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CYLINDRUS AND THE RATIONAL CIRCULARITY OF ERROR IN THE *MENAECHMI*

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The *Menaechmi* is the *palliata* that inspired Shakespeare's *Comedy of Errors*. It revolves around a pair of identical fraternal twins, who until the end of the play are unaware of each other's presence in the same town, and a series of misunderstandings that ensue when the twins are constantly mistaken for each other. A series of characters who are intimately familiar only with one of the two and unaware of the existence of the other, repeatedly assume that they are talking to the brother they know, not the one they do not know. Of all the characters in the play only Messenio, loyal servant of one of the Menaechmus brothers, is aware of the existence of both of them. But accidental mistakes make only a partial contribution to the forging and maintenance of the comic element in the plot. More important is the craftiness with which one of the twins, Menaechmus Socicles (Menaechmus II), Messenio's master, opportunistically takes advantage of the misunderstandings around him, gladly playing along with the propagation of error.

Regarding the play's plot, we are told in the prologue that six years previously Menaechmus II set out from his place of origin, Syracuse, and ever since he has been travelling around the world looking for his homonymous twin. Many years before that, when both siblings were young children and attending the festivities of certain *ludi* in the company of their father, one of the twins had strayed away in the midst of a big crowd and become lost (29-31). This background information is provided in the opening section of the play by an extradiegetic Prologus who emphasizes the striking resemblance between the twins — so striking that even their own mother could

not tell them apart (19-22).[1] This exaggeration is repeated twice subsequently and foreshadows the centrality in the dramaturgy of the play of optical illusion as a result of identical appearances. This illusory perception may either be by real accident (the actors are genuinely unaware that they are confronted by two identical images, and the permanent confusion induced by this imperceptible visual duplicity determines their understanding of the world around them) or by ostensible accident (the agents involved in the process realize the error but decide to keep pretending that they are still in error, in order to secure some advantage for themselves). The recurrence of controlled and manipulated appearances governs the course of this dramatized experiment with optical duplicity. I will presently attempt to illustrate how the confrontation between intellectually clear vision and perceptually blurred vision is acted out in the encounter between Menaechmus II and the cook Cylindrus in Act II.2 (273-332), which I hold as the event triggering a chain of errors and illusions that flesh out the plot of the *Menaechmi*.

The theme of optical illusion is entwined with Epidamnus, the proposed topographical setting for enactment of the series of errors that ensue from repeated misidentification. The city is introduced as a den of insincerity and fraud:

> Nam ita est haec hominum natio: in Epidamnieis
> voluptarii atque potatores maxumei;
> tum sycophantae et palpatores plurumei
> in urbe hac habitant; tum meretrices mulieres
> nusquam perhibentur blandiores gentium.
> propterea huic urbei nomen Epidamno inditumst,
> quis nemo ferme huc sine damno devortitur. (258-264)

> Now here's the race of men you'll find in Epidamnus:
> The greatest libertines, the greatest drinkers too,
> The greatest liars and most charming flatterers
> Live in this city. And as for women of the meretricious profession

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1. Recent treatments on the *Menaechmi* with comprehensive bibliographical overview include K. McCarthy, "The Ties That Bind: *Menaechmi*", in: *Slaves, Masterss, and the Art of Authority in Plautine Comedy*, Princeton 2000, 35-76; E. Segal, "*The Menaechmi*: Roman Comedy of Errors", in id. (ed.), *Oxford Readings in Menander, Plautus, and Terence*, Oxford/New York 2001, 115-127.

> Nowhere in the world, I am told, are they more cajoling.
> Because of this, they call the city Epidamnus,
> For no one leaves unscathed, 'undamaged', as it were.'[2]

The speaker, Messenio, the *servus fidelis* of Menaechmus II, defines Epidamnus as the setting par excellence for the dramatic illusion, by means of an ostentatious wordplay on the city's name, with double effect, firstly, to reinforce its para-etymological connection with 'peril, loss' (*damnum*),[3] and secondly, by association, to emphasize the Greek (and therefore, by definition anti-Roman) identity of the city, and to enforce the ties of the city to debauchery. This is the necessary dramaturgical convention of the *palliata*, allowing the Roman audience, being Romans, to dissociate themselves from the actors on stage and so enjoy the play. As a result of this multi-levelled wordplay Epidamnus, the setting for the *Menaechmi*, is projected as a particularly dangerous place for outsiders. The warning comes near the end of Act II.1, when Messenio and his master, shortly after they have entered Epidamnus, come across the first inhabitant of the city, who happens to be the cook Cylindrus. Their meeting dominates scene II.2; by the end of the scene the outsider Menaechmus II is ready, willing and able, albeit without really knowing what is involved, to join the plot. By the end of the next scene, II.3, he has become the quintessential insider, not to mention a spurious stand-in for his brother.

