrines in theology in accordance with the rules for demonstrative science as developed in the Posterior Analytics as understood through the logic of the scholastics. What is important is that over the centuries, increasing emphasis began to be placed upon the presentation itself or the demonstrative form of the scientific doctrines, and upon the method of bringing about such demonstrative presentation, as well as upon the method of discovering derivative propositions necessarily implied by more basic propositions. These emphases were not the sole prerogative of the theologians. But the theologians of the late sixteenth and early seventeenth centuries appear to have been the ones who resurrected the definition of art as system, and to have made the connection between the presentation of scientific doctrine as art and therefore as system. By focusing upon the precise fertile moment when thinking about the most felicitous presentation itself of the doctrines of science became connected with the ancient definition of art, we see the fruition of a new concept of science and its presentation, the concept that the presentation of doctrines in a science is itself a form of artistic construction of propositions. The doctrines, or more precisely, the propositions thus constructed into a whole thereby themselves take on a kind of separate integrity or a separate reality. But in spite of this separate character, it is important to mention that the early moderns who first considered the issue of system thematically and used the term itself were not really "moderns" philosophically. They believed the system of propositions actually imitated and presented the "system" of being, or of the beings of the world. But their change of emphasis from the system of things to the presentation of the things in a system of propositions was one of the great turning points toward philosophic modernity. In

von der Stein, "System als Wissenschaftskriterium," pp. 94-104; Rescher, Cognitive Systematization, pp. 3-6, as well as his "Leibniz and the Concept of a System," pp. 114-16. An example of the emphasis placed upon the demonstrative form of presentation is tersely brought out by a comparison of a passage from Aquinas and from an early seventeenth-century German theologian. "Arthron enim in graeco, quod in latino articulus dicitur, significat quandam coaptationem aliquarum partium distinctarum: et ideo partlculae corporis sibi invicem coaptatae dicuntur membrorum articuli. . . . Unde et credibilia fidei christianae dicuntur per articulos distinguit, in quantum in quodam partes dividuntur, habentes aliquam coaptationem ad invicem." Summa theologica 2-2, Q. 1, Art. 6, ed. Institutui studiorum medieavilium Ottaviensis (Ottowa: Studii generalis, 0.Pr. 1941). "Ea enim est ipsorum [sc. articulorum fidel] conditio vel mutus potius affectio, ut, quemadmodum ansulae in catena quaprim cohaerent, ita in sacratissima scientia nostra theologica unus semper articulus alium et distinctum de se gignat, hic rursus alium, et sic deinceps, donec integrum doctrinae christianae corpus sive systema perfectum absolutumque habeas," Leonhart Hutter (1563-1616), Compendium locorum theologicae (1610), Preface, as cited in Ritschl, p. 24.
order now to grasp this "fertile moment" within which the modern concept of a system of philosophy arose, we move to a brief treatment of the first thinkers to consider the system concept thematically and to turn to the ancient definition of art for a term to describe their concept.

Section IV

First Thematic Treatments of System

By the time of Descartes, disgusted with the apparent lack of progress in the various sciences, and admiring the certitude displayed in geometry, those who thought on these matters continued the denigration, begun by the humanists, of the sciences as taught in the Schools. The distinction of the various sciences into several subject matters with corresponding methods became the point of attack, for the lack of progress seemed to lie in the point of view one was taking of the objects, the disunity of subject matter, and in the lack of unity of method. In that lack of unity both of subject matter and of method seemed to lie the source of nonproductivity and unclarity. First expressed by Descartes (a fact which perhaps makes understandable the fact that it was a Cartesian, Pierre Sylvain Regis, who first claimed to have produced such a system of the whole), the early modern wish was to reduce all the sciences to a single method imitative of the common method underlying all mathematics, and especially exemplified in geometry.92 This

92 Criticism of the scholastics and their disputations are so frequent in the seventeenth century that passages are too numerous to recount. Joseph Glanville (1636-80) in The Vanity of Dogmatizing writes that "A Schoolman is the Ghost of the Stagirite, in a body of Condensed Air: and Thomas but Aristotle sainte," Scopisia Scientifica: or Contest Ignorance, the Way to Science; in an Essay of the Vanity of Dogmatizing and Confident Opinion (2nd ed. of Vanity [1661], London: E. Cotes, 1665), p. 117. For anti-Aristotelianism in general see Basil Willey, The Seventeenth Century Background (London: Chatto and Windus, 1942). Hobbes's criticism of the schools runs rampant throughout Leviathan, particularly in chapter 46, "Of Darkness from Vain Philosophy, and Fabulous Traditions," where he says of them, "The natural Philosophy of those Schools was rather a Dream than a Science, and set forth in senseless and insignificant Language; which cannot be avoided by those that will teach Philosophy, without having first attained great knowledge in Geometry" (Leviathan 46.11 [p. 686]). Both Hobbes and Descartes are clear that the reason there has been no progress in the sciences is the notable lack of a single method for the resolution of all problems and the finding of truth in every subject. See Descartes, Rules for the Direction of Mind in Elizabeth S. Haldane, and G.R.T. Ross, trans., The Philosophical Works of Descartes, 2 vols. (1911; reprint ed., Cambridge: The University Press, 1979), vol. 1, pp. 10-11, paragraphs 3-4 of Rule 4; Discourse on the Method, Part 2, paragraph 13 of Haldane-
change seems to have provided one of the major breakthroughs in moving toward the notion of a single science of the whole or a single system. But taking the system concept as a theme in an attempt to reduce the presentation of the individual sciences to rigorous demonstrative form as this was attempted by the late sixteenth and early seventeenth-century thinkers who actually used the term system, thinkers whom we are about to treat, seems to have provided the important separate treatment of the presentation itself of science while at the same time connecting it with the term system. Thinking through the problem itself of demonstrative form and the problem of method was a proximate cause of the Cartesian reduction of all science to a single method and the proximate cause of the concept of a system of the whole of reality. Descartes apparently thought of a system of the whole, but never produced it because he feared to make the decisive reduction of all science to a single subject, extended being, and because, as he said of himself, "auctor non libenter scribit ethica." Hobbes did both, but never

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93 Principles of Philosophy, Author's Letter to the Translator of the book, paragraph 8, where Descartes says, "Thus philosophy as a whole is like a tree whose roots are metaphysics, whose trunk is physics, and whose branches, which issue from this trunk, are all the other sciences. These reduce themselves to three principal ones, namely, medicine, mechanics and morals— I mean the highest and most perfect moral science which, presupposing a complete knowledge of the other sciences, is the last degree of wisdom," Haldane-Ross, vol. 1, p. 211.

94 Charles Adam and Paul Tannery, eds., Oeuvres de Descartes, 12 vols. (Paris: Léopold Cerf, 1897-1910), vol. 5, p. 178. This comment refers to the Discourse Part 3 (Haldane-Ross, p. 95, paragraph 1, lines 10-11), where Descartes is speaking of the temporary rules for morality, "quae tribus tantum aur quatuor regulis continebatur; quas hic
referred to his philosophy as a system. Spinoza and Leibniz clearly wanted to systematize knowledge, but Régis was the first to call such a complete construct of all sciences a system of philosophy. By Régis's time, the turn to modernity and modern system had clearly been made. It is therefore necessary to study the first system thinkers who provided the bridge between the concept of various systems in the various sciences, and the concept of a single system of all knowledge named and attempted by Régis. These philosophers and theologians used the term system as well as considered the concept thematically. They comprise the "School of Melanchthon," namely, Melanchthon himself, Bartholomew Keckermann, and Clemens Timpler.

The immediate predecessor of the important late sixteenth-century and early seventeenth-century system thinkers was the great protestant theologian of the Reformation, Philip Melanchthon (1497-1560), with whose writings Hobbes was familiar and whose "school" influenced the Oxford of Hobbes's schooldays and afterwards. Although others used "non pigebit adscribere" (Adam-Tannery, vol. 6, p. 552, and in French of the same volume, p. 22: "qui ne consistoit qu'en trois ou quatre maximes, dont ie veux bien vous faire part"). The comment continues after ethica: "sed propter paedagogos et similis coactus est has regulas adscribere, quia alias dicere illum esse sine religione, fide, et per suam methodum haec everttere velle." It is interesting to notice that Hobbes, who was not as prudent as Descartes but the essential lines of whose scientific doctrine were similar to those of Descartes, was accused precisely of being without religion. The comment about Descartes's not writing ethics is dated April 1648. See also Descartes's comment in Part 4, Principle 188, of the Principles of Philosophy: "I should add no more to this Fourth Part of the Principles of Philosophy, did I (as I had formerly in my mind) purpose writing other sciences, namely, a Fifth and a Sixth Part, the fifth treating of living things, that is of animals and plants, and the sixth of man. But because I am not yet quite clear about all the matters of which I should like to treat in these two last parts . . . I shall here add a little about the objects of the senses" (Haldane-Ross, vol. 1, p. 289). Descartes had written a preface to the French translation of the Principles upon the completion of that translation in 1647, but the 1644 Latin version was the only one published in his lifetime. His last published work, The Passions of the Soul, was finished in 1646 and published with major revisions finally in 1649, a year before Descartes's death. But this cannot count as "morale," and the comment in 1648 about his not writing ethics remains true. Therefore, although Descartes had the notion of system, he never produced one.

A prolific writer, Melanchthon's works cover the first twenty-eight volumes of Carolus Gottlieb Bretscheider, ed., Corpus reformatorum, vols. 1-28 (Halle and Braunschweig: A. Schwetschke and Son, 1834-60).
the term system after Melanchthon, the first scholars to consider the concept of system thematically and to use the term itself cite Melanchthon as their authority. In the context of a statement in which he makes system a necessary condition for any perfect doctrine, Melanchthon cites the ancient definition of art.

Melanchthon here cites the Greek and mentions Quintilian, who, as we have seen, repeated the definition in Latin. Although he does not mention Lucian in the above passage, the latter could have been his source given Melanchthon's great familiarity with and respect for Lucian's works. "Inter graecae linguae scriptores tum propter multijugam eruditionem, tum propter sermonis elegantiam et miram quandam venerem, nemo, ut opinor, Luciano praeferendus est." August Messer notes having seen a 1529 edition (Melanchthon's book was published in 1534) of Quintilian wherein the Greek text is given in the margin. It is thus possible that Melanchthon could have gotten the Greek text through that of Quintilian. What is clear is that Melanchthon was aware of the tradition of this definition of art, and chose to cite this definition as paradigmatic of the development of any perfect doctrine. Furthermore, in explaining the perfect doctrine as requiring systematic presentation as in art, Melanchthon explicitly mentions, in explaining the fundamentals of the definition of art, points we have delineated above as essential characteristics of the definition of art, namely, the need for order and method (ordine ac ratione) and the need to establish the end or goal as the guide for the development of the study (certum finem studiorum). Clearly also, from the generic character of the first sentence in its treatment of varias disciplinas, Melanchthon is applying the definition of art to intellectual disciplines in general as well as to the arts. In the very least we have a modern use of the

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96 Praefatio in officia Ciceronis (1534) in Corpus reformatorum, vol. 11, p. 257.


99 See above, pp. 19-74.

100 Ibid.
ancient definition of art applied to the presentation of theoretical as well as nontheoretical disciplines. Melanchthon's usage constitutes an important link between the ancient usage and the specifically modern sense we are seeking out.

The use of system in the late sixteenth century replaced the use of σύστημα and corpus integrum in theology to express the organized presentation of the articles of faith.101 This use of system leads to the question of whether system refers to the presentation or the form alone of the articles of faith, or to the actual dogmas themselves. Is the system contained in the truths themselves, or in their presentation, or both? Given the fact that this is a pre-Kantian, as well as even pre-Cartesian phase of thinking, and given the fact that those who used this terminology were not, like Descartes and Kant after them, concerned with the problem of whether or not thinking corresponds to the things, but merely with the problem of organizing Christian doctrine into a demonstrated intelligible whole, the evidence would weigh in favor of the last of the three alternatives. The presentation or system as construction of demonstratively organized propositions about the faith reproduces the inner logic and connections among the objects of belief.102

But the very attempt of sixteenth-century theologians103 to organize the

102 See Hans Jonas, "Bemerkungen zum Systembegriff und seiner Anwendung auf Lebendiges," Studium generale 10 (1957):88-94. Jonas discusses the problem of the difference between system as a form imposed upon things by mind for the knowing of the things and the system as the inner structure in the nature of the things themselves. Jonas points out that truth and falsity occur only in speech, simply because of the gap between the things themselves and the registration of them, the latter being susceptible to error. On the side of the things themselves, or of being itself, there is an actual system of real dependencies and connections among the beings. The articulation by mind and in speech of whatever system there is in the things themselves is parasitic upon being itself (p. 89). His purpose is biological: to discuss in what sense living things are describable as systems (p. 89, para. 4, last sentence). His position on the general problem of how the system of thought manifests the inner articulations of the things, is that even mere classificatory "systems" work according to the principle of similarity, which is an aspect given by the object itself and thus the real source of an apparently arbitrary classification (see p. 88, para. 2).

103 Among the sixteenth-century theologians and their works delineated by Ritschl as concerned with systematization under another name are Victorinus Strigel, Loc i theologici, quibus Loc i commun es . . . Melanchthonis illustrantur et velut corpus doctrinae Christianae integrum proponit et (1563); Andreas Hyperius, Methodi theologiae sive praecipuorum Christianae religionis locorum communium libri tres, lam
doctrines of belief implies a distinction between the thing itself and
the ordered presentation of it, but only in the way that there is a
distinction between the thing known as such and such and the proposi­
tion that refers to it. There are not two unconnected realities here.

In the work of the early seventeenth-century theologian and phil­
osopher Bartholomae Keckermann (1571-1609), we have the first extended


treatment of the concept of system as well as use of the term system. 104

As early as 1600, Keckermann published at Hanover a book on logic en­
titled Systema logicae. 105 He is considered by Bocheński one of the
few real logicians after the scholastic period until the end of the
nineteenth century. 106 In the very beginning of the text, Keckermann
traces direct lineage of the use of the term system to the ancients
through Melanchthon. In the passage in which he does this, he distin­
guishes between logic as an intellectual habit and logic as a system of
precepts constructed for the sake of acquiring the habit.

Nec loco id solum repetemus, ut artis omnis, ita Logicae etiam
vecem dupliciter uoupori: primo pro habitu ipso in mentem per
praeecepta ad exercitationem introducto: deinde pro praeeceptorum
Logorum comprehensione seu Systemate, quale nunc tradimus, pro
Logico habitu ex praeeptis usu accedente, acquirendo: unde illa
definitione Luciani Domini Melanchthoni valde probata: quod ars
sit odothma egkatallêswêv ëggêgymnasmewêv prôs ëi telôs eûx̄mptow

denuo in lucem editi (1568); Johannes Wigand et Matthaeus Judex,
Eòvresya seu corpus doctrinae Christi (1560); Nic. Selencker, Institu­
tio Christianae religionis (1573); Ursinus, Explicationum catheceticarum
absolutum opus totiusque theologiae quasi novum corpus (1598); Nic.
Hemming, Syntagma institutionum Christianarum ex scripturae saeae
assertionibus comprehensum (1574); and others. See also, above, n. 91.