Cylindrus opens Act II scene 2 at line 273. He was introduced to the audience a little earlier, at 218 ff., when he was summoned on stage by his mistress, the courtesan Erotium, and ordered to go to the market. At the request (and at the expense) of his mistress' lover, the Epidamnian Menaechmus (Menaechmus I), Cylindrus is sent to buy provisions for a meal which he presumably will later prepare at home. The cook returns from the market only to find, to his great confusion, the identical twin, Menaechmus II, before Erotium's door. Cylindrus is reportedly a cook (*coquom* 218), a member of Erotium's household (218), and in addition to this, a *servus*

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2. Translation E. Segal, *Plautus, Four Comedies: The Braggart Soldier; The Brothers Menaechmus; The Haunted House; The Pot of Gold*. Oxford Classics, Oxford/Oxford University Press 1998.

3. On the wordplay with the (supposed) etymology of Epidamnus and the ensuing joke, see A. Gratwick, *Plautus: Menaechmi*, Cambridge Greek and Latin Classics, Cambridge 1993, 139-140.

(*mean eram* 300; *vae tergo meo* 275) of the courtesan. This fusion of identi-
ties is not unusual in Plautus, notes Lowe, as he admits that Cylindrus' dra-
matic contribution in the play does not involve a demonstration of his cook-
ing skill, because it reflects Roman reality.[4] Yet, Cylindrus' presence in the
play has nothing to do with his status as servant/cook; rather, his act even
though a brief one it is interspersed with jokes and phraseology reminiscent
of the prankster cooks encountered in Menander.[5] For most critics the con-

4.   J.C.B. Lowe, "Cooks in Plautus", *CA* 4 (1985), 91-92: "In Roman life that [*coquus*]
     was the normal word for a household slave responsible for cooking" (p. 91).

5.   One example of this is the joke in lines 222-223 about the greed of parasites. Another is
     the boastful exaggeration in 225 that the dinner is already cooked though the provisions
     have not yet even been purchased. Two more examples include the contentment over
     his purchases at 273-274, *bene opsonavi atque ex mea sententia, bonum anteponam
     prandium pransoribus* ('I've shopped quite well, and just according to my heart, I
     know I'll serve a lovely dinner to the diners') and the metaphor at 330, *dum ego haec
     appono ad Volcani violentiam* ('While I surrender these to the fierceness of Vulcan's
     art'). The purchase of provisions, the preparation of food, the heat of the kitchen, are
     all present in such a representative passage from a Middle Comedy as Sotades' *Enk-
     leiomenai* fr. 1 K.-A., which is actually spoken by the play's *mageiros*; cf. J. Wilkins, *The
     Boastful Chef: The Discourse of Food in Ancient Greek Comedy*, Oxford 2000, 382 ff.
     Plautus' portrayal of Cylindrus evokes the broader comic thematics of the poetic
     mageiros of the *Mése*, but the brevity of the role (the Sotades passages is extensive and
     suggestive of a much more prominent role for the cook overall in the play) and the
     confinement of the cook to a suggestive rather than dramatically functional role in the
     drama calls to mind the precedent of Menander. The plays of Menander represent a
     move away from the popular *mageiros* character staged by the poets of the earlier
     comic tradition. Menander's deflating of the *mageiros* role is evident in the *Aspis* cook
     whose speech, though retaining some of the volubility and wit of the earlier *mageiroi,*
     is very brief (216-233); and even earlier, in the *Dyskolos*, whose cook, Sikon, func-
     tions more as a prankster, without exhibiting any of the comic exuberance and in-
     flated rhetoric of the braggart cooks of the *Mése*; cf. H. Dohm, *Mageiros*: *Die Rolle des
     Kochs in der griechisch-römischen Komödie*, Zetemata, 32. München 1964, 243, notes
     Menander's restriction of the cook's normal loquacity; also, Wilkins, *The Boastful
     Chef,* 380, who notes that the cook in Menander is a stock character with a stage per-
     formance that is tied specifically to the culinary preparations for a wedding banquet;
     also H.-G. Nesselrath, *Die attische mittlere Komödie: ihre Stellung in der antiken
     Literaturkritik und Literaturgeschichte,* Untersuchungen zur antiken Literatur und
     Geschichte, 36, Berlin 1990, 297; E.W. Handley, *The Dyskolos of Menander*, London
     1965, ad *Dysc.* 946-953, commends on the volubility of Sikon, his wit, and his ten-
     dency to grandiose language; on the boastfulness of the cook in the *Samia*, see A.W.
     Gomme and F.H. Sandbach, *Menander: A Commentary*, Oxford 1973, ad *Sam.* 283-
     285; for a discussion of cook-scenes (*inter alia*) in Menander see E.W. Handley "The
     Conventions of the Comic Stage and their Exploitation by Menander", in E.G. Turner,

fusion that results from this encounter is the cook's "dramatic raison d'être":[6] he is the first character in the play to fall victim to the optical duplicity of the identical twin brothers. The dramatic projection of his confusion is the first act in the metadrama of errors around which the *Menaechmi* plot unfolds. I propose to argue that the significance of Cylindrus' part in the play is not to be discovered through a study of his performance, but through the origin of his name and its relation to the core theme of the play: the double, and the recycling of illusion as a result.

The cook's name, Cylindrus, which has little to do with food, eating or cooking, is the Latinized form of the Greek *κύλινδρος*, the cylinder. Apart from the geometrical shape, the term 'cylinder' was also used to denote the so-called 'roller', a cylindrical stone for levelling the ground. Pliny uses it, also, in reference to a precious stone shaped in the form of a cylinder (cf. *OLD* s.v.). Still, all attestations of *cylindrus* in a metonymic sense are considerably later than either Plautus or Terence, with only a single occurrence in Cato's *Res Rustica* dating from the literature prior to Cicero. But it hardly seems plausible that the etymologically alert Plautus would have chosen for his cook a name virtually incompatible with Cylindrus' professional identity. There is, naturally, always the possibility that Plautus is following his lost Greek model, but in the surviving evidence from Greek comedy, extant literary texts, fragments, and testimonia, there is no record of 'cylinder', either as the name for a character or as the name for any kind of object. The other cooks in Plautus' plays, when not — following literary precedent — assigned names traditionally attributed to cooks in the Greek texts (e.g. Cario in the *Miles Gloriosus),* either are anonymous or bear names of etymological kinship to their profession (e.g. Congrio and Anthrax in the *Aulularia*, Chytrio in the *Casina*, Cyamus in the *Truculentus*). Given this, it seems reasonable to wonder why Cylindrus, unlike every other cook in Plautus' plays, is given a name that is etymologically irrelevant to the culinary profession. Such a mode of naming is also unprecedented in the Greek comic tradition of any era. But there is usually nothing fortuitous about the

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ed., *Ménandre*. Entretiens sur l'antiquité classique XVI, Vandoeuvres-Geneva 1970, 3-26 (discussion, 27-42; note Handley's comment, p. 32).

6. Lowe, *Cooks in Plautus*, 90; Lowe's discussion of Cylindrus (pp. 90-92) draws heavily on H. Dohm, *Mageiros. Die Rolle des Kochs in der griechisch-römischen Komödie*, München 1964, 264-266, the most thorough examination to this date of the Cylindrus episode.

names Plautus assigns to his dramatis personae; it is the critic's job to ex-
plain why the Roman poet gives this particular character a name so atypical
for a comic cook.

Metonymically, and in Greek, the word *kylindros* can denote the parch-
ment scroll, the object the Latins translated as *volumen.* Works of literature,
including comic plots, were recorded on these scrolls. It may not be too far-
fetched to imagine that Plautus may have been alluding obliquely to the
possibility of Cylindrus being a hidden author. The technique of giving to a
character assigned with fashioning the narrative progression in a play a sig-
nificant name suggestive of the character's authorial identity is exemplified,
to cite just one instance, by the Plautine *meretrix* Phronesium in the *Trucu-
lentus.* The derivation of Phronesium's name from Greek *phronesis* is out-
lined in lines 77-78a and perhaps emphasizes her intelligence rather than
her beauty so as to underline her status as the director of the plot[7] and sub-
stitute for the *servus callidus*.[8] Cylindrus' brief presence in *Menaechmi,* how-
ever, does not compete with the dominant role played by the *meretrix callida*
in the *Truculentus*. And so, Cylindrus' etymological association to the
volumen does not seem relevant for his role in the play. Still, Cylindrus'
dramatic identity is not altogether devoid of sophistication, but in order to
comprehend it some scientific knowledge is required — knowledge tied to
the name of the character for whose sake the cook has been hired,
Menaechmus: what requires investigation is the background to Menaechmus'
name.

Menaechmus is a Greek name and was probably familiar to the Romans
of Plautus' day as the name of an important contemporary. It was the name of
a famous Greek geometer and mathematician, a pupil of the great Eudoxus,
who lived near Cyzicus in Asia Minor circa 380-320 BC. Menaechmus was
famed first and foremost for his analysis of the cone: he was the first to
show that ellipses, parabolas, and hyperbolas are to be obtained by cutting

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7.   W.S. Anderson, *Barbarian Play: Plautus' Roman Comedy*, Toronto, 85, 103; C.
       Dessen, "Plautus' Satiric Comedy: the *Truculentus*", *PhQ* 56 (1977), 157.
8.   D. Konstan, *Roman Comedy*, Ithaca, NY 1983, 150: "it is unusual for the girl herself,
       rather than, for example, a clever slave, to play such an important role in conceiving
       and carrying out the deception". Phronesium's plotting methodology is the main sto-
       ry-line of the play: she simultaneously deceives three lovers and presides over three
       different intrigues.