104 After Melanchthon, the term was used extensively in theology and
in other disciplines ranging from logic to politics, jurisprudence and
medicine. Ritschl cites over 150 uses of the term in titles alone,
mesty from the seventeenth century but partly from the eighteenth, a
fact which indicates that Hobbes could hardly have been unaware of the
usage. See Ritschl, p. 24, for the comment about theology, and his
bibliographical appendix at the end of his monograph. Hobbes himself,
in his capacity as librarian of the Hardwick Library at Chatsworth,
classified Keckermann's Systema ethicae. See James Jay Hamilton,
"Hobbes's Study and the Hardwick Library," Journal of the History of
Philosophy 16 (1978):446, and n. 6, as well as p. 450.

105 See Ritschl, System und systematische Methode, pp. 24-25, n. 2.

106 I. M. Bocheński, A History of Formal Logic (Notre Dame, In.:
Keckermann's citation of Melanchthon as the one who recognized the importance of the ancient concept of art as system makes Keckermann the next most important link, after Melanchthon, between the modern adoption of the term for use in the sciences, and its eventual use by Régis for the coherent presentation of all the sciences as one body.

Keckermann, not untraditionally, views logic as an art. "Genus ergo logicae est ars." As every discipline and art, "etiam logica acquiritur natura, praeceptis, et usu." In keeping with the tradition Keckermann distinguishes between logic as potentially a habit of mind and logic as actually a habit of mind. Given the natural ability to acquire logic, one acquires the actual habit of thinking logically by studying the rules of logic and putting them into practice. Acquiring the habit of actually thinking correctly is the goal of logic.

Logica est ars recte de rebus cogitandi: Die Logick ist ein Kunst den dingen richtig nachzudencken oder nachzusinnen: etenim Ratione uti, intelligere, cognoscere et cogitare, idem significant: nec alium sunt hominum cogitationes quam mens seu Ratio, et Intellectus actu circa res occupatus.

From *Systema logicae tribus libris adornatum pleniore praeeptorum methodo et commentariis* (Hanover 1600), as it appears in D. Bartholomaei Keckermanni Dantiscani, in Gymnasio patrio philosophiae professoris eruditissimi, *Operum omnium quae extant* (Geneva: Peter Aubert, 1614), vol. 1, col. 549C-D. For the publication dates and places of those works of Keckermann in which the word system appears, see the appendix in Ritschl, *System und systematische Methode*. All references to Keckermann will be cited from the *Operum omnium quae extant* (1614).


109 *Systema logicae* in *Operum* 549D-50A.

110 Ibid. 550E.

111 Ibid. 549D-50A.
There is, then, a difference between logic as an organized body of precepts and logic as a habit of mind. Only the former, that is, the organized presentation of logic, does Keckermann call **system**.\(^{112}\)

Logic as every art is a system. Every system has three characteristics: arrangement or order (*ordinem*), due proportion among the parts (*commensurationem partium*), and limitation or division (*determinationem sive partitionem*). The formal aspect of the presentation of logic consists of the determined distribution itself of the parts and of their coordination to each other and to the end or purpose of the whole. The material part is the actual content which is so arranged, namely, the precepts themselves of logic.\(^{113}\) Thus, within logic itself, considered as a system rather than as a habit of mind, there is a form and content. The form is the structure itself, and the content is the sum of the precepts themselves so arranged.

Keckermann gives the formal criteria of a rightly and clearly ordered system of logic. (1) Since every system is a means to an end, in this case, logic a means to correct thinking, the system should be ordered and adapted to this end by the proportionality exhibited among the parts, by the beauty or apparent harmony produced by the proportional arrangement of parts in relation to their end, and by method, all so as to be acquired more easily by the learner. (2) Whatever is in the end purpose or the use of logic should also appear in the system itself,

\(^{112}\) According to Keckermann, logic is not a science itself because it does not teach, that is, it does not present a doctrine about things to be grasped by mind. Logic merely directs mind in the grasping of such truths. "Hisce tantis defectibus mentis nostrae dum per praecepta sua medetur Logica, dicitur eam dirigere in cognitione rerum: rei quae disciplinar, ut Physica, Mathematica, etc. non tam dirigunt mentem, quam docent, quam imbuunt cognitione rerum, quod Logica per se non facit. . . . Regit autem Logica mentem nostram et elius conceptus, non absolute: sed in relatione ad res, id est, quatenus actu circa res apprehendendas et iudicandas sunt occupati," *ibid.*, 550B-C. Although Aquinas maintains logic is an art (see above, n. 108), he preserves the two-fold character of logic as both an art to direct mind as well as the science that presents the doctrine about reasoning itself as its proper object: "Et haec ars est **logica**, id est rationalis scientia. Quae non solum rationalis est ex hoc, quod est secundum rationem (quod est omnibus artibus commune); sed etiam ex hoc, quod est circa ipsum actum rationis sicut circa propriam materiam. Et ideo videtur esse ars artium, quia in actu rationis nos dirigit, a quo omnes artes procedunt" (*In anal. post. 1, lect. 1, nos. 2-3*).

\(^{113}\) *Praecognitorum logicon tractatus tres*, *Operum*, vol. 1, col. 139E-F.

\(^{114}\) *Ibid.* 154A-B. See also *Systematis logici plenioris pars alter, quae est specialis: continens usum et exercitationem artis logicae, antehac gymnasium logicum appellata: nunc recognita, et varie aucta ab auctore* (1609), in *Operum*, vol. 1, col. 1117F-G.
that is, in the presentation or means. (3) Nothing should be taught or prescribed in the system which is not directed to the end or use. (4) The use of the teachings or precepts should be easily and clearly understood. System, then, or the presentation, is the means to the actual possession of the habit, or the end. But just as most properly substance refers to the nature or essence of a thing, especially to the form, without excluding the fact that substance is in fact the whole composite of material and formal parts, so also system most properly refers to the method of ordering the material, that is, to the form.

"Methodus est anima et forma disciplinarum, sine qua nec cohaerent res ipsae, nec cognitiones hominum de rebus." System, then, for Keckermann is a means to an end, the means of presenting the doctrine of the art so as to inculcate it most easily and successfully into the learner by its clarity of presentation. Although system has form and content, the method meaning form, the precepts themselves content, special emphasis is to be placed on the method or order or manner of presenting the precepts. The more careful the method, the more easily the learner achieves his goal which is the acquisition of the habit.

"In praecceptis artium ordinem esse rem ad docendum efficacissimam, ut facilius Auditores cum percipient, cum retineant." The special emphasis placed on method, then, makes the primary meaning of system the method of presentation. What is reduced to a clear, teachable order by method is system. In his introduction to Praecognitorum philosophicorum libri duo, Keckermann states that the learners are led by things methodically arranged "et dum posteriora ex prioribus videntur nasci, accepiuntur omnia pro certissimis." If the learner sees how dependent propositions are derived from or at least connected with the more prior propositions, his assent to the certainty of the content of the whole is assured. "Est autem ordo rerum cohaerentium concinna unio mentis humanae representata. Unio autem est diversorum connexio." But what are the prior and posterior propositions? "Connectuntur ea, quorum alterum ab altero pendet. Pendent autem posteriora a primit, specialia a generalibus, angusta a communibus." The proper method of presenting philosophy is to begin with

115 Praecognitorum logicorum, ibid. 146F-H.
116 Praecognitorum philosophicorum libri duo, introduction, Operum, vol. 1, col. 5A-G. See below, n. 155 for emphasis upon form and presentation.
117 Ibid.
118 Ibid.
119 Ibid.
120 Ibid.
a general treatment in which are explained those things which are the
most general and common, that is, the first things which by their gen-
erality are applicable conceptually to everything else. They are the
most common genera. After that, the individual disciplines, which fall
under the most general and common things, are treated each with its own
special method. The general treatment includes an explanation of the
most common genus (communissimi generis) and a statement of the proper
object (objecti) of the science, the end or goal (finis), and the sub-
ject (subjecti) in which the proper object of study is found. This kind
of general treatment must necessarily precede a particular treatment if
one wishes to teach in an orderly and methodical way. Keckermann cites
Aristotle's Posterior Analytics, chapter 1: "'omnia doctrina est ex
praecognitis.' Sic ergo generalem tractationem . . . ipse voco Prae-
cognita. . . . Quia singulae partes sine natura totius intelligi
sequent, Methodi ratio postulat, ut antequam ad speciales disciplinas
sive partes philosophiae accedamus, de ipso toto Auditorum animos
in-formemus. Caeterum de philosophia in genere Aristoteles, teste Laer-tio,
in eius vita, libros aliquot scriptis; sed si libri iniquitate temporum
perierunt." Thus, Keckermann is not only talking about the way the
individual "systems" of the various disciplines should be ordered, but
about the way the most general entrance into philosophy itself should
precede the entrance into the individual disciplines.

Undercoring the thesis that system means primarily method, Kecker-
mann in a statement pointing out the necessity of the study of philoso-
phy for the study of theology, uses the expression "In ipso Systemate
seu Methodo praeceptorum Theologicorum." Also, the title of section
1 of chapter 2 reads: "Systema sive Methodus eius disciplinae, quam
docere vulgo, exactissima construatur." There he explains that the
Schools use two procedures in teaching, one, wherein the system or
method of a discipline is formed on the basis of the nature and scope
of the discipline itself, or its subject matter; another, wherein texts
are commented on. Keckermann says that the former is by far to be pre-
ferred (ipso Systemate praeferenda est). A synthetic treatment based on
the topics themselves is in itself clearer than an analytic treatment
based on scrutiny of the texts of others.

Although Keckermann uses the term system in connection with phil-
osophy as a whole composed of many parts, mentioning that others,
"alios . . . philosophos" call philosophy "ordinatum artium liberalium
Systemate," or "Systema Sapientiae ad salutarem tum veri cognitionem,

121 Ibid.
122 Ibid. 36H.
123 See ibid. 51E-H.
124 Ibid.
turn actionem boni,"^{125} he excludes logic and rhetoric as nonphilosophical because neither is scientia nor prudentia. In his final description, he himself uses not system to refer to the whole of philosophy in all its parts, but aggregatio, Totum integrum,^{127} and compage. Ritschl takes this to mean that Keckermann did not use the term system for the titles to his works on speculative philosophy, but only for nontheoretical sciences, that is, those directed to some end useful to life, as the ancient definition states. But the heading to the introduction of Praecognitorum philosophicorum libri duo, which speaks of specialiae singularium philosophiae partium Methodum, sive Systemat^, cannot be overlooked. Here he indicates a special method for the special parts of philosophy. These various methodological presentations in each area he calls systems. Therefore, although Ritschl would seem to be wrong in saying that Keckermann did not use the term for the speculative sciences,^{131} his general understanding that Keckermann limited his own use of the term is correct. System does not apply to philosophy as a whole, but each individual discipline is a separate system. Nevertheless, as we have seen, there is a proper systematic treatment of the whole of philosophy which starts from the most general considerations and proceeds to the various divisions of philosophy. Keckermann does not call this procedure from the most general to the most specific system. This makes intelligible the habit of early seventeenth-century writers to name individual disciplines "system of . . ." but not as yet to refer to philosophy as a whole as such.

With Keckermann, then, system is extended to the individual sciences and not just to the arts, refers especially to method, and contains an implicit the need for a prior treatment of the most general concepts before the concepts of the individual sciences can be understood. Furthermore, there is the distinction between system as the form and as the content, that is, as the structure and as the precepts of an individual discipline. There is no statement of the correspondence between

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125 Ibid. 9D-E.
126 Ibid. 11F.
127 Ibid. 11G-H.
128 Ibid. 9G-H.
129 Some of Keckermann's works appeared posthumously, with the title systema added by editors. See Ritschl, System und systematische Methode, p. 30, and Messer's review of the latter work, pp. 662-63.
130 Praecognitorum philosophicorum. Operum. vol. 1, col. 5A-C.
131 Messer notes that even in antiquity the theoretical disciplines were included in the seven liberal "arts" (Review of O. Ritschl, System und systematische Methode, p. 664).
the system and the habit it helps achieve nor the actual referent of the system, namely, the things in the actual world about which a science manifests the truth. It is implicit, however, in this pre-Cartesian and pre-Kantian philosophic perspective, that neither the things nor the concepts of them are misrepresented in the system or the artificial presentation of the things. Hence, there is system in the things themselves also. One might say that the system as things is according to nature, whereas the system as presentation is according to art. In any case, system as a form of artifact serves as the medium between the things themselves about which certain truths must be known and manifest and the habit of mind acquired concerning them, the term itself referring specifically to the artifact:

Clemens Timpler (1567/68-1624) in 1606 published Metaphysicae systema methodicum, "eines der ersten Lehrbücher dieses Gebietes auf deutschem Boden," in which he explicitated the problem of the relationship between the system as methodical presentation of the doctrine, the habit of mind or knowledge it produces, and the things themselves of which one has knowledge. On the side of the presentation and the habit, he distinguished between liberal arts external and internal. The external art is the systematic presentation, while the internal is the habit. The external he calls systematic or enunciated, the internal habitual or conceptual, a terminological novelty, he admits.133

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133 Timpler thought his usage novel. But see our treatment of Keckermann, above. "Ars liberalis sit doctrina, quae hominem vere literatum et doctum reddit. Ex qua etiam facile intelligitur, quid sit ars..."
Treating the external art, he repeats the traditional definition, saying that it is used in the Schools, is transmitted by Lucian, and goes back to the Stoics.

Timpler calls the systematic presentation of doctrine integrum doctrinae corpus ex diversis partibus coagmentatum. A true methodic system is "bene secundum leges methodi ordinatum et dispositum." This description agrees with that of others, who say liberal art is "doctrina certa, de talibus rebus, quarum aliqua est in vita utilitas" or "doctrina methodica, constans ex praeceptis de certo rei scibili generis traditis ad explendum naturae humanae defectum." Although Timpler claims novelty by the external/internal art distinctions, he admits that the novelty is only in the naming. The doctrine itself does not differ from what we already know Keckermann could not

134 Ibid., p. 4.
135 Ibid.
136 Ibid.
137 Ibid.
but have held, even given our brief treatment above. But, at first sight, Timpler's claim that philosophy is art is shocking. Again, however, once explained, this statement is not in its meaning different from what Keckermann must be understood to have held. Timpler asks, "An metaphysica sit ars?" and answers "yes," with an explanation. "His ita positis et declaratis respondeo, Metaphysicam diverso respectu esse artem simul et scientiam." Metaphysics is art insofar as it is taken either as a system, that is, a systematic presentation of doctrine, or as the knowledge of certain precepts methodically presented for some end useful in human life, "non autem quatenus sumitur pro habitu cum recta ratione efficendi." It is science insofar as it is taken as a certain knowable doctrine, or as a certain intellectual habit, or as a habit provided it is a contemplative one. Just as in Keckermann, who was not so explicit, art as system refers to the methodic disposition of the doctrines, not to the intellectual habit or to the things themselves so known. Thus, the matter of the art is not the thing capable of being known, "rem scibilem circa quam explicandam quaelibet ars occupatur," but the precepts about that knowable thing, "praecepta ipsa, quae de re illa scibili traduntur." The form is not the end of the art, as contained in its definition, but the methodical disposition of the precepts, "ipsam methodicam praecipitorum dispositionem." The thing to be known in the art is not the matter, properly speaking, but the precepts themselves are the matter. "siquidem ex illis totum artem Systema concinnatur et coagmentatur." Since the end and the form are two different kinds of cause, the end of art is not the form of art. The form of art is the "methodica dispositionis praecipitorum." . . . Unde etiam frequenter per metonymiam formae ab Aristotele ars vocatur methodus." The same can be said for system, and thus we find the same emphasis in Timpler on method as in Keckermann. System is art, and is essentially distinguished from other things, by its methodical disposition of precepts, that is, by its systematic character.