a cone or a *cylinder* in a plane not parallel to the base.[9] These discoveries concerning the conic sections and cylinders were made while Menaechmus was working on the problem of duplication of the cube, according to Proclus (Proclus, *Comm. in Tim.* 34.2D = fr. 9 Schmidt).[10] Menaechmus applied his discovery of the ellipse, parabola, and hyperbola to devise the mathematic formula of mean proportionals, through which he solved the problem of the duplication of the cube by reducing it to the problem of constructing a pair of mean proportionals.[11] The significance of this geometric discovery lies, for our purposes, in the realization that Menaechmus in his constructions of the mean proportionals uses the analytic method.[12] This is most clearly shown in another of the fragments Eutocius, the ancient commentator of Archimedes, credits directly to Menaechmus, fr. 5 Schmidt (= Proclus *Comm. in Eucl.* 72.23ff.): in this fragment Menaechmus espouses the so-called circular proof,[13] the pattern of analytical reasoning which holds that the proof of one statement depends on a second statement, whose proof in turn depends on the first:

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9. A good overview of Menaechmus' contribution to the evolution of mathematics can be found in I. Bulmer-Thomas, "Menaechmus", in C.C. Gillespie (ed.), *Dictionary of Scientific Biography* 9, New York 1974, 268-276.

10. The standard edition for the fragments attributed to Menaechmus is M.C.P. Schmidt, "Die Fragmente des Mathematikers Menaechmus", *Philologus* 42 (1882), 72-81. The discussion in the following paragraphs on Maenechmus' contribution to the circular proof theory, including the commentary of the testimonia cited, follows J. Barnes, "Aristotle, Menaechmus, and Circular Proof", *CQ* 26 (1976), 278-292.

11. For Menaechmus' discovery of the conic sections, see the text of the pseudo-Erastosthenes as recorded in Eutocius' commentary to Archimedes' work *On the sphere and cylinder* [= *Comm. in Arch.* 3] 96-10-27, in the text of E. Hiller, *Eratosthenis Carminum Reliquiae*, Leipzig 1872, 130. The Greek text of the *On the sphere and cylinder,* together with Eutocius' commentary on it, has been recently translated by R. Netz, *The Works of Archimedes*, vol. 1, Cambridge 2004. Menaechmus' solution to the problem of finding two mean proportionals in continuous proportion so as to be able next, with the aid of two lines, to solve the problem of producing a cylinder half as large as an originally given cone or cylinder, is listed on pp. 286-290; also see the earlier translation in T.L. Heath, *A History of Greek Mathematics* II, Oxford/New York 1921, 110-116; for the proof of the construction for which mean proportionals are the solution, see pseudo-Eratosthenes in Eutocius, *Comm. in Arch.* 3.88-17-23; see discussion of the text in Barnes, *Aristotle, Menaechmus.*

12. For details on the two constructions preserved under his name see Eutocius, *Comm. in Arch.* 3.78.13-84. 7 Hiller = fr. 11 Schmidt.

13. Barnes goes as far as to call Menaechmus (on p. 285), "the father of circular proof", on account of the information provided in fr. 5 Schmidt.

As Menachmus informs us, the term 'element' (στοιχεῖον) can be employed in two senses: what proves (τὸ κατασκευάζον) can be identified as an element of what is proved by it. In Euclid the first theorem is an element of the second, and the fourth of the fifth. Many propositions can be called elements of one another in this sense, when they may be established reciprocally (κατασκευάζεται... ἐξ ἀλλήλων). From the proposition that the exterior angles of a rectilinear figure are equal to four right angles we can prove the number of right angles to which the interior angles of the figure are equal, and vice versa… But in another sense 'element' means a simpler part into which a compound can be analysed. In this sense not everything can be called an element of anything [that follows from it], but only the more primary members of an argument leading to a conclusion (τὰ ἀρχοειδέστερα τῶν ἐν ἀποτελέσματος λόγῳ τεταγμένων), as postulates (αἰτήματα) are elements of theorems.[14]

For Barnes this fragment confirms the suggestion that Menaechmus advocated "circular reasoning": the mathematician uses the term 'element' in two different senses that contradict each other, on the one hand stating that "not everything can be called an element", on the other, a few lines later, arguing that "elements themselves can be proved; theorems can be established 'reciprocally' or circularly; and there can be demonstration of everything".[15]

According to the Menaechmean conception of understanding proof, in the case of propositions A and B, and the two possible arguments that can derived from them (A so B; B so A), both A and B can be elements and each of the two arguments based on A and B can be regarded as a proof. In reality Proclus misreads Menaechmus, because this circular-proof-based relationship is not applicable to the way Euclid's five theorems relate to each other. But the reasoning that detects circular proof in the Euclidean 'elements' hypothesis may hold true if amended slightly to allow for an external