138 Metaphysicae systema methodicum, chap. 1, question 3, p. 42.
139 Ibid.
140 Ibid.
141 Ibid.
142 Ibid.
143 Technologia, p. 10.
144 Ibid.
145 Ibid.
146 Ibid.
Finally, Timpler delineates six requirements for an art or system. First, the laws by which we bring about a liberal art are the same as those by which we judge the art once constituted. Second, there must be a proper and adequate goal for each art, neither wider nor narrower than the subject matter demands. Third, there must be a certain proper and adequate subject matter. Fourth, there must be laws for constituting and examining the precepts of art. Fifth, there must be a certain methodical disposition of the precepts, in such a way that "generalia specialibus praeponuntur." Sixth, art should imitate nature in doing nothing in vain, in doing always what is best, in omitting anything superfluous and retaining what is necessary, and in observing a certain order. As regards order, a system must be such that, while occupied with teaching, it observe the resolutive order of nature, which proceeds from the whole to parts, caused to causes, and while occupied with actually operating it follow the compositive order of nature, which proceeds from parts to whole, from causes to caused, etc. It must be such that it proceed from general things to particular, as in nature, and such that it do what nature does, but more perfectly. The parallels with Keckermann are clear, but the claim for the priority of the analytic method in teaching is different.

With Timpler, therefore, we have, by 1609, a further elaboration, using the term system, of the system concept. Many of his principles agree with Keckermann's. As with Keckermann, but more explicitly, system refers to the presentation of both the arts and the sciences, prac-

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149 Ibid. 150 Ibid., pp. 15-16.
151 Ibid., pp. 18-19. See above, p. 37, Keckermann's fourth characteristic. Also, note the subsequent paragraph starting on p. 37, and the notion that the general concepts are to be taught before the specific.
153 Cf. above, p. 36, Keckermann's first characteristic.
154 Ibid., pp. 19-20. See also, Ritschl, System und systematische Methode, pp. 31-36, and Messer's review of that monograph, pp. 663-64.
tical and theoretical. As regards this presentation or system, Timpler and Keckermann both distinguish between the form or structure or order and the content or the precepts themselves. Both state the need for a goal appropriate to the subject matter, and a proper methodical arrangement wherein the particular principles clearly follow from the general. For both, method should include nothing not directed to the goal. In general, in both, the emphasis is on method which more than anything equals system. Timpler makes more explicit the correspondence between art and nature in his sixth statement about the necessary characteristics of art. Art imitates nature, and several important characteristics of this imitation are new. Art always does what is best. It observes the resolutive order of nature in teaching, by proceeding from wholes to parts, caused to causes, and the compositive method in its actual operation, moving from parts to wholes, causes to caused. Both are orders "of nature." Finally, it proceeds from general to particular, as in nature, but more perfectly. Art, then, as presentation which inculcates a habit, follows a natural order, that is, it does not construct arbitrarily as if without influence of the order and process of nature. Art as habit imitates the things themselves. Art as system is not arbitrary but allows mind to achieve the imitation of nature which the exercise of art is.

By the beginning of the seventeenth century, then, both the term and the concept were used and so connected with science or art as to render system a necessary condition for their presentation. The emphasis upon systematic presentation is clear among the theologians to follow Keckermann and Timpler. Ritschl offers some pertinent excerpts in which system as presentation is distinguished from intellectual habit: "Potest autem vera theologia considerari vel systematice per modum disciplinae alicujus in sua praecepta certa quaedam methodo dispositae vel habitualiter per modum alicujus existiti in intellectu residentis" (Samuel Maresius, Systema theologicum (1645); "Theologia supernaturalis consideratur vel systematice, prout notat compagem doctrinae salutaris de Deo et rebus divinis ex scriptura expressae, per modum disciplinae alicujus in sua praecepta certa methodo dispositae, quae et abstractiva et objectiva dicitur, vel habitualiter et per modum habitus in intellectu residentis, et concretiva et subjectiva vocatur" (Franciscus Turretin, Institutio theologicae eleuthericae (1688); "Distinguis sic quoque solet [sc. theologia] in systematicam, quae est certum scilicet aliquod volumen, omnia capita fidei controversiace, quas habemus cum adversariis, continens, nititurque sacra scriptura ... et habitualuem, quae est in mente hominis" Johann Braun, Doctrina foederum sive systema theologicum (1691), p. 39, n. 1, continuing to p. 41. Christian Matthiae, Systema theologicum minus (1639) begins by describing his "systema theologicum, in quo totum religionis christianae corpus coagmentavi et methodo artificioso dispositui" and Hieronymus Kromayer begins his Theologia positiva-poietica (1666) by noting that one brings together "in systemate theologia" the dogmas of faith "ut ... in corporibus arimalium artus artibus per suas compages juguntur" (cited in Ritschl, p. 43, n. 2). The quota-
of the term in theology or philosophy before the time of Melanchthon, Keckermann, and Timpler show conceptual development of any interest toward establishing the scientific sense of system, even if by another name. From the most influential and well-known system thinker whose doctrine was worked out the least, namely, Melanchthon, to the least influential and well-known system thinker whose doctrine was worked out the most, namely, Timpler, there is the first explicit thematic treatment of system using the term and placing primary emphasis on the method of organizing precepts from the most general to the most specific in such a way that the presentation achieves a new and separate integrity hitherto unknown in the previous great attempts at systematic accumulation of knowledge. That such thinking was in the air among the new protestant theologians and philosophers provides us with a conceptual link between the traditional presentation of all knowledge, with its division according to subject matters and methods, and the modern seventeenth-century presentations of all knowledge which attempt to reduce all to a single subject matter and a single method, more geometrico. Equally important is the fact that the emphasis by these theologians and philosophers upon the "construction" or "system" of propositions themselves, as opposed to the system or order of the things themselves, represents a gestalt-shift, as it were, essential to the modern separation of thought and proposition, on the one hand, from things, on the other.

Section V
Concluding Remarks on Sections 1-IV

We have shown that a particular sense of the term ὁμιτίμον going back to the Stoic definition of art induced certain late sixteenth and early seventeenth-century thinkers to adopt the term to describe the demonstrative presentation itself of individual sciences. Although these thinkers thought that the systems of propositions con-

tion from Leonhard Hütter (above, n. 91) is taken by von der Stein to mean that the true didactic method of science was at this time decidedly recognized as the synthetic method, wherein one proposition generates another (see von der Stein, "System als Wissenshaftskriterium," p. 103). That this is by no means certain appears from our discussion of Timpler, for whom the true method of teaching is resolutive. For another early seventeenth-century theorist of system, which Ritschl ranks with Keckermann and Timpler before him as regards the level of his thinking on the topic of system, namely, Johann Heinrich Alsted (d. 1638), see Ritschl, pp. 36-40. But, just as we have shown that Timpler's thinking on system, although in some respects further refined, already had the essential outline of the possibilities available to it in the thought of Keckermann, so also we can note with Messer, "Auch Alsted, der die beiden Vorgänger [sc. Keckermann and Timpler] kennt und schätzt, verwendet den Ausdruck wie Timpler" (p. 664 of Messer's review of Ritschl's monograph).
stituting the individual disciplines manifest the natures of things as they are, their shift of emphasis from things to propositions is one of the great turning points in the direction of philosophic modernity. Although they also did not yet conceive of a single complete system of all the sciences or of all philosophic knowledge, such that the sciences themselves would be logically connected and ordered just as the propositions in the individual systems are logically connected and ordered, the development of the concept of the system of propositions in the individual sciences was the logical prerequisite for the idea of a system of propositions of all the philosophic sciences. Both these changes together constitute two of the most important conditions for the change to philosophic modernity, and yet these changes have been ignored by scholars, with the result that one of the better means of understanding the change that occurred with the rejection of classical philosophy and the beginning of the modern era has been obscured. The turn of the philosophic mental gaze from things to propositions about them and from the order of nature to the order of propositions together constitute the conditions whereby the things themselves began to be considered opaque to the understanding and only the products of the understanding itself knowable, and whereby the concept of nature as an ordered whole (κόσμος as ἰδέα) was replaced by the concept that man himself does not find but creates order by constructing a system of all philosophical knowledge (system as construction).

Section VI

System as Approached through Method

Before we proceed to that philosopher who both uses and explains the term system and claims to have constructed the first complete system of all philosophic knowledge, we need to fill an obvious gap in these investigations. That gap consists of a certain later medieval and early modern emphasis upon method without which systematic connection among the sciences could not be brought about. The philosophers who stressed method did not use the term system or clearly define and carry out the project of producing a system of all philosophic knowledge, but there is a clear connection between the emphasis upon method and the later system concept, and that connection must now be made to provide the fullest picture of early modern systematicity.

The modern emphasis upon certainty, as adumbrated by the gradual attempts at systematization of theology whereby all the propositions of theology could be shown to be derivative from fundamental articles of faith as stated in Scripture or Tradition, and mutually consistent with each other, is a turn toward method. This is because method has to do with the discovery and demonstration of propositions from known or accepted propositions, and hence has to do with the connections among propositions. Method is the way of discovering the connections among propositions and of presenting those connections by demonstration. System is possible if and only if there is a sufficient method for discovering and demonstrating connections among propositions. This idea
of method received great attention not only among professional theologians but also and perhaps more especially among natural scientists, especially at the University of Padua. The paradigmatic model for method eventually becomes, with Descartes and Hobbes, a method gleaned from the most certain of the deductive sciences, namely, mathematics, and especially geometry. This turn to method for the sake of certainty led naturally to the notion of a system of all the sciences, that is, the logical ordering by method not only of all the propositions in all the particular sciences but also of all the sciences in relation to each other. Systematization is thus the result in modern thought of the desire for certainty, and its prerequisite is a sufficient method to generate and demonstrate propositions. The paradigm of such a method is located by Descartes and Hobbes and Spinoza in mathematics, specifically in geometry. But geometric method is not only synthetic, as in Euclid, but also analytic. Analytic and synthetic method in geometry have their counterparts in resolution and composition in philosophy as a whole, especially but not exclusively as used in natural philosophy. What is the relationship between these two sets of methods? It is sufficient for our purposes to outline this relationship, in order to put more clearly into perspective the paradigmatic character of geometric, especially Euclidean synthetic, method for the early moderns, and in order to display further background leading to the modern concept of a system of all philosophy.

The terms analysis and synthesis as naming methods in geometry and the other sciences go back to the Greeks. Some sources ascribe the discovery of analysis to Plato. Aristotle was clearly aware of geometrical analysis because he compares deliberation of means to an end to it. But only later in Pappus do we first find an extensive explanation of analysis and synthesis in geometry. The application of geometric methods to the physical sciences, particularly medicine, is clear in Galen, and his texts later served as a paradigm for the work of the students of method at Padua. By the time of Aquinas, we have a specific treatment of resolutive and compositive methods in a synoptic treatment of how one proceeds to metaphysics from the other sciences, and from metaphysics to the other sciences. The emphasis upon the relationship among the propositions in the various sciences is an early concern for systematization. Aquinas speaks of proceeding in the realm of external causes by resolution until one reaches a final


term in the separate substances, that is, from the other sciences to
metaphysics, and by composition in the realm of intrinsic causes, that
is, from the formal more general principles of metaphysics, to the less
general principles of the other sciences. By the fifteenth century,
the Aristotelian procedures of reasoning from causes to effects and
from effects to causes, that is, the demonstrations propter quid and
quia, become identified with the Latin terms compositio and resolu-
tio. The intermediaries between the Paduan Aristotelians and Aris-
totle himself seem to have been the influential passages from Galen on
method, translated into Latin from Arabic, and texts of Cicero and
Boethius on resolution and composition. By means of such texts,
the Latin terms resolutio and compositio took the place of the correp-
sponding Greek terms, and medieval theologians such as Aquinas employed
the terms without reference to the specifically mathematical sense.
Their sense becomes logical, even in the very rare cases where the
older Greek terms are cited.

In the School of Padua, resolution and composition are explicitly
treated as the means of getting at and proving the causes of phenomena,
or, stated in terms of proposition, syllogism, and demonstration, as the
means of getting at a middle term. By 1576, with a text of Bernardinus
Tomitanus, teacher of Zabarella, we find for the first time the identi-
fication of resolution with induction. Hence, given other identifica-
tions by previous Paduans, by the end of the sixteenth century, it
appears that composition is identified with a priori reasoning, propter
quid demonstrations, and with the process of demonstration or presenta-
tion to the learner as opposed to the learning process itself. Re-
solution is identified with a posteriori reasoning, demonstrations
quia, and with the logic of discovery or learning as opposed to that
of teaching or presenting. Both methods are considered necessary
for any complete science, as appears in a text from Hugo of Siena, Ex-
positio Ugonis Senensis super libros Tegni Galieni, published at Venice

162 John F. Wippel ("The Title First Philosophy According to Thomas
Aquinas and His Different Justifications for the Same," Review of Meta-
physics 27 [1974]:590-600) gives a fine treatment of Aquinas's Commen-
tary on the De Trinitate of Boethius, Q. 6, Art. 1, wherein Aquinas
treats resolution and composition.

163 Randall, "The Development of Scientific Method in the School of

164 Ibid., pp. 187-88.

165 Andreas Hyperius uses the Greek in his 1568 Methodi . . . libri
tres, as Ritschl testifies (System und systematische Methode, p. 20).

166 Randall, "The Development of Scientific Method in the School of
Padua," pp. 197-98.
in 1498: "... because in the knowledge of causes we use demonstration quia, and in the scientific knowledge of effects we use demonstration propter quid. It is the common opinion that both of these procedures are necessary."167 For those who would see modern science as grounded upon centuries of preparation in "an experimentally grounded and mathematically formulated science of nature" developed already by the time of the School of Padua,168 the change to modernity with Descartes169 was by no means a revolution, but the mere addition of a "mathematical emphasis . . . to the logical methodology of Zabarella."170 This change to modernity is a change of emphasis which can be seen in the transformation of terminology regarding method. The so-called new method "is the method called by Euclid and Archimedes a combination of 'analysis' and 'synthesis,' and by the Paduans and Galileo, 'resolution' and 'composition.' It is traditional and Aristotelian in regarding the structure of science as dialectical and deductive, and in seeing all verification and demonstration as inclusion within a logical system of ideas. It has altered the scheme of the medieval Aristotelians in making the principles of demonstration mathematical in character."171 Others see the switch from the resolution and composition of the Paduans to the analysis and synthesis of modernity as a fundamental and radical change of metaphysical perspective from the qualitative physics and metaphysics of Aristotelianism, to the quantitative physics and metaphysics of modernity. The latter as opposed to the former, by its very abstraction from quality, a principle of heterogeneity which allows differentiation into kinds of being, and its reduction to quantity and hence to a principle of homogeneity incapable of differentiating beings into kinds other than by mere magnitude and figure, is a radical departure from the standpoint of common experience and hence produces a correspondingly radically different theory.172 Whatever the consequences of the reintroduction of the terms analysis and synthesis in place of resolution and composition beginning after Padua, the explicit connection with the analysis and synthesis of geometry is not in the forefront at Padua. In fact, the kinds are consciously differentiated.173 The connection seems to have been made between the time of Galileo and Newton. Both Descartes and Hobbes fall in the interim, and to Descartes belongs the honor of having explicitly connected mathematics to the other sciences in a way previously unthought of.174 Even Randall, who stresses more

167Ibid., p. 190.

168Ibid., p. 177.

169Ibid., p. 205.

170Ibid.

171Ibid., p. 206.


173See Randall on Zabarella, "The Development of Scientific Method in the School of Padua," p. 197.

174Ibid., p. 205.
the continuity of modern with medieval science than the novel character of modern science, sees the necessary condition for the identification of resolution and composition with the mathematical analysis and synthesis to be the stress of the humanists upon the study of ancient sources in their originals, for that emphasis yielded editions of Archimedes, Apollonius, Pappus, Diophantus, and others, published after the heyday of the Paduan Aristotelians. Hobbes himself benefited at Oxford from this humanist stress on original texts, as his own proficiency in Greek proves, and we find in Hobbes both pairs of terms, analysis and synthesis, resolution and composition. It is sufficient for our purposes to note that the transference to geometrical analysis and synthesis as paradigmatic for all the sciences was made in the seventeenth century, and that the analysis and synthesis of geometry became connected with the resolution and composition of the physical sciences in an attempt to infuse natural science with a certainty approximating that of mathematics.

According to Descartes, what the other sciences lacked was certainty, because they were constructed upon an uncertain foundation. He hoped to bring certainty to the other sciences by applying to them a method distilled from methods used in logic, geometry, and algebra. In Rule 4 of his *Rules for the Direction of Mind*, Descartes explicitly connects universal method, that is, a method universally applicable to all the sciences, and universal mathematics, that is, the true common foundation of all the mathematical sciences. Philosophy had hitherto been a disorderly haphazard enterprise, a hit-and-miss affair, the philosopher like a man searching for treasure by merely roaming the streets in hopes of chancing upon it. But "it were far better never to think of investigating the truth at all, than to do so without a method," that is, if philosophy is the nonarbitrary investigation of truth, it must have a method, for truth is capable of being acquired in a progressive way if and only if a sufficient and consistent method is applied to investigation. Without method, the claim of philosophy to a nonarbitrary standpoint and to the acquisition of the truth itself would be no better than the claim of ordinary opinion. In fact, it would be worse, for at least ordinary opinion is grounded in pleasure and pain, in known laws and customs and religious beliefs, all of which imply at least some consistency of application. After instancing geometry as an example of the ancient use of a true method, Descartes states that "the ancient Geometricians made use of a certain analysis

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175 Discourse Part 1, para. 10 in Haldane-Ross, vol. 1, p. 87; Part 2, para. 6 in Haldane-Ross, pp. 91-92, and paras. 7-10 in Haldane-Ross, p. 92 for the method, and para. 11 in Haldane-Ross, pp. 92-93 for the projected application to the other sciences; paras. 12-13 in Haldane-Ross, pp. 93-94 for the connection between certainty and method/mathematics.

which they extended to the resolution of all problems." The reference to "all problems" refers to geometrical problems. Descartes, by contrast, refuses to allow value to the "solution of empty problems" such as these, and explicitly connects the concept of method and mathematics "to the eliciting of true results in every subject." Not only mathematics, but also all other sciences are to be infused with "self-evidence and certainty." The second section of Rule 4 connects universal method with the universal mathematics that underlies all the mathematically based sciences such as astronomy, music, optics, mechanics, geometry, and others. Universal mathematics is concerned with order and measurement, whatever the subject matter, and the other sciences, because of their proper subject matters, add special differences. But universal mathematics is itself more basic than these, such that any differences it contains are also contained by them, but not vice versa, and such that this science must be mastered before the others, but not vice versa. Thus mathematics provides the model for reasoning in all the sciences, and the actual method in all specifically mathematical sciences.

Descartes explicitly joins his own metaphysical reflections with the analysis and synthesis of geometry in the Reply to the Second Objections to his Meditations. There he states his preference for the analytic method, which "shows the true method by which a thing was methodically discovered." Synthesis is primarily directed to the reader, such that by clearly delineating primary and derivative propositions as well as the demonstrations of the latter from the former, it compel the reader to render assent. According to Descartes, it was the synthetic method that the Greek geometers employed in their writings, although they were not ignorant of, and in fact highly esteemed, the analytic method. Although "analysis . . . is the best and true method of teaching," and in spite of the fact that his Meditations are written in the preferred analytic mode, nevertheless, to satisfy the request of the writer of the second objections, he consents to "append here something in the synthetic style." What follows is his Arguments Demonstrating the Existence of God and the Distinction Between Soul and Body, Drawn up in Geometrical Fashion, where the term geometrical is equivalent with synthetic. Hence, Descartes explicitly connects the analysis and synthesis of geometry with the method of proceeding and

177 Ibid., para. 3 in Haldane-Ross, p. 10.
178 Ibid., para. 4 in Haldane-Ross, p. 11.
179 Ibid., para. 5 in Haldane-Ross, p. 13.
181 Ibid., p. 49.
182 Ibid.
183 Ibid., p. 51.
presenting discoveries in other sciences. Method was connected with mathematics and brought into the other sciences to yield certainty. It is only a step from the connection between method and mathematics to Descartes's tree of philosophy image in the Author's Letter to his Principles of Philosophy. This passage gives a metaphorical description of system by comparing philosophy and its parts to a tree and its parts, just as Hobbes, in the Epistle Dedicatory to De Cive compares philosophy and its parts to "the ocean" and the various seas that comprise it. But Descartes never produced a recognizably complete system. He never wrote an ethics or politics, the morale, which he considered "the highest and most perfect moral science, which presupposing a complete knowledge of the other sciences, is the last degree of wisdom" [184] and he did not order his philosophy in the synthetic mode. It was Régis, half a century later, who claimed to have been the first to systematize the principles of Descartes's philosophy, and this fact is itself confirmation that Descartes did not produce a system. Nevertheless, by his explicit connection of universal method with universal mathematics for the sake of achieving certainty in all the sciences, Descartes remains the most important link, after the School of Melanchthon and the School of Padua, in the history of the system concept. This is because the turn to system is a move to greater certainty, and such a turn presupposed the reduction of all the sciences to a unity only achievable by a unified method of discovery and of presentation and demonstration.

The next most obvious link in the main of development of the system concept, except for Hobbes, whose place in the history of early modern system thinking will be treated in Section VII, is Spinoza. Today Spinoza's Ethics, supposedly demonstrated ordine geometrico, which is taken to mean primarily, as in Descartes's use of the term, synthetically, has occupied Spinoza studies almost exclusively to the exclusion of A Theologico-Political Treatise. This one-sidedness would give the impression that according to Spinoza, philosophic method is equivalent to synthetic method. But the Treatise is not written in the synthetic mode and the "history of nature" therein mentioned is called "the foundation of philosophy." In the Preface to the Principles of Philosophy of René Descartes, it is shown that both analytic and synthetic methods are geometric, even though in deference to Euclid the synthetic is called "geometric." [187] The doctrine of Spinoza in the Preface is that analytic method is the method of discovery. This led Strauss to conclude that it is by the analytic method that the premises

184 Author's Letter to the Principles, Haldane-Ross, vol. 1, p. 211.


186 Ibid., p. 293.

187 Ibid., p. 295.
of the Ethics are established, and thus the synthetic method would be dependent upon a prior analytic procedure. Nevertheless, Spinoza's ordine geometrico shows that for him as well as for Descartes, the analytic and synthetic methods are essentially viewed on the geometric paradigm, not the natural-scientific paradigm as in the resolutive and composite methods of Aristotle and the School of Padua. Whatever the overlap between resolutive and composite, on the one hand, and analytic and synthetic, on the other, by the time of Spinoza, Euclid's synthesis is clearly the model for philosophic presentation, and the Greek geometers' analytics is the model for discovery, at least among these important moderns. If one were to apply the term system to Descartes's philosophy as it stands in his texts, it would have to refer to the logical coherence, achieved by analytic method, of the various propositions of his philosophy. In Spinoza, if one abstracts from the necessity of analysis and its place in the Ethics itself as the method of discovering the primary premises from which the rest is demonstrated synthetically, this systematicity is seen more clearly in his synthetic construction of such logical coherence in the Ethics.

System, then, for Descartes and Spinoza, would necessarily presuppose that the series of propositions in science be discovered and ordered by method, whether that method be analytic, synthetic, or both. Furthermore, their model for method is mathematics, or more specifically, geometry. But nowhere in these authors do we have either the term system treated in the sense of a logically coherent structure of all the sciences, or an extended and clear explanation of the concept of a system of all the sciences, and we certainly lack any complete series of texts supposedly giving such a system.

Section VII

First Thematic Treatment of the Term and Concept of a System of Philosophy in All Its Parts

The concept, then, of the strict unification, coherent arrangement, and methodic presentation of doctrines in some art or science, was definitely present in scholarly thinking in the seventeenth century, and is traceable both through the usage of the term system itself, and through the study of method in philosophers who never used the term. The use of the term in this way was the culmination of attempts over the centuries to provide ever more comprehensive and coherent presentations of doctrines, particularly theological. But when did the

188 Ibid., p. 296.

189 Ibid., pp. 306 and 309.

term first take on the sense wherein system is considered a necessary condition for certitude in science, and therefore for both true science and effective teaching of it?

Von der Stein locates the first explicit use of system as a necessary characteristic for science in Kant. According to von der Stein, this fact is proved by reference to the passage on the Architectonic of Pure Reason. That Kant recognized system as necessary for science is indisputable: "Eine jede Lehre, wenn sie ein System, d.h. ein nach Principien geordnetes Ganze der Erkenntnis sein soll, heisst Wissenschaft." But that the passage in the first Critique proves that Kant was the first to make the explicit connection between system and science is untrue. The first Critique states that "Systematic unity is what first raises ordinary knowledge to the rank of science, that is, makes a system out of a mere aggregate of knowledge." But von der Stein's claim fails to account for not only Keckermann's and Timpler's requirement of system for the presentation of science to the learner, but fails to account for Kant's own statement on this matter in the first Critique itself, where even Kant recognizes system as scholastic in origin: "Hitherto the concept of philosophy has been a merely scholastic concept—a concept of a system of knowledge which is sought solely in its character as a science, and which has therefore in view only the systematic unity appropriate to science, and consequently no more than the logical perfection of knowledge." Kant makes no claim to newness in stating that system as the logical unity of knowledge is a necessary prerequisite for science. Various kinds of knowledge form a system only when they are united under a single idea, provided by reason itself, namely, the idea of the end and the form of the whole. The unity of the end is that single most important guiding idea which as a standard determines the relationship of the parts and the lack of anything essential or superfluity of anything nonessential to the end. Kant's claim to originality is the explanation of the concept of philosophy as the system of all philosophical knowledge insofar as all philosophical knowledge is united and directed by a single idea: the ultimate end of human reason, which is essentially a moral end, namely, the determination of the will by reason itself. "The ultil-
mate end . . . is no other than the whole vocation of man, and the philosophy which deals with it is entitled moral philosophy. On account of this superiority which moral philosophy has over all the other occupations of human reason, the ancients in their use of the term 'philosopher' always meant, more especially, the moralist; even at the present day we are led by a certain analogy to entitle anyone a philosopher who appears to exhibit self-control under the guidance of reason, however limited his knowledge may be.\(^{197}\) The ends of the individual sciences are subordinated to the ideal end of reason "in which everyone necessarily has an interest."\(^{198}\) Thus, unless the sciences are directed to an end which is the highest of the "essential ends of human reason,"\(^{199}\) that is, if they are directed to some "optionally chosen ends," then the unity of the sciences determined under such ends would be merely conditional. All systems of such a type Kant refuses to call the single true philosophical system. Such "systems" are "scholastic."\(^{200}\) Thus Kant's description of system as a necessary logical condition for the achievement of science is not the same as his description of the abstract ideal system of all knowledge. As he himself makes no such claim to have apodictically connected science and system but relegates such a claim to his predecessors, the concept of system as necessary for science must be sought in a time earlier than that of Kant.

Since our concern is with the concept of a systematic presentation of philosophy in all its parts as that concept was available in the seventeenth century, surely the sense of system in Kant in the section on the Architectonic of Pure Reason is not appropriate. Since Kant himself also refers to the concept that science presupposes system and classifies this concept as precritical, that is, the concept of a unified science of the whole wherein the unity of the scientific system consists primarily in logical perfection and wherein the goal or end uniting the science is not necessarily an idea equivalent with the necessary universal end of all human reason, we are entitled to search for such a sense of system in pre-Kantian philosophy.

Scholars who have deliberately studied the concept of a system of all philosophy disagree on the time frame of its emergence. Ritschl covers the development historically, noting the different senses of system in different authors. Messer dismisses any claims to signifi-

\(^{197}\) Cf. ibid., B 868 = Smith, p. 658.

\(^{198}\) Ibid., B 868 = Smith, p. 658, n. a.

\(^{199}\) Ibid., B 867 = Smith, p. 658.

\(^{200}\) Ibid., p. 868 = Smith, p. 658, n. a.
cant development of the concept from Keckermann and Timpler on. But we have seen that Keckermann and Timpler did not treat the concept of the systematic connection of the various sciences into a whole. This fact, plus Kant's own comment indicating that such a sense was "scholastic," lead us to conclude that the sense we seek emerged sometime between the early 1600's and the time of Kant.

Ulrich Ricken in an interesting paper claims that the term first began to be used in ways different from the traditional Latin uses by the middle of the seventeenth century. The term immediately acquired a bad reputation and was resurrected only in the eighteenth century, especially with Condillac (1715-80), cousin of Jean Le Bond d'Alembert (1717-83), editor with Diderot of the Encyclopédie. Although the term system was unpopular in the seventeenth century, other terms were used often to connote the essential notions of the concept. Bouhours (1628-1702) noted in 1675 the repugnance of some scholars for the term.

Il y a quelques années que ce mot n'estoit connu en nostre langue que des philosophes et des mathématiciens; c'estoit un mot d'art en quelque sorte, le système du monde, le système de Copernic. Depuis que M. de la Chambre a fait le système de l'âme, on s'est accoutumé à ce mot; et comme il signifie proprement constitution et situation, on s'en est servi dans le figuré, pour exprimer bien des choses... mais cela n'est pas encore bien établi; et je connais des gens habiles en notre Langue, qui ne peuvent souffrir ces expressions.