14. The translation of fr. 5 Schmidt is taken from Barnes 1976, 286; Barnes copies Proclus' translation from G.R. Morrow, *Proclus – A Commentary on the First Book of Euclid's Elements*, Princeton 1970, revised edition 1992. The ancient text of Proclus runs as follows: *Πάλιν δὲ τὸ στοιχεῖον λέγεται διχῶς, ὥς φησιν, ὁ Μέναιχμος. καὶ γὰρ τὸ κατασκευάζον ἐστὶ τοῦ κατασκευαζομένου στοιχεῖον, ὡς τὸ πρῶτον παρ' Εὐκλείδῃ τοῦ δευτέρου, καὶ τοῦ πέμπτου τὸ τέταρτον οὕτω δὲ καὶ ἀλλήλων εἶναι πολλὰ στοιχεῖα ῥηθήσεται· κατασκευάζεται γὰρ ἐξ ἀλλήλων. δείκνυται γὰρ καὶ ἐκ τοῦ τέτρασιν ὀρθαῖς εἶναι ἴσας τὰς ἔξω τῶν εὐθυγράμμων γωνίας τὸ πλῆθος τῶν ἐντὸς ὀρθαῖς ἴσων καὶ ἀνάπαλιν ἐκ τούτου ἐκεῖνο. καὶ ἔοικεν λήμματι τὸ τοιοῦτο στοιχεῖον. ἄλλως δὲ λέγεται στοιχεῖον, εἰς ὃ ἁπλούστερον ὑπάρχον διαιρεῖται τὸ σύνθετον· οὕτως δὲ οὐ πᾶν ἔτι ῥηθήσεται παντὸς στοιχεῖον, ἀλλὰ τὰ ἀρχοειδέστερα τῶν ἐν ἀποτελέσματος λόγῳ τεταγμένων, ὥσπερ τὰ αἰτήματα στοιχεῖα τῶν θεωρημάτων.*

15. Barnes, *Aristotle, Menaechmus*, 286.

factor — let it be called H. This H may represent a set of certain Euclidean postulates that function as corrective parameters towards making fr. 5 Schmidt truly uphold a valid description of circular proof, when combined accordingly with each of Euclid's five theorems in their relationship to each other, and vice versa; or, H, A so B; and H, B so A.[16]

This proof by circular reasoning may in plain speech be called a 'vicious circle', and it provides a perfect description of the situation in the *Menaechmi*, where the recurrent manifestation of the same type of 'error'[17] is the cornerstone for the construction of a non-repetitive plot. An application of the circular-proof reasoning to the plot in question would presuppose a pair of propositions, or dramatic characters, who in this play would be the Menaechmi brothers, M1 and M2. These are 'related' as follows: M1 so M2; M2 so M1. Or, alternatively, as with Menaechmus' syllogism on the way the Euclidean theorems are in a circular relation to each other, it would presuppose a subset of dramatic 'axioms', or secondary characters in the play, whose contribution to the equation would be catalytic, so that A, M1 so M2; A, M2 so M1. Introduced into the chain of events under discussion, this would mean that 'M1 is seen by a character or certain characters A and is believed to be M2; M2 is seen by a character or certain characters A and is believed to be M1'. I describe this character or these characters as 'axiomatic' because they are set-piece *palliata* figures, whose function in the plot is limited to generating an ill-defined sense of suspense in the plot. It is through these characters that the 'error' is spotted, and the vicious circle of logical fallacy begins to take shape. Messenio, the *servus fidelis* of Menaechmus Sosicles and the only character in the play, apart from the Menaechmi themselves, who knows that his master has an identical twin brother, is one such set-piece character, as is the *meretrix* Erotium. But the character who first falls victim to the confusion and becomes the perpetrator of the first 'error' is the *coquus* Cylindrus.

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16. On Proclus' reading of Menaechmus' views, as reproduced in fr. 5 Schmidt, see Barnes, *Aristotle, Menaechmus*, 287-289. In Barnes' view the definition of what Euclid calls an 'element' needs to be rephrased, taking into account that it may mean two different things. It can be understood in a broader sense as a proposition that constitutes a proof and so is an element of the Euclidean theorem so proven, and in a narrower sense in terms of the simplest Euclidean propositions, the 'axioms', which are undemonstrable.

17. A detailed presentation of the play's plot structure, mapping out the chain of sequential errors, is given in Gratwick, *Plautus: Menaechmi*, 16-26.