3. Ibid., pp. 476-79.
4. Ricken gives a table and a list of words used to indicate the notion of system in the seventeenth and eighteenth centuries. For the seventeenth century, he lists only ordo/ordre and their synonyms, with system in parentheses to indicate perhaps its lack of popularity. For eighteenth-century alternative terms, he lists in French: "arrangement, automate, complexe, conformité, constitution, construction, enchaînement, équilibre, figure, harmonie, liásion, loi, machine, nécessaire, nature, organe, rapport, règle, réunion, vie, axiome, conjecture, clarté, hypothèse, maxime, principe, supposition, théorie, doctrine." p. 476.
5. Dominique Bouhours, Remarques nouvelles sur la langue français (Paris 1675), pp. 43-44, cited in Ricken, p. 475. Also, see Ferdinand Brunot (1860-1939), Histoire de la langue française des origines à 1900,
Brunot notes that others confirm the opinion of Bouhours. See also, above, n. 203. It is debatable whether the meaning of the term in French is traceable to the Greek or Latin. The earliest appearance in French is 1552 in Pontus de Tyard's (1521-1505) Discours du temps, found in the 1587 edition of his Discours philosophiques (p. 348B), where he says, "Je suis pres de vous montrer la composition de ce Système" (Hughues Vaganay, "Pour l'histoire du Français moderne," Romanische forschungen 32 (1913): s.v., "système"). See also Edmond Huguet, Dictionnaire de la langue française du seizième siècle, vol. 7 (Paris: Didier, 1967), s.v. "système." Système here means generally what we find it to mean in the early seventeenth-century uses, namely, an ensemble of propositions or principles set in order and connected so as to constitute a coherent doctrine. See Walther von Wartburg, Französische etymologisches Wörterbuch: Eine Darstellung des galloromanischen Sprachschatzes, vol. 7 (Basel: Ztinden, 1966), s.v. "système ensembles," p. 503. But at least one important etymological dictionary claims that the term comes from Latin (Ernst Gamillscheg, Etymologisches Wörterbuch der Französischen Sprache (Heidelberg: Carl Winter Universitätsverlag, 1968), s.v. "système." By contrast, the Dictionnaire etymologique de la langue française by Oscar Bloch and Walter Wartburg (Paris: Presses universitaires de France, 1964), s.v., "système," makes explicit issue of the fact that the term, when used to mean "système philosophique," is derived directly from the Greek, because later Latin used the term only in music. Frédéric Godefroy, Dictionnaire de l'ancienne langue française et de tous ses dialectes du 9e au 15e siècle, vol. 10 (Paris: Emile Bouillon, 1927), s.v., "système," cites another use in 1578, the traditional musical sense (see Robert Sasso, "'Système' [sic] et discours philosophiques au 17e siècle," in André Robinet, ed., Recherches sur le 17e siècle, vol. 2 [Paris: Editions du centre national de la recherche scientifique, 1978], pp. 123-24, who notes also a similar usage in 1555), but the real beginning of the extended use of the term is said by Bouhours to be occasioned by Cureau de la Chambre's Système de l'âme (Paris: Jacque d'Allin, 1664). Given the fact that the use of the term widened after 1664 and that before the later part of the seventeenth century the occurrence of the term is relatively infrequent except for specialized uses (Adolf Tobler, Alt-französisches Wörterbuch, vol. 9 [Wiesbaden: Franz Steiner, 1973], gives no entry for the word système), and given the fact, already established in the section on Melanchthon, Keckermann, and Timplier, that the term in Latin acquired the sense of a coherent set of doctrines by the end of the sixteenth century, the term in French could have been borrowed from the Greek through Latin. Most important seems to be the question of the medium through which sixteenth-century Latin acquired the sense in question, and that seems to have been, from the evidence we have in hand, directly from Greek by Latin scholars familiar with Greek learning. The date of de la Chambre's work, 1664, is, of course, just a date of departure. There is no inherent reason why de la Chambre's treatment should have caused the proliferation of the uses of the term. De la Chambre himself recognizes the extraordinary usage with respect to the soul, and in his preface explains this "titre si
But the true significance of the criticisms of the term must be determined with reference to how the term is taken in those cases. As a predicate referring to the philosophies of various thinkers, the term began to be applied in the seventeenth century to the Cartesian philosophy and to the philosophy of Leibniz. One cannot assume that the term meant the same in both cases. 206

Leibniz's use of the term in his Nouveau système de la nature et de communication des substances aussi bien que de l'union qu'il y a entre l'âme et le corps, published in the Journal des Savans in 1695, means primarily "hypothesis," that is, the "supposition" needed to explain the relationship between substances, as he himself refers to it in his Second Explanation of the System of the Communication of Substances in Histoire des Ouvrages des Savans (Feb. 1696). There is some indication that Leibniz is the first philosopher to popularize system to designate a body of truths, as a letter to Remond shows. There he speaks of Plato, "auteur qui me revient beaucoup, et qui mériterait d'être mis en système." 207 But whatever the significance of this Leibnizian usage, extraordinary." Just as astronomers do not explain the natures of the things which they study, but merely describe their actions, so he will do the same with respect to the soul in Système de l'âme. The meaning here is much more akin to hypothesis or explanatory model (Robert Sasso, "'Système' et discours philosophiques au 17e siècle," p. 127).

206 For Régis's use of system, see below, pp. 60-71. Du Hamel (1624-1706) wrote Reflections critiques sur le système cartésien de M. Régis (Paris 1692) (the latter cited in Ricken, "Ordre-système," p. 476). See below, pp. 58-60, for the usage to mean "hypothesis." There it is explained that Leibniz used the term in that sense. Those also who adopted the "système des causes occasionalistes," meaning the explanation of the interaction of substances by the intermediary of the power of God on each separate occasion of interaction, also so used the term. "This is what they call the System of Occasional Causes, which has been made very fashionable through the beautiful reflections of the author of the Recherche de la Vérité" (Leibniz, New System of Nature and of the Communication of Substances, as well as of the Union of Soul and Body [1695], sec. 12, in Philip P. Wiener, ed., Leibniz: Selections [New York: Charles Scribner's Sons, 1951], p. 113).

207 For his reference to system as hypothesis, see Wiener, ed., Leibniz: Selections, p. 118. For his other use of system, see C. C. Carothers, Die philosophischen Schriften von Gottfried Wilhelm Leibniz, vol. 3 (1887; reprint ed., Hildesheim: Georg Olms, 1960), under 2 "Leibniz au Remond," p. 605. And see Ricken, "Ordre-système," pp. 479-80, and Sasso, "Système' et discours philosophique," p. 126. Leibniz insists on the hypothetical character of his solution to the problem of the relationship between substances and on the novelty of his solution as opposed to the "autres systèmes" of the Cartesians ("système vulgaire") and of the occasionalist hypothesis. See also, André Robinet, Malebranche et Leibniz: Relations personnelles (Paris:
we have seen that it was already present in the School of Melanchthon. As to the meaning "hypothesis," this usage is also present in Fontenelle's (1657-1757) *Doutes sur le système des causes occasionnelles* (1686). But this usage as "hypothesis" had a striking precedent, namely, the usage referring to the explanation by which the movements of the heavenly bodies are explained. Du Cange himself cited this usage in his dictionary of medieval and post-medieval Latin, although he gives no references. The sense is pre-Leibnizian. The most famous pre-Leibnizian usage is found in Galileo's *Dialogo sopra i due massimi sistemi del mondo Tolemaico, e Copernicano* of 1632, although Galileo's sense seems also to mean *system* in the much older sense of an ordered whole of the actual physical heavenly bodies.

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209 See above, p. 14-16.

This usage as hypothesis is attested to by Bouhours in 1675, who gives as an example of the previous uses "le système du monde" and "le système de Copernic," as cited above.\footnote{See above, p. 56. See also, Dictionnaire de l'Académie (1694), s.v., "système": "Supposition d'un ou de plusieurs principes d'où l'on tire des conséquences, et sur lesquels on établit une opinion, une doctrine, un dogme," cited in Sasso, "'Système' et discours philosophique," p. 124. The Dictionnaire universel français et latin (Trevoux: Estienne Ganeau, 1704), s.v. "sisteme, ou système," gives: "Terme d'Astronomie. Supposition, ou hypothèse que font les Astronomes d'un certain ordre, et d'un certain arrangement des parties de l'Univers, sur le fondement de laquelle ils expliquent tous les phenomenes, ou apparences, qui se trouvent dans le cours des astres, ou dans leurs changemens. Il n'y a de difference entre Sistème, et hypothese . . . Le Sistème de Ptolemée, de Copernic . . . ." On this level, then, system does not mean the elaboration of a discourse but merely a plausible explanation of phenomena. See Sasso, "'Système' et discours philosophiques," p. 126.\footnote{Ibid., p. 128.} This employment as "hypothesis" is thus a major philosophical use of the term in the seventeenth century. We are left, therefore, by process of elimination, with the term as used and thematically considered by the Cartesians, notably Pierre Sylvain Régis. Régis provides an explicitly verbal use of the term system and an extended explanation of the meaning of the term as a body of truths or laws, an explanation more careful than any previously given.

The Trevoux dictionary published in 1704 gives the other major philosophical use of the term system. "Système signifie en général en quelque science que ce soit, un arrangement de principes et de conclusions, un enchaînement, un tout de doctrine, dont toutes les parties sont liées ensemble et suivent ou dépendent les unes des autres."\footnote{Sasso, "'Système' et discours philosophiques," p. 125.} As the definitions in dictionaries follow actual usages, this particularly modern philosophical sense of system was used prior to 1704. The only notion it lacks, important for our purposes, is that of the various sciences taken together as constituting a system of all rational knowledge. The closest we can come to this precise sense, which also includes the above characteristics, is found in Pierre Sylvain Régis's Cours entier de philosophie ou système général (1690).

Avec le Système de Philosophie de Pierre Sylvain Régis qui paraît en 1690, on peut dire que la problématique du rapport entre l'objet du discours philosophique, le cadre et les procédures d'énonciation de ce discours, est parfaitement posée (même si dans la réalité de la procédure, l'auteur contredit ses promesses méthodologiques).\footnote{Ibid., p. 128.}
Thus with Régis we have not only a statement of the philosophic sense of the system concept, as well as the use of the term system, but also a perfect delineation of the meaning and problem of system in knowledge, and of the relationship of a systematically presented body of knowledge with its object. Such a sense of the issue itself transcends the use of a particular term to name it. Régis is doing nothing his modern philosophical contemporaries would not have understood or accepted, however little many of them wished to use the term system. Furthermore, in both creating a system and explaining the system concept, Régis was doing no more than taking his cue from the systematizers of his day. Indeed, he is in his own estimation merely systematizing the philosophy of Descartes, as is indicated by the added subtitle to the 1691 Amsterdam edition, "selon les principes de M. Descartes."214

Although the Système was published for the first time in 1690, Régis was ready for publication in 1680, and must have conceived the majority of it before that. "Il y a plus de dix ans que j'en aurais eu l'idée, si la fortune ou l'envie ne se fussent opposées à mon dessein."215 Although he does not claim to be the first to have compiled the various sciences that compose philosophy into a single body, he does claim to be the first to manifest clearly the connections between the parts and thus to be the first to have produced a true system of the whole. He himself states that others before him had the idea to produce a true system of philosophy, that is, they had the same goal, but they did not achieve it because they did not clearly manifest the connections between the parts and thus left vague the true logical coherence of the whole.216 From this it follows that the

214 (Amsterdam: Huguetan, 1691).

215 Preface, p. vii. Although the preface does not have page numbers, I have numbered them in Roman numerals, starting with the first page of the preface. I have used the facsimile edition of the Johnson Reprint Corporation (New York 1970) with an introduction by Richard A. Watson. The reason for the delay in Régis's publication was political. "Agreement was finally reached when Cartesianism became less controversial, but even so, Régis had to remove Descartes' name from the title of the Paris edition. The Amsterdam edition of 1691, however, contains the phrase selon les principes de M. Descartes." See Watkins's introduction, pp. v-vi.

216 "Ceux qui n'ont fait que des traités séparés de Logique, de Métaphysique, ou de morale, n'ont rien donné de plus complet: il n'y a que ceux qui ont rassemblé en un seul corps toutes les parties de la Philosophie, qui ayent tenté la même dessein que moy. Mais si l'on considère bien leurs ouvrages, on y trouvera si peu de rapport: entre les parties de ce corps qu'ils ont essayé de composer, qu'on ne peut dire que cet assemblage ne donne point l'idée
design or goal of a total system of all knowledge was present to the contemporaries of Régis. Régis himself thinks he is the first real systematizer, but that systematice very as an ideal was present to the minds of his contemporaries. Régis plays Minerva's owl.

Régis's system, as appears from the full title, consists of the recognized major parts of philosophy, namely, logic, metaphysics, physics, and "morale" by which Régis means ethics and politics. What is first clear in the Epistle Dedicatory to the Abbot of Louvois is the author's intention. His claim to novelty is not in the field of doctrine, but in that of presentation of doctrine or in system. The content of the doctrines themselves Régis accepts as having been grasped and manifested by his predecessors, particularly, of course, by Descartes. Régis has synthesized these doctrines in the correct order of logical dependence. But the claim of the book is high: it gives everything that has until his time been the object of human reason, not every individual detail, but the principal concepts under which all the particulars naturally fall, that is, "les semences et les premiers enseignements de la Philosophie."

Although the scope of the subject matter is, as befits philosophy, all that can be known, and although the author is not a radical innovator in the realm of doctrine, as was Descartes, his claim is to have constructed a true and perfect system of philosophy or to have made to stand together a complete presentation of all philosophy in which the truths themselves become most quickly and easily intelligible to the learner so that "ceux qui liront cet Ouvrage, pourront apprendre la parfaite d'un tout bien regulier; car il ne suffit pas pour faire un corps naturel, de joindre plusieurs parties ensemble, il faut aussi que ces parties ayent de certains rapports entre elles, sans lesquels elles ne produisent qu'un corps difforme et monstrueux" (preface, pp. vi-vii).

After "selon les principes de M. Descartes," it continues: "contenant La Logique, La Metaphysique, et La Morale."

"Mais comme les découvertes que se sont dans la Philosophie, dependant d'une longue suite d'experience sur lesquelles les Sçavans rectifien de jour en jour leurs meditations, j'ay cru vous faire un present et utile et agreable en vous offrant un Ouvrage qui renferme toutes les choses et tous les faits differents qui ont esté jusqu'icy l'objet du raisonnement des Hommes" (epistle dedicatory, p. iv).

Ibid.

"Au reste, bien que je ne me fusse pas propose au commencement de rechercher des choses nouvelles, mais seulement d'établir un Systeme par lequel on pût expliquer uniforment celles qui sont deja découvertes, je n'ay pas laissé de trouver en mon chemin plusieurs
Philosophie d'eux-mêmes sans le secours d'aucun Maître." This has been achieved by what Keckermann and Timpler thought the essence of system, namely, "une Methode aisée qui sans engager l'esprit dans un labyrinthe de raisonnements le conduise par une voye droite et courte de l'évidence des premiers principes à la connoissance des plus sublimes veritez." Régis has defined basic terms, established a small number of principles admitted by everyone, and has derived the rest of the doctrine from these showing clearly the relationship of dependence.

The question remains how the above systematization of philosophical knowledge differs from that of any of Régis's predecessors. According to Régis, others have tried and failed to accomplish what he alone has been able to do. Their lack of achievement rests not in the fact that they have been unable to systematize any of the individual sciences or parts of philosophy. Their failure lies in their inability to achieve the ultimate synthesis of all rational knowledge taken together, a task which requires the manifestation of the necessary connections between all the parts of philosophy that make up the whole of all knowledge. According to Régis, he has not simply presented a compilation of separate systems of each principle part of philosophy, that is, a mere aggregate, but a single system in which the catalyzation of all the parts into a single whole is manifest.

The system is apparent in the correct and necessary order of treatment and in the correct and necessary manifestation of the logical dependencies within that order. Logic is first because actual claims to knowledge of the truth presuppose a study of how mind can be truthful, that is, how mind can grasp and reason about other things. Metaphysics as the registration of the first and most universal truths follows logic and is necessarily prior to any consideration of truths about

\[\text{veritez qui estoient ignorées, et dont la connaissance est nécessaire pour l'intelligence de toutes les parties de la Philosophie} \] (preface, p. xiv).

221 Ibid., p. xv.
222 Ibid., p. iv.
223 "Je me contenteray de dire que j'ay tâché d'en arranger telle-ment toutes les parties, que le commencement de l'une est une suite nécessaire de la fin de l'autre. J'ajouteray, que pour me rendre plus intelligible, j'ay défini tous les termes dont je devois me servir, et que j'ay établi un petit nombre de principes qu'on admet part tout, d'où j'ay tiré tout le reste, comme autant de conséquences qui en dépendent naturellement" (ibid., p. xii).
224 Ibid., pp. vi-vii.
particular objects. In accordance with Descartes's procedure, one must start with absolutely known first principles or truths, namely, the self as thinking thing, and body as extended being. Thinking being and extended being are the two widest classifications of kinds of substance. Physics, or the study of the particular beings and of their interrelationships, follows. Finally, the most important of the individual beings, or more precisely, the one in which we have the most interest, man himself, is treated from the point of view of his end as primarily a reasoning and willing being. This is "morale," or ethics and politics combined, in which there is a treatment of the laws which reason, the state, and Christianity give to regulate man's conduct in accordance with his end. There is, then, in philosophy which truly constitutes a system, a dependence of parts which Régis alone, in his opinion, has made clear.

Ainsi la Morale suppose la Physique; la Physique suppose la Metaphysique; et la Metaphysique la Logique: et par ce moyen toutes les parties de la Philosophie ont un tel rapport, et une telle liaison ensemble, que j'ay cru que le tout qui resulte de leur assemblage, puyvoir justement estre appele le Systeme general de la Philosophie. C'est par ce Systeme qu'on pourra reduire les veritez les plus eloignees aux premiers principes.

To better explain the proper logical dependencies within the order of treatment in philosophy, in order that the true character of the system may be made manifest in a preliminary way to the reader, Régis gives an example of the dependence of parts, starting with a most specific example taken from the most particular part of philosophy, namely, "morale," and tracing it back to the most general concepts.

Par example, si l'on demande dans la Morale, (qui est la derniere partie de la Philosophie) pourquoi l'homme doit être sincere? On peut repondre qu'il doit estre tel, parce que s'il ne l'estoit pas, personne ne se feroit à luy; si l'on ne se fioit à luy, il ne pourroit faire aucun traite; s'il ne fairoit aucun traite, il seroit en querelle avec tout le monde; et s'il estoit ainsi en querelle, il ne pourroit se conserver long-temps, ni par consequant procurer la gloire de Deux qui depent principalement de sa conservation, et de celle de son prochain.

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225 Ibid., pp. viii-ix.
226 Ibid., p. ix.
227 Ibid., p. x.
228 Ibid.
229 Ibid.
"Conservation" or self-preservation in the terminology of physics means that a body must be well-disposed to cause thoughts and sensations in the soul. This leads to the question of where the movement in body originates, a question answered by an appeal to metaphysics, for Régis shows that movement comes from God himself. Finally, even further,

Regardless of questions about the adequacies of Régis's example and his actual philosophical achievement, from the above discussion it is clear that for Régis a true system of the whole of philosophy requires that all the parts be connected in a deductive order of dependency.

230 Ibid., pp. x-xi. 231 Ibid., p. xi. 232 Ibid.

233 Since this text is not readily available, it is worthy of citation. "La Metaphysique ne sert pas seulement à l'ame pour se connaître elle-même, elle lui est encore nécessaire pour connaître les choses qui sont hors d'elle, toutes les Sciences naturelles dependant de la Metaphysique; la Mathématique, la Physique et la Morale sont fondées sur ses principes: En effet, si les Geometres sont assurés que les trois angles d'un triangle sont égaux à deux droits, ils ont recue cette certitude de la Metaphysique, qui leur a enseigné que tout ce qu'ils concevrent clairement est vrai, et qu'il est tel, parce que toutes leurs idées doivent avoir une cause exemplaire qui contient formellement toutes les propriétés que ces idées représentent. Si les Physiciens sont assurés que la substance étendue existe et qu'elle est divisée en plusieurs corps, ils savent cela par la Metaphysique, qui leur apprend non seulement que l'idée qu'ils ont de l'étendue, doit avoir une cause exemplaire, qui ne peut être que l'étendue même; mais encore que les différentes sensations qu'ils ont, doivent avoir des causes efficientes diverses qui leur repondent, et qui ne peuvent estre que les corps particuliers qui ont résulté de la division de la Matiere. Enfin, si les Philosophs Moraux sont assurés que la connaissance de nos devoirs est nécessaire, ils ont encore reçu cette certitude de la Metaphysique, qui leur a enseigné que les hommes sont libres, et partant que leur principale perfection consiste à faire un bon usage de la liberté que Dieu leur a donnée; ce qu'ils ne sauront faire qu'en suivant les maximes de la Morale, dont la connaissance est par consequent necessaire" (ibid., vol. 1, pp. 64-65).
Of special importance to the claim of the deducibility of the less
general from the more general sciences is the problem of the deduc-
bility of physics and the sciences dependent upon it from metaphys-
ics.\textsuperscript{234} This is particularly important because if the true first
principles are achieved by reasoning alone, how are the particular
objects of the physical world, together with their properties and in-
terrelationships, derivable from these first principles, given the
fact that individual beings are contingent or nonnecessary? Why do
these particular beings of all possible beings actually exist? Can
this be known from the first most universal principles alone? As
Descartes clearly recognized the problem of the deducibility of the
most specific things from the most general principles,\textsuperscript{235} Régis too
cannot ignore the problem, if he is to realize without criticism his
ambitious claim to a strictly coherent system based on the rules of
syllogism. "La Physique speculative" is at bottom "problématique" and "tout ce qui est démonstratif ne luy appartienne pas."\textsuperscript{236} But

\textsuperscript{234} "Je n'ay rien supposé dans la Logique, dans la Metaphysique, ni
dans la Morale; et si j'ay fait quelques suppositions dans la Physi-
que, ce n'a esté que pour expliquer ce qu'elle a de plus problémati-
que, avec cette precaution, que les suppositions que j'y ay faites,
dépendent absolument des loix generales de la nature, ou au moins,
n'y sont pas contraires" (ibid., preface, p. xii).

\textsuperscript{235} Discourse Part 6, para. 3 in Haldane-Ross, p. 121.

\textsuperscript{236} Régis, Cours entier de philosophie, vol. 1, p. 275, in the ad-
vertisement to the section on physics. See also Watkins, introduc-
tion, p. ix. On p. x, Watkins notes that "his physics is only pro-
blematic, and this only because the faculty of human understanding is
limited. Régis has all of the certain principles ... a criterion of
intuitive certainty, some of the facts, and a limited range of reason.
If what he can comprehend adequately covers the case, then his explana-
tions are true for the cases only as he sees them, and seldom as they
really are in their intricate complexity. However, since his hypot-
theses derive from certain principles, even though they may not ade-
quately cover the cases as they really are, Régis believes that it is
quite probable that they constitute the true explanations. At least
they are correct approximations of the truth. Régis presents a dog-
matic rationalistic physics; unfortunately only God has the capacity
to know the true system." Compare this to Wippel's comment in inter-
preting Aquinas on the possibility of reasoning in the order of ex-
trinsic causes according to the process of synthesis, that is, from
a knowledge of God and separate substances to a knowledge of the par-
cular things of the physical universe that follow from them.
"While such might indeed obtain in a universe wherein man enjoys some
kind of direct insight into the divine essence and wherein there is
no freedom on the part of God to create or not to create, neither of
these conditions would be conceded by Thomas Aquinas. Hence there
would have been little point in his viewing metaphysics in terms of
extrinsic causes according to the process of synthesis" ("The Title
First Philosophy according to Thomas Aquinas," p. 598).
physics is one of the most important realms of human knowledge, and there are some things strictly knowable in it. If one has been able to conceive distinctly such and such a disposition, such and such a figure, and such and such an arrangement of parts, one can "aisément déduire tous les effets qui dépendent de ce corps."\textsuperscript{237} Even though one is not absolutely certain of everything in physics, that is, of everything physics teaches, at least one has learned "tout ce que l'esprit humain est capable de connaître dans un corps physique."\textsuperscript{238} The problem is that the disposition, the figure, and the arrangement of parts are not apparent, and one must make suppositions or hypotheses about these. Once given hypotheses which do not contradict either the more general principles in metaphysics or each other, one can then deduce with certainty from those suppositions the particular effects that normally proceed from some particular body. What is most important is that the hypotheses assumed in physics are based on nature itself and are consistent with first principles established demonstratively in metaphysics. According to Régis, these hypotheses are not merely arbitrary or conventional, but manifest in some way the actual natures of things. In this way Régis thinks his own hypotheses differ markedly from those of other modern philosophers. Régis thinks that his system is not merely a logically coherent construction which, although clear, is arbitrary. It actually articulates the natures of the beings themselves. Its principles are not merely explanatory, if by explanatory one means simply salutory of the phenomena. Régis admits the hypothetical character of physics, as did Nifo, a Paduan Aristotelian,\textsuperscript{239} but to assure that these hypotheses are exact, "nous ferons ensuite qu'elles dépendent absolument des premières vérités."\textsuperscript{240} As examples of the first truths he gives: that one corporeal nature exists; that this nature considered according to some particular also takes the name of quantity; that quantity is divisible by its nature, and actually divisible by local movement; that local movement occurs in accordance with laws; that according to these laws the parts of quantity receive various figures; that according to the different figures, physical bodies which are composed of these parts of quantity are capable of producing different effects.\textsuperscript{241} "Ce sort là les premières vérités auxquelles se doivent nécessairement rapporter toutes les hypotheses qui sont propres à former le véritable système de la Physique."\textsuperscript{242} Any hypotheses not inconsistent with the

\textsuperscript{237} Régis, \textit{Cours entier de philosophie}, vol. 1, p. 275.

\textsuperscript{238} Ibid.

\textsuperscript{239} Randall, "The Development of Scientific Method in the School of Padua," pp. 193-96.

\textsuperscript{240} Régis, \textit{Cours entier de philosophie}, vol. 1, pp. 276-77.

\textsuperscript{241} Ibid.

\textsuperscript{242} Ibid.
Basic principles may be assumed in order to explain any particular phenomenon. This coherence with basic principles apparently is what constitutes the real as opposed to arbitrary or conventional character of the hypotheses. As an example, one can, to explain the action of the magnet, assume a certain outer structure as one of the necessary conditions to explain its action, provided that the assumptions are consistent with the first principles, and presumably with any other assumptions made to explain other bodies. "Par cette méthode nous réduirons facilement toutes nos explications aux premiers principes, ce qui est le principal but de ce traité de Physique." In physics, therefore, one attempts to explain by "des vraies hypothèses, c'est à dire, par des hypothèses qui dépendent tellement les unes des autres, et toutes ensemble des premières vérités, qu'elles fassent un seul Système." Régis then states quite clearly that this means that the hypotheses are not purely arbitrary: "désirant en cela nous éloigner de la pratique de ceux qui ont coutume de faire des hypothèses purement arbitraires." Such false philosophies "font un tout aussi monstrueux que le serait le portrait d'une femme qui finirait par la queue d'un poisson." In sum, not only is there no breach in the truly deductive character of the system in the transition between metaphysics and physics, but also, even though hypotheses must be assumed in order to explain certain phenomena, because these hypotheses are consistent with the first principles and with each other, they are not arbitrary but truly explanatory.

Just as Aristotle distinguishes degrees of precision to be expected in the various sciences, comparing particularly mathematics and politics, Régis concludes "qu'il faudroit estre aussi déraisonnable pour demander des demonstrations en Physique, qu'on l'est de se contenter des probabilités en Mathematique; comme celle-cy ne doit rien admettre que de certain et de démonstratif, l'autre est obligée de recevoir tout ce qui est probable, pourvu qu'il soit déduit d'un seul Système fondé sur les premières vérités de la nature."

The logical relationship between metaphysics, or the study of the first most universal truths, and physics, or the study of particular things subject to motion, is of absolute importance in the study of the seventeenth-century concept of a system. Even though physics is obliged to accept things which are only probable, the whole of all rational knowledge is still a system provided that what physics accepts is deduced from the most general first principles established in the most general science.

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243 See above, n. 234.
244 Régis, *Cours entier de philosophie*, vol. 1, pp. 277-78.
245 Ibid.
246 Ibid., p. 275.
Comme la nature agit toujours par les voies les plus simples, nous sommes persuadés que son action se saurait être expliquée que par un seul système. Nous entendons par système, non une seule hypothèse, mais un amas de plusieurs hypothèses dépendant des unes des autres, et tellement liées avec les premières vérités qu’elles en soient comme des suites et des dépendances nécessaires. Ce que ne saurait convenir aux hypothèses purement arbitraires, telles que sont celles de la plus-part des Philosophes modernes.

In the same thought in which one considers "hypothesis" in Régis, one must remember that Régis's stress on the true versus the arbitrary character of his hypotheses and their connection with the first truths and with each other, indicates that, in spite of the fact that some hypotheses are required, Régis thinks that the system reproduces the actual system of being itself. As Sasso in his article on system in philosophical discourse says of Régis and the problem of the relationship between the system as a coherent presentation of doctrines and the real things the system is supposed to manifest, "un système est un discours reproduisant dans sa discursivité même les articulations effectives de son objet." 248

247 Ibid., pp. 275-76. Italics original.

248 Sasso, "'Système' et discours philosophiques," p. 130. Further proof of the real character of physics is the relationship Régis sees between physics and geometry. Because geometry is primarily an aid for understanding the natural world, physics is prior by nature to geometry. The concepts of geometry depend upon prior experience of an extended world, as the root meaning of the word geometry suggests. But Régis makes the extraordinary claim that to be a good physicist, one need not be a good geometrician, but to be a good geometrician, one must be a good physicist. The latter is true because of the dependence of geometry on a knowledge of the facts of the world. A true understanding of geometry demands a prior understanding of the nature of physical being itself. If geometry consisted of demonstrations from arbitrary hypotheses, one could be a good geometer without being a good observer of nature (see Régis's preface, p. xiii). All this shows that Régis thinks that geometry manifests something of the nature of physical being. Geometry requires some basic knowledge of the physical world because it exists to help further knowledge of the physical world. Thus, when he says one must be a good physicist to be a good geometrician, he must mean "physicist" in the general sense of a good observer of nature. For it geometry is an aid to knowledge of nature, how could one become the best physicist possible without first being a good geometrician? On the other hand, Régis seems to be indicating that the "faits averez" or the "vérités constantes" upon which geometry must ultimately base its definitions are products of physics. But it would seem more likely, given the merely probable character of physics, that the true facts about body in general upon which geometry depends would be those about extension established in metaphysics. The latter more consistent position is that of Hobbes.
Regis's claim is that his system manifests the real natures of things. It is in this assertion that Regis shows himself unaware of the actual consequences of his own starting points. Even if we were to grant Regis's first principles, defined in metaphysics, were achieved by an analysis of experience, and thus are parasitic upon the real world of our experience, once those "principles" are established in propositional discourse, propositions, not things, become the point of departure. Regis's very emphasis upon propositional discourse and the construction of a system of coherent propositions makes it quite clear that he has inherited the modern gestalt shift from things to speeches about them. His point of departure is also Cartesian, which means that his emphasis is upon thoughts not things, and that his perspective toward nature is mathematical, not qualitative. Regis not only accepted the turn from things to thoughts and propositions, but also explained for the first time using the term system, the concept of a system of all rational knowledge, generated by reason's working upon propositions, not things, and attempted to construct such a system out of the principles of Descartes.