In the *Menaechmi* 'error' takes the form of inability to distinguish be-
tween the visual image of a certain 'item'/person, Menaechmus I (or, the 'true
value', in the vocabulary of mathematical analysis), and the image of an-
other item/person, Menaechmus' identical twin brother, who looks exactly
like him to a third party. This implies that both brothers should appear on
stage wearing the same mask. This mask should be that of the *adulescens,*
but the convention runs partly against the family situation of the Epidamian
twin: Menaechmus I is in love with a *meretrix*, like a typical comic *adules-*
cens, but he also is married, to a wife who nags him. This two-fold comic
standing causes the Epidamnian Menaechums to belong as much to the
world of the *senex amans* as to the *adulescens*. As a result, the resemblance
of Menaechmus I to Menaechmus II is only approximate (it is 'an estimate,
or approximation, of the true value'). But in a sense the approximation ac-
tually is literal, because the two identical-looking masks worn by the twin
brothers are *de facto* not *identical*, no matter how very similar they may
look. The spectators who watch the play from a relative distance may easily
be fooled each time one of the brothers comes on stage and for as long as he
remains silent, especially if the two brothers are dressed in identical cos-
tumes. And there is another consideration: the characters in the play are
scripted to be fooled, for their wilful mistaking of the approximation for the
original is after all the backbone of the *Menaechmi* plot. It is this 'oversight'
that sets in train the successive errors whose sequential dramatization pro-
vides the play with its content. From the perspective of the mechanics of
plotting, the smoothing-over of the actual difference between the two simi-
lar but not identical masks and appearances of the twins, applies only for
the *dramatis personae*. Cylindrus showcases the potential for success that
emanates from plotting a comic drama with mistaken identity as its narra-
tive cornerstone. Once Cylindrus is deceived and the first misinterpretation
is acted out on stage, a pattern of action is formed that becomes the dra-
matic precedent against which more such situations of confusion will arise,
further developing this core plot issue. Cylindrus' error proves crucial for
full assessment of the dynamics of the *peripeteia*, which is based not on de-
liberate deception, as usually happens in the Roman New Comedy, but on
accident and misunderstanding.[18]

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18. Notwithstanding the fact that, due to their relative distance from the on-stage action,
    the spectators technically speaking should not be in a position to discern the fine dif-

Plautus was no mathematician, hence one should not assume that he had had a considerable knowledge of mathematics, including the circular proof theory in mathematical analysis, its complex history, and the specifics of Menaechmus' central role in its formulation. On the other hand it should not be necessary to go so far as to conceive of Plautus as a primordial *poeta doctus* foreshadowing the 'neoteroi', nor is familiarity with mathematics and philosophical discussions a necessary prerequisite for such an intelligent and talented dramatist as Plautus to be able to compose a narrative or a stage-debate around the notion of 'Knowledge'. All that is necessary is for him to be able to combine in sequence a rationally evolving subset of dramatic propositions or plot premises. Knowledge and reasoning are inextricably intertwined. Knowledge is, essentially, reasoning in action. To profess to know something logically means to have solid arguments (i.e. arguments convincing to a third party) indicating that a statement is valid. Ra-

ferences between the masks and clothing of the two actors performing the roles of the twins, their confusion is not expected to last beyond the first moments following the entrance of a twin on stage. According to C.W. Marshall, *The Stagecraft and Performance of Roman Comedy*. Cambridge 2006, 127, 149, in all the plays of Plautus involving twins the siblings were made distinguishable, despite the identical masks, from the way that their respective performances were based on how the mask was animated by the different actors playing the roles. Plautus also provides a second non-verbal criterion for distinction between the twin brothers: their respective performances are accompanied by different metrical patterns. A variety of choral meters (glyconian, ithyphallic, cretic, choriamb, etc.) accompany the acting of the *amans* Menaechmus I, serving to set him firmly apart from his more composed brother, whose presence on stage is not accompanied by music. T.J. Moore, "Facing the Music: Character and Musical Accompaniment in Roman Comedy", *Syllecta Classica* 19 (1999), 130-153, discusses musical accompaniment as the factor distinguishing between the twins, and inviting a contrast between their different personalities beyond their identical appearance. It is nonetheless possible that prior to the audience realizing that only one of the twins has a musical accompaniment when he comes onstage, the spectators would have been confused, and in this confusion would prefigure the experience of the participants in the given scene. Scene IV.2, for example, is one such scene, when Menaechmus I returns from the market. Essentially this moment marks his re-entry into the action, which he abandoned at the end of Act I. His wife and his parasite each had an encounter with the other Menaechmus twin, whom both mistook for his brother. When Menaechmus I returns, then, it is only logical that he too should at first be mistaken for his brother. When he begins to talk, of course, by the third line of his speech, the confusion has been dispelled. But because he has not been part of the play since the first Act, the association of his acting with music may have not been registered as a distinctive feature of his role.

tionality is, of course, not the same as truth. My reasons for knowing something by virtue of a process of analytical thought may be solid and acceptable, but may contradict 'truth' as defined under particular circumstances. If I am not in a position to assess (to be familiar with certain parameters that define) what is true under these circumstances, then my knowledge, however rationally inferred, will be true only to me, while my unfamiliarity with the parameters that determine the truth of this knowledge will make my inference sound comical to those familiar with them. Plautus' *Menaechmi* plays with the limitations of logistic regression, celebrating the amusement resulting from the incongruity which emerges when confidence in reasoning is led astray by ignorance. Ignorance indeed in the cook scene becomes the primary catalyst for the unfolding of the plot, when a character in possession of 'knowledge' repeatedly — in fact no less than six times and mostly with emphatic 'certainty' — dismisses out of hand rationally grounded discordant input, stigmatizing it as 'insanity' on the part of his interlocutor. A variety of comical exchanges take place between the cook Cylindrus (292 *insanum esse te certo scio*; 309 *insanit hicquidem*; 313 *tu quidem hercle certo non sanu's satis,* 'for sure this man is insane'), and the Menaechmus Sosicles-Messenio pair (282 *certe hic insanust homo*; 325 *non edepol tu homo sanus es*, *certo scio*; 336 *ille insanus,* 'It is certain, by Hercules, that you are not sane enough'), in all of which the facile evocation of insanity will be the typical reaction for incomprehension when incomplete knowledge fails to provide a satisfactory, rational explanation. It will become more or less a thematic leitmotiv as the play progresses through the successive scenes of mistaken identity.[19]