In sum, the position of Regis on system is unambiguous. All rational knowledge, found out by one method, analysis, can be reduced to system or teachable presentation by another, synthesis, wherein the most general basic concepts and the propositions created from them provide the basis from which all other more particular and therefore dependent concepts and propositions can be derived. All the parts of philosophy, that is, the individual sciences, exist in a relationship of prior and posterior. The sciences treating the most general concepts and propositions are the more general sciences; those treating the less general concepts and propositions are the less general, and the less general sciences depend logically on the more general. Although physics is not demonstrative in the same way as metaphysics, its hypotheses and explanations are deduced from, that is, are one of the many possible deductions from, and are consistent with, the truths established in the prior sciences. Furthermore, Regis thinks that the system as a logically coherent presentation of principles manifests the very natures of things. All science is ultimately in the service of man. Not only does Regis claim to be the first to organize all rational knowledge in such a way, but all philological and philosophical evidence so far displayed in our investigation shows that such a concept of a completely unified science of the whole achieved its fruition previous to Kant and after Timpler, that is, within the seventeenth century. Using the term system as a means of entry into the problem, we have discovered Regis to be the only one

249 See Regis's preface, p. ix. In Regis's text, method occupies the fourth and last part of his treatment of logic, just as in Hobbes method occupies the sixth and last chapter of his section on logic in De corpore.

250 See Watkins's introduction to the facsimile edition of Regis's text, pp. xiii-xix.
explicitly to treat the full system concept using the term system to name it. But it is not absolutely clear that no other before Régis did exactly what Régis thinks he alone did, even though this other neither uses the term system nor so absolutely unambiguously defines his project. This other indeed seems to be Hobbes. In fact, although our historical and philological studies culminate in the treatment of Régis, Régis's explicit use of the term system and detailed explanation of the concept of a system of all philosophy can be applied with remarkable accuracy to Hobbes's understanding of system some fifty years before Régis.

At this point, we can briefly consolidate the major characteristics of system according to Régis. System requires (1) a series of basic nonderived propositions, and a series of nonbasic derived propositions; (2) dependence of the less general on the more general sciences; (3) a discussion of logic in the older sense which includes epistemology or a discussion of how mind is truthful; (4) a defined method or procedure of generating new knowledge from given propositions and of presenting and ordering science; (5) a single goal, utility, that is, what is useful to man in this life. These basic characteristics can be distilled from Régis's account, but that treatment by Régis would not have been completely intelligible without the historical understanding of how the presentation of doctrine became so important, and how this presentation became connected with the ancient definition of art. Finally, in spite of Régis's own pretensions to manifest the real natures of things, it is clear that by his acceptance of the shift from things to propositions, and by his attempt to explain and produce a system of all philosophic knowledge, Régis brought to completion two essential topoi of philosophic modernity. Those topoi are first, that nature itself cannot be known, but that we can know only what we make, and second, that by consequence we cannot know the system of nature or cosmos, but that the system of nature is a system of our own construction, namely, a system of propositions or laws. Therefore, it is indeed by a study of system that we come to understand philosophic modernity more completely.

VIII

Hobbes's System

Finally, it is worthwhile to suggest that the first philosopher to bring to completion a philosophic system in the sense defined by Régis, even though he neither used the term system nor treated the concept thematically in any one extended text, was the clearly more important figure, Thomas Hobbes. Hobbes's treatment of the characteristic requirements of any systematic philosophy follows the system characteristics delineated by Régis so remarkably well that there is little way one can deny that Hobbes at least wished to have a system in this sense, especially as regards structure, whether or not he actually achieved such a system.
Hobbes produced a three-sectioned system of philosophy (De corpore, De homine, De civie), which covered the basic sciences: logic, first philosophy, geometry, physics, ethics, and politics. We know that until the time of Régis, there could be found no clear precedent in the usage of the term system to mean the construction of a philosophy of the whole with clear indications of the logical dependencies among the parts. We know also that Hobbes never used the term system in this way in reference to his own philosophy or that of others. Hobbes does use the term in the ancient sense of a political body and in the astronomical senses as the physical universe of all the heavenly bodies and as the hypotheses necessary to explain their configurations.251 As a classical scholar and reader of patristic texts, he could not have failed to be familiar with the most common use in music, which continued in his own day, as well as many other mean-


252 Hobbes was the late recipient of the classical revival that began at Oxford as early as the beginning of the fifteenth century. By the early sixteenth century, "scholastic conservatism had been modified by classical humanism," and Greek and Hebrew, as well as Latin learning, became popular (V.H.H. Green, A History of the University of Oxford [London: B. T. Batsford, 1974], pp. 36-40). Magdalen College, to which was attached the Hall to which Hobbes belonged, was itself founded in the mid-1400's as a remedy for the lack of Latin learning that had infected Oxford at that time. (R. S. Stanier, Magdalen School: A History of Magdalen College School [Oxford: The Clarendon Press, 1940], p. 8, n. 2; see also pp. 48, 104, and 115 for a reference to Hobbes.) In his own words, aside from numerous mention of classical authors, Hobbes's shows first-hand familiarity with the works by both Greek and Latin Patristic authors: Tertullian (EW 4.307, 392, 398, 429); Ambrose (LW 3.433); Athanasius (EW 4.306-307, 311, 353, 398, 402); John Damascene (EW 4.304-305, 395); Eusebius of Caesarea (EW 4.397); as well as the whole Arian controversy and the problem of the homousion (EW 4.392-93, 397; LW 3.544, and the entire Appendix ad Leviathan, chap. 1: "De symbolo niceno," pp. 511-39; chap. 2: "De haeresi," pp. 539-59).

253 Of four Latin-English and one English-Latin dictionaries in existence in England during Hobbes's time, two give a definition of systema in the musical sense, and the other three omit the word entirely. The anonymous Ortus vocabulorum (1500; facsimile ed., Menston, England: The Scholars' Press, 1968) gives no listing. Two very important dictionaries Hobbes could not have failed to know, namely, Sir Thomas Eliot, Bibliotheca Eliotae (1548; facsimile ed., Delmar, N.Y.: Scholars' Facsimiles and Reprints, 1975), and Thomas Cooper, Thesaurus linguae romanae et britannicae (1565; facsimile ed., Menston, England:
ings of the term, especially in the traditional definition of art.


Hobbes was familiar with the works of Lucian (EW 1, epistle dedicatory), and expressed admiration for Melanchthon, as well as a familiarity with his works and the works of other protestant theologians: "And Melanchthon, a divine once much esteemed in our Church, saith of it ["School-theology"] thus: 'It is known that that profane scholastic learning, which they will have to be called Divinity, began at Paris; which being admitted, nothing is left sound in the Church, the Gospel is obscured, faith extinguished, the doctrine of works received, and instead of Christ's people, we are become not so much as the people of the law, but the people of Aristotle's ethics," (EW 5.64). Hobbes continues on the next page: "I could add to these [theologians, including Luther, whom he mentioned on the previous page] the slighting of School-divinity by Calvin and other learned Protestant Doctors." That Hobbes was influenced by the "School of Melanchthon," which included Keckermann, in logic, is doubtless, given the fact that Oxford logicians, even in Hobbes's time, made it clear that they followed that school, primarily a school of deductive logic, rather than that of Peter Ramus, who enjoyed popularity at Cambridge. See I. Thomas, "Medieval Aftermath: Oxford Logic and Logicians of the Seventeenth Century," in Oxford Studies Presented to Daniel Callus, Oxford Historical Society, n.s., vol. 16 (Oxford: The Clarendon Press, 1964), pp. 300-301. Confirming this anti-Ramist orientation of Oxford, Green writes: "From the Ramist movement, anti-Aristotelian in character, which so affected Cambridge, Oxford was comparatively free" (pp. 53-54). Green also makes quite clear the presence of protestant theological works and even of protestant theologians at Oxford. All of this makes it quite clear that Hobbes was not quite as oblivious to his studies during his stay at Oxford as he
Finally, as the very cataloguer of a book with the title *Systema ethicae* by Keckermann,255 Hobbes knew the usage in the late sixteenth and early seventeenth-century texts referring to the orderly presentation of doctrine in an individual science. A brief survey of English dictionaries in and around Hobbes's time shows that the word was probably not used, at least not commonly, in the sense in which Régis uses it.256 Since the real tendency of scholars to decry the term is only first documented by Bouhours in 1675, and the early eighteenth-century deprecation of the term is actually a rejection of its sense meaning "hypothesis," and of the attempts by Leibniz and the Cartesians to construct hypotheses to explain phenomena by pure reason alone, it is most reasonable to conclude that the term was not available to Hobbes in the sense in which Régis uses it. Even if Hobbes somewhere would have us believe. Although it is possible that Hobbes had to return to the study of much that he had forgotten, the seed of his later development was planted at Oxford. Or at least Oxford gave Hobbes direction. The fact that Hobbes's own logic is of the type taught by Keckermann, wherein great stress is laid upon the teaching of the more common concepts before the less common, points to this. Finally, since Hobbes was familiar with Melanchthon directly because he read his works and with his "school" certainly indirectly because of the Oxford logicians, and since Hobbes's familiarity with the classics was strong, it is quite possible that Hobbes was well aware of the definition of art as system.


256 But one dictionary gives a definition Keckermann and Timpler would have found appropriate: "a composing, or putting together; also a Treatise or body of any Art or Science, also the compasse of a Song," Edward Phillips, *The New World of English Words* (London: E. Tyler, for Nathanial Brooke, 1658), s.v. "system." N. Bailey, *Dictionarium Britannicum or a More Complete Universal Etymological English Dictionary Than any Extant* (London: T. Cox, 1736), s.v. "system," after giving a general definition, continues with "System of the World," "Solar System," "System (in Musick)," "System of Musick," and "System of Philosophy, is also a regular collection of the principles and parts of that science, into one body, and a treating them dogmatically or in a scholastic way, in contradistinction to the way of essay, in which the writer delivers himself more freely, loosely, and modestly." Randle Cotgrave, *A Dictionaries of the French and English Tongues* (London: Adam Islip, 1611), gives no entry for the term. Egbert Buys, *A New and Complete Dictionary of Terms of Art* (Amsterdam: Kornelis de Veer, 1768-69), gives: "properly a regular, orderly collection or Composition of many things together; a complete Treatise or Body of any Art or Science," and under "System of the World," gives: "(in Astronomy) the general Fabrick and Constitution of the Universe, or an orderly Representation of it, according to Some noted Hypothesis."
encountered the use of the term in Régis's sense, it is unlikely that he would immediately adopt a usage strange to the already established classical senses, given his own classical training, and his own stress on the absolute necessity in science for clear, well-defined terms. But of all possible alternative terms that could bear exactly the sense of a primarily synthetically developed system as so described by Régis using the term system, Hobbes chose perhaps the clearest and most commonly understood term among possible alternatives, namely, Elements, to describe his philosophical system: Elements of Philosophy. If a parallel can be given in one who also employs such a clear alternative, but the structure of whose text more clearly than that of Hobbes's indicates the intention described by Régis, one could point to no better example than Hobbes's brilliant contemporary Spinoza. Spinoza's addition to the title of his Ethics of the phrase ordine geometrico demonstrata furnishes an example exactly parallel to Hobbes's own title to his major three-sectioned work on philosophy, Elements of Philosophy. Both Hobbes's and Spinoza's works are examples of uniquely modern attempts to develop a science of the whole with the method of geometry serving as a model. The significance of Hobbes's title, Elements of Philosophy, can be appreciated as intending exactly what Régis described by system, only in the clear light of the previous philological and historical analysis. In that analysis the connections between the gradually increasing emphasis upon certainty in science, the concept of method, with its transferred emphasis from the natural to the mathematical model, and the concept of system, have been described.

The issue of whether or not Hobbes actually achieved a true system, however, has been the source of serious controversy since at least 1936, when Strauss's book on Hobbes appeared. Strauss denied a true system in Hobbes's philosophy by throwing into doubt the systematic relationship between Hobbes's political and natural philosophy. Without considering the complexities of whether or not Hobbes really carried out his intention to produce a system in the sense described by Régis, we can at least agree with the majority of Hobbes scholars, including Strauss, that Hobbes wanted his philosophy to be systematic, and, by pointing to Hobbes's own texts, confirm the previously mentioned suspicion that Hobbes, before Régis, conceived of systematicity in Régis's sense.