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19. Recourse to reasoning deriving from 'knowledge' elicits laughter, perpetuating the fallacy and delaying the discovery of the mistaken identity. Messenio's explanation of how the cook knows Menaechmus II's name (339-345), is itself derived from reasoning. Though no more plausible, his conjecture is introduced as indisputable fact or knowledge. Circular reasoning similarly informs the second instance of mistaken identity, a little later, when Erotium, addressing Menaechmus II, attempts to 'prove' that she 'knows' his identity. She accordingly reveals a past acquaintance with the man's father (407). Intrigued by this declaration of the *meretrix*, Mehaechmus II decides to play along with her and pretend that he is persuaded by her reason-based argument that they do indeed know each other (in the process perhaps availing himself of the courtesan's promise of 'hospitality'). Upholding the dramatic illusion and consciously surrendering to plausible fallacy, Menaechmus II is obliged to feign ignorance and compromise reality for the sake of upholding the chain of errors. In real life, hearing that Erotium knew him and also knew the name of his father, he would instantly have

But it is quite possible that not only Plautus but also his audience, who were mostly plain folk, were familiar with the names of prominent intellectuals among the various personalities of the olden times, especially if these distinguished personages were associated with some legendary problem or challenge, or if tradition linked them to some truly famous hero of the past, or if their work was mentioned in connection with some important contemporary event. As noted, the mathematician Menaechmus was traditionally associated with one of the three great mathematical problems of ancient geometry, the duplication of the cube, which Gratwick believes to have been understood by the unmathematical audience of Plautus as a kind of 'twinning'.[20] We also know of at least one widely circulated popular story according to which Menaechmus, a contemporary of Aristotle, was Alexander the Great's teacher, and upon being asked by Alexander to teach him geometry in a concise way, is said to have replied that, while on land there are "common roads and royal highways... in geometry there is one way for all". This anecdote is recorded in the writing of the 5th c. AD anthologist Stobaeus (2.31 = fr. 1 Schmidt), and features also in Proclus, who transforms Menaechmus and Alexander into Euclid and Ptolemy Euergetes (Proclus, *Comm. in Eucl.* 68.13-17). Most critics believe that the story was originally told of Menaechmus and was later adapted with a view to enhancing the reputation of the more famous Euclid.[21] For the purposes of the present argument suffice it to say that both of these mathematicians were personalities

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realized that the woman knew his twin brother. But this would have brought the play to a premature end. Menaechmus II therefore omits to assimilate this information and the audience suspends their disbelief and plays along.

20. Gratwick, *Plautus: Menaechmi*, 138 ad 43n.

21. For the origin of the anecdote, see Barnes, *Aristotle, Menaechmus*, 287-288; Barnes believes that Stobaeus preserves the outline of the original story and employs it as external evidence corroborating the affinity in scientific thinking between Menaechmus and Aristotle, as well as the inference that, like Aristotle, Menaechmus had been a tutor to Alexander. The adoption of the same story frame for both Menaechmus and Euclid could result from the fact that, according to reports recorded in the works of ancient writers, Euclid elaborated on Menaechmus' discovery of the conic sections, especially the parabola, in order to establish a connection between Menaechmus' parabola and the section of the right-angled cone. It is also likely that, in order to construct his curve, Menaechmus would have drawn on Euclid's' well-known construction for the mean proportional between two lines, whose formulation is preserved in *Elements*, VI.13.

well enough known among common people to become the central charac-
ters of widely circulating popular anecdotes.[22]

There is another good reason for supposing that Menaechmus' name
may have been in circulation around the time that the *Menaechmi* comedy
is reported to have been produced. The relevant data may even be of assis-
tance in achieving more precise dating for a play whose production has
been said to have taken place alternatively as early as 215 BC and as late as
186 BC.[23] Menaechmus' endeavour to resolve the problem of duplication
of the cube set in train a linear intellectual process that resulted first in the
discovery of the conic sections, specifically of the parabola, inspired a num-
ber of important mathematicians, including Apollonius of Perga, Aristaeus,
and Euclid, and culminated in a succession of mathematical breakthroughs.
In the third century it constituted the basis for the work of Archimedes,
whose considerable contributions to the study of the conic sections, espe-
cially in the area of the parabolic segments, encouraged study of the Archi-
medean triangle, gave rise to the theorems associated with it, made possible
the quadrature of the parabolic segment and, ultimately, produced Diocles'
geometry of burning mirrors. Interestingly it is not Diocles but his more fa-
mous contemporary Archimedes that is well-known for his association with