Régis's account of system requires that every philosophic system of the whole of reality consist of a series of basic nonderived propositions, and a series of nonbasic derived propositions. According to Hobbes, all science must of necessity begin with "universal principles," that is, with "primary or most universal propositions," and must proceed "by a perpetual composition of propositions into syllogisms, till at last the learner understand the truth of the conclusions sought after."257 These universal principles or primary propo-
sitions with which all science must begin "are nothing but definitions."258

Primary propositions are definitions, "wherein the subject is explained by a predicate of many names, as man is a body, animated, rational; for that which is comprehended in the name man, is more largely expressed in the names body, animated, and rational joined together.259 In a definition, the first predicates constitute genera, the last the differentia.260 Definitions are called primary because they are "first in ratiocination,"261 that is, they are the first propositions that constitute the premises of demonstrative syllogisms. The thinking through of the premises whereby the conclusion is seen clearly to follow from the premises, because two terms are related through a middle, is "ratiocination."262 Definitions are first because

258 Ibid. 6.13 (EW 1.81).
259 Ibid. 3.9 (EW 1.36-37).
260 Ibid. 6.14 (EW 1.83).
261 Ibid. 3.9 (EW 1.36-37).
262 Ratiocination and reasoning are the same. See Leviathan chap. 4, para. 14 (hereafter 4.14), where reasoning is shown to be equivalent with ratiocinatio (C. B. Macpherson, ed., Thomas Hobbes: Leviathan [Baltimore: Penguin, 1968], p. 106. This edition will be cited in this investigation). In this passage from Lev., the level of propositions is meant: "the act of reasoning they called Syllogism" (see The Elements of Law 1.5.11 [Ferdinand Tönnies, ed., Thomas Hobbes: The Elements of Law, Natural and Politic (2nd ed., 1929; London: Frank Cass, reprint ed. 1969, with a new introduction by M. M. Goldsmith), p. 22 ], where reasoning and ratiocination is "making of syllogism" and see De corp. 6.16 [EW 1.86], where the term ratiocination is used). Hence reasoning or ratiocination is the thinking through of propositions so as to connect their terms and produce conclusions based on the connections (on "the thoughts in the mind answering to the direct syllogism," see De corp. 4.8 [EW 1.49-50]). But ratiocination also includes separation and connection on the level of concepts alone. See De corp. 1.3-4 (EW 1.3-5) and 2.14 (EW 1.23-24), where the addition and subtraction of notions from a concept is described as ratiocination, and see the end of chapter 4 on syllogism, which summarizes: "And thus much seems sufficient for the nature of syllogisms. . . . Nor are precepts so necessary as practice for the attainment of true ratiocination (4.13 [EW 1.54-55]). See also Lev., A Review and Conclusion, para. 13 (p. 725), where ratiocination means demonstrative reasoning, that is, reasoning with propositions. Wein-
"nothing can be proved without understanding first the name of the thing in question," that is, without an explication of the concept. Even though definitions are first in the sense of being self-evident, at least self-evident after a process of analysis, the necessity of precision in the speech of science makes exact agreement upon formula-
tions imperative. Definitions or primary propositions are the "prin-
ciples of demonstration," because they are the premises of demonstra-
tive syllogisms, and the starting points of derived propositions, be-
cause they are self-evident and indemonstrable, and because their
formulation is agreed upon originally by the users of scientific
speech, that is, they are "truths constituted arbitrarily by the
inventors of speech." The whole of De corpore Part 2, Philosophia
Prima, consists in the judicious setting forth of these primary propo-
sitions. "Sunt enim definitiones principia scientiarum, sive propo-
sitiones in demonstratione omnium primae." Although the definitions

berger notes that ratiocination as the addition and subtraction of
notions from a concept is properly a getting at the nature or what of
a thing, rather than a seeking out the causes of a phenomenon, or the
phenomenon from the causes (J. Weinberger, "Hobbes' Doctrine of
1342). See also, De corp. 1.3 (EW 1.3-5), where Hobbes equates rea-
soning also with the addition and subtraction from the notions of a
concept. Hence, computation, ratiocination, reasoning, and reckoning,
have a common partial meaning for Hobbes (ibid. [EW 1.5]).

263 De corp. 3.9 (EW 1.37).

264 The use of the term arbitrary has led to the criticism that
Hobbes's whole philosophy is an "arbitrary" construction, that we no
longer know the natures of things, but only what we ourselves make.
Science is possible because we ourselves create the first principles
and derive the consequences. Cf. Leo Strauss, Natural Right and
History (Chicago: University of Chicago Press, 1953), pp. 172-75;
Arthur Child, Making and Knowing in Hobbes, Vico, and Dewey, Uni-
versity of California Publications in Philosophy, vol. 16, no. 13
(Berkeley: University of California Press, 1953), pp. 277-83; Hannah
Arendt, The Human Condition (Chicago: The University of Chicago
Press, 1958), pp. 283-84; see also an important dialogue written by
Leibniz in which the problem of ontological truth, specifically in
reference to "a very gifted writer," namely, Hobbes, is treated. It
specifically deals with the problem of whether or not "truth is
arbitrary and depends on names" (Leroy E. Loemker, trans., and ed.,
Gottfried Wilhelm Leibniz: Philosophical Papers and Letters, 2nd ed.
(Boston: D. Reidel, 1969), p. 183. All of the above may be said to
hold that Hobbes's philosophy is an arbitrary construction.

265 Examinatio et emendatio mathematicae hodiernae (LW 4.26) (here-
after cited as Examinatio).
are self-evident, there is need for a prescientific intuition of them, and this demands a special kind of intelligence different from that whereby demonstrations are produced. For complete accuracy in science, there must be intuition into the true properties of a thing so as to list correctly essential predicates in definitions. There must be precise mutually agreed upon formulations of definitions, "quaes nisi accuratae sint, quae sequunturae sunt omnes incertae erunt ... Itaque hoc recte facere [that is, "accurate definire"] ante omnes scientias descendum est. Et haec quidem sive peritia sive prudentia recte definendi, quae acquiritur experimenta circa verborum usu, vocatur Philosophia Prima."266 "So that in the right Definition of Names, lyes the first use of speech; which is the Acquisition of Science,"267 such that, if men "begin not their Ratiocination from Definitions,"268 absurdity results. All science, therefore, requires accurate definitions established in one's first philosophy and from which all further conclusions are generated in the other sciences. Science, of course, requires correct reasoning from the primary propositions to the secondary speculative ones. All science consists, then, in a series of primary, nonderivative, and nonprimary, derivative propositions.

An entire system of philosophy consists of many sciences. Régis demands that in any true philosophic system the less general sciences depend upon the more general, as, for example, geometry depends upon metaphysics, and physics upon geometry. Hobbes holds the same doctrine. He deals with the relationships among the sciences in his discussions of the structure and divisions of the sciences, of which discussions there are at least five.269

De corpore 6.7 is the celebrated text wherein Hobbes states that we can proceed synthetically "by ratiocination ... from the very first principles of philosophy,"270 to the "causes of the motions of the mind,"271 that is, the "passions and perturbations of the mind,"272 and from there to the "causes and necessity of constituting commonwealths," and to "the knowledge of what is natural right, and what are civil duties ... what are the rights of commonwealth, and all other things pertaining to civil philosophy."273 One can proceed thus

266 Ibid.
267 Lev. 4.13 (p. 106).
268 Ibid. 5.8 (p. 114). See also Decameron physiologicum chap. 2 (EW 7.84-85); De homine 13.8 (LW 2.116).
269 De cive, Epistle Dedicatory and Preface: De corp. 6.4-7 and 6.17; Lev. chap. 9, and table; Examinâtio (LW 4.25-30); Latin Lev. chap. 9; cf. De hom. Epistola dedicatoria and chap. 10.
270 De corp. 6.7 (EW 1.73).
271 Ibid. 272 Ibid. 273 Ibid. EW 1.74.
because "the principles of politics consist in the knowledge of the motions of the mind and the knowledge of these motions from the knowledge of sense and imagination," which Hobbes has said cannot be known without a knowledge of geometry, which in turn depends upon first philosophy. Setting aside the issue of another approach to civil philosophy, we know that Hobbes sees a dependence of the sciences in terms of less or more general, that is, of later on earlier sciences, for any understanding of the later to occur. That is corroborated by the clear text of 6.17, wherein Hobbes connects the discussion of methodical demonstration with his own order of presentation of the sciences in his works. Three things are necessary to methodical demonstration: (1) "a true succession of one reason to another, according to the rules of syllogism," (2) "that the premises of all syllogisms be demonstrated from first definitions," and (3) that the demonstrative treatment of philosophy as a whole proceed in the order Hobbes himself has given it: philosophia prima, geometry, mechanics (unnamed but described), physics, and its subordinate doctrine "of the internal passions . . . in which are comprehended the grounds of civil duties." And that this method ought to be kept in all sorts of philosophy, is evident from hence, that such things as I have said are to be taught last, cannot be demonstrated, till such as are propounded to be first treated of, be fully understood. Of which method no other example can be given, but that treatise of the elements of philosophy, which I shall begin in the next chapter, and continue to the end of the work.

This definitive statement about the strict dependence of the less on the more general sciences, such that concepts of the less general cannot be understood without the concepts of the more general, for example, passion without the concept of internal motions, and the latter without the concept of endeavor, endeavor without motion in general and body, and so on, is in direct contrast to statements about the separability of civil from natural philosophy in De corpore 6.6, in the Introduction to Leviathan, and in the Preface to De civis, and is directly confirmed by both the Latin Leviathan and the Examinatio. Since Hobbes in 6.17 is talking about logical and conceptual requirements, such that without the concept of one thing, the concept of another cannot be understood, and since Hobbes's whole idea of science consists principally in conceptual connections, we must take the

274 Ibid.
275 Ibid. 6.17 (E W 1.87).
276 Ibid. E W 1.87-88.
The Latin Leviathan and the Examinatio give similar divisions of the sciences, with the major difference that, whereas the Latin Leviathan makes magnitude the subject of some sciences, motion of others, the Examinatio makes magnitude and motion the subject matter of all the sciences, but distinguishes the sciences from each other by the way magnitude and motion are treated as explanatory principles in the various sciences. Both accounts are in agreement that the structure of the sciences, considered as a whole, is hierarchical. The ordering is from general to specific. All are sciences of body, starting with the most abstract treatment, that is, features common to all bodies, and moving to the most specific. The accounts of the Latin Leviathan and the Examinatio agree with De corpore 6.6-7 and 6.17 on the dependence of the less on the more general sciences.

In the Examinatio:

A: Quot sunt ergo rerum species, tot sunt philosophiae totius partes sive scientiae particulares.

B: Sed qua methodo distinguishendae sunt?

A: Eadem qua distinguishunt, ipsa phaenomena sive accidentia quae apparent, nimium, incipiendo a maxime communibus.

The maxime communia are magnitude and motion, and the science of the most general consideration regarding these and their actions is geometry. This science, "in qua determinantur magnitudines tum corporum tum motuum, primo loco ponenda est: nam primo loco discenda est."

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277 See De corp. 6.7 (EW 1.73) with 6.17 (EW 1.87-88), Latin Lev. (LW 3.66-67), and Examinatio (LW 4.25-29), on the issue of the separability of the political from the natural philosophy. The latter show that logic itself requires that the most general sciences be understood first, such that without such understanding, demonstration of the less general, nay, even understanding itself of them, would be impossible. De corp. 6.17 is important because it is on the requirements for any logically developed and demonstrative system. The apparent contradiction in Hobbes's doctrine is still the subject of controversy.

278 Latin Lev. 9 (EW 3.66).

279 Examinatio (LW 4.27).
Hobbes then defines arithmetic, and continues giving the sciences in the proper logical order: "Proximo loco ponit operationem Physicae Universae, terio loco, succedit . . . Astronomia . . . Quarto . . . Physica."

From there Hobbes proceeds to the various divisions of physical things, which are named for their subjects, and in which he includes in the final place ethics and politics, but sees little need for detail in such kinds of subdivision: "sed ex subdivisione singulorum subjectorum innumerarum aliae scientiae nasci possunt, quae numerare neque facile neque necessarium est." The order of the sciences, first mentioned in De cive in the Preface, and here clearly delineated, is a necessary order, in accordance with the rules for demonstrative science given in De corpore 6.17. Clearly, Hobbes's procedure as well as his justification for his procedure and his general methodological statements about the proper order of demonstration and dependence among the sciences agree with Régis's demand that the less general sciences depend upon the more general.

If the demand for a series of basic and derived propositions, and the demand that the less general sciences depend upon the more general more than anything constitute system, then even from the above alone it is clear that what Régis explained thematically as system only after Hobbes's death, Hobbes already conceived and explained in various places, although not under the name system, some twenty years earlier. But there is more agreement. The third characteristic of systematicity, according to Régis, is that a discussion of logic, that is, a discussion of how reasoning and science are possible, must precede science. It is well-known that Hobbes begins his De corpore with logic, the first five chapters of which consist of introductory statements about philosophy, a philosophy of language and knowledge, a logic of terms, of propositions and correct predication, and of syllogism, and the last chapter of which consists of a discussion of method and the theory of demonstration. At the end of chapter 3, Hobbes calls the theory of proposition and syllogism the progressus integer or "complete pace" to science, method being, as he says in the last sentence of chapter 5, but the via or "way" upon which that step is trod. Thus it is assumed by both Régis and Hobbes that before the sciences proper can begin, any true system must justify and explain what makes science possible in the first place.

Régis's fourth characteristic for any true system is that it must have a defined method of generating new knowledge from given proposi-

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280 Ibid.
281 Ibid. (LW 4.28).
282 Ibid. (LW 4.28-29).
283 Latin Lev. 9 (LW 3.67).
tions and of presenting and ordering science. Hobbes's well-known and lengthy treatment of method in chapter 6 of De corpore corresponds to this demand. It is also quite clear that Hobbes considers method one of the essential characteristics for science, without which science itself would be impossible.

Finally, just as Régis demands that philosophy be directed to a goal, so Hobbes states many times that the goal of philosophy is "Benefit of Mankind" or utility.

Quite clearly, although Régis's is the first explicit use of the term system and thematic treatment of the concept of a system of all philosophy, the actual concept of system as he describes it appears to have occurred to Hobbes more than a quarter of a century earlier. Even if the same concept of system, minus the name, could be attributed to the work of Descartes, Spinoza, and even Leibniz, clearly none of the latter completed such a system of all philosophic knowledge in the sense described by Régis. Hobbes alone, although Régis denies this, completed such a system. And it is precisely Hobbes who has so often been accused of having taken the modern turn most radically. Hobbes is said to have made not nature but the arbitrary use of names and definitions the starting point of all philosophy, and is thus most explicitly charged with the modern doctrine that natures themselves are unknowable, for we know only what we ourselves make. By consequence, if the latter are genuinely Hobbesian doctrines, then knowledge of nature as cosmos in the Greek sense of an ordered whole is clearly denied by Hobbes and replaced by knowledge of "nature" created by man himself by reasoning from the arbitrary use of names and definitions.


285 Lev. 5.20 (pp. 116-117); 5.17 (p. 115); 4.1 (p. 100); 4.3 (pp. 101-102); 4.13 (pp. 105-106); 3.5 (p. 96); 46.1 (p. 682); 5.17 (p. 115); 46.11 (pp. 686-87). For a decisive statement of the utility of science, see The Elements of Law 1.13.3 (pp. 65-66). See De hom. 11.9 (LW 2.99), and in general 11.8-9 (LW 2.99).

286 See above, n. 264.
Section IX

Conclusion

The principal contribution of this investigation is that it offers yet another means—usually ignored—of appreciating the modern shift of philosophic perspective from the system of things or natures to the system of thoughts or propositions. The study carries out this goal by correcting the usual connection between the early modern use of the term and the most common Greek etymological sense meaning aggregate of physical components standing together (Rescher, Klein, von der Stein). The paper offers much evidence to show that it was rather the most peculiar sense of the term system in Greek meaning construct of understandings or concepts, as in the Stoic definition of art, which induced the early moderns to consider the term appropriate to describe a rigorous science as an artificial construct of laws or propositions. That connection itself is much more revelatory of the modern change of perspective from things to propositions than is the connection between the modern use of the term system and its most common Greek etymological sense, for the latter sense is much more oriented to things, not thoughts or propositions standing together. The above etymological origin and early modern understanding of individual disciplines as scientific systems is shown in Sections I to IV. Section V points out that the increasing emphasis by philosophers on method was really an attempt at systematization under another name and the necessary condition for the emergence of the full-blown system concept. Finally, the last two sections on Régis and Hobbes complete the discussion of the emergence of the early modern system concept. Régis provided the first complete treatment of the new system concept by applying it to the whole of philosophic knowledge or all the sciences considered together as a unity—as a system—and by carefully delineating the characteristics necessary for scientific systematicity. Hobbes, who never used the term, was the first important modern to complete such a system remarkably in accord with the requirements listed almost half a century later by Régis. It has been argued that Hobbes was one of the paradigmatic moderns because he carried philosophy from the naive understanding that the natures themselves of things can be known by mind to the idea that we know only what we make, and that science is knowable precisely because it is a construction of our own device.

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