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22. Plautus often names selected well-known characters of the historical past, including,
for example, Philip of Macedon (Alexander's father), Agathocles and Hiero, both ty-
rants of Syracuse (in the *Menaechmi,* 409-412), Attalus, and Darius of Persia, as a
means of aggrandizing his own characters through analogy. Much more numerous are
the hyperbolic analogies elaborated around famous mythological characters such as
Hercules and a variety of Trojan War heroes. Quite apart from the characteristic orig-
inality of these mythological and non-mythological hyperboles (according to E.
Fraenkel, *Plautine Elements in Plautus,* trans. from the Italian [*Elementi Plautini in
Plauto*] by T. Drevikovsky and F. Muecke, Oxford, 45-71, genuinely Plautine inven-
tions; according to N. Zagagi, *Tradition and Originality in Plautus*, Göttingen 1980,
15-67, essentially indebted to a technique already at work in Greek drama but con-
siderably reworked to be compatible with the Plautine literary ideology), their organic
integration into the plot suggests that the Roman audience attending these plays had
enough basic knowledge of Greek mythology and history to appreciate the wit of the
analogies.
23. On the basis of Erotium's ironic mock-chronological comment at 409-412, where his-
tory and fiction are ludicrously mixed in a bogus genealogy, Gratwick believes that,
for the joke to be successful, the play would have to be dated later than 211, the date
of the Roman conquest of Syracuse, with this date also being within the living mem-
ory of the audience, See Gratwick, *Plautus: Menaechmi*, 1993, 180 ad 409n.; 229 ad
983-4n., for an alternative attempt to establish a plausible dating.

burning mirrors. As early as the second century AD Archimedes is alleged to have used concave mirrors as a weapon of war to set ablaze and totally destroy the Roman fleet at anchor in the harbour of Syracuse during Marcellus' siege of the city in 213-211 BC.[24]

The *Menaechmi* was evidently composed and produced in the aftermath of the capture of Syracuse, and so may well have drawn inspiration from the fascination among contemporaries all over Italy with Archimedes' parabolic mirrors as defensive weapon against the Romans in 211 BC. This fascination probably gave rise to all sorts of related rumours and anecdotal stories, some of which would have linked the concave mirrors of the Syracusan Archimedes to Menaechmus' original experiments with cylinders. Taking all the above into consideration, then, Plautus' naming of Menaechmus, who, in recalling Archimedes and the events of 213-211, comes from Syracuse too, seems very likely to be part of an elaborate intellectual game. The more so when the chain of errors is initiated via an encounter, amid a flamboyant display of cultural and literary connections with Sicily, between Menaechmus and a character named Cylindrus. The intellectually elitist subject of mathematics was thus metamorphosed into a popular and, for his

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24. The two sources that specifically identify Archimedes' contribution to the defence of Syracuse against the Romans as the artful employment of fire are Galen, who notes that Archimedes used "*pyria*" for "burning the triremes of the enemy" (*Opera* 1.657-658 Kühn), and Lucian, who remarks that Archimedes "set ablaze the triremes of the enemy through art (*technei*)" (*Hippias* 2). Neither specifically mentions burning mirrors, though Knorr and others believe that Galen's *pyria* probably denotes "some sort of concave reflecting surfaces, although convex lenses are possible" (W. Knorr, "The Geometry of Burning-Mirrors in Antiquity", *Isis* 74 (1983), 54 n. 2). The story of Archimedes destroying the Roman fleet is presented as an incontestable fact by Anthemius, the great 6th century architect and mathematician (J.L. Heiberg, *Mathematici Graeci Minores*, Copenhagen 1927, 82, 85). For more on Archimedes and mirrors, see E.J. Dijksterhuis (ed.), *Archimedes*, New York 1957, 28-29; and esp. I. Schneider, "Die Entstehung der Legende um die kriegstechnische Anwendung von Brennspiegeln bei Archimedes", *Technikgeschichte* 36 (1969), 1-11; additional bibliography is cited in Knorr, *Isis* 74 (1983) 53-54 n. 1 & 5; Knorr's arguments for Diocles being the most substantial contributor to the geometry of burning mirrors rely on the edition of Diocles' work by Toomer [= G.J. Toomer (ed. and trans.), *Diocles, On Burning Mirrors*, Berlin/Heidelberg/New York 1976]. The credibility of the ancient sources on Archimedes' use of burning mirrors and, more broadly, on the potentially great effectiveness of burning by means of concentration of solar rays via mirrors, has been corroborated by engineer E.S. Stamatis' experiments with burning mirrors, described in E.S. Stamatis (ed.), *Archimedes: Hapanta*, Athens 1970-1974, vol. 3, 309-317 [in Greek].

audience, fascinating commentary on what must have been a momentous event in their recent history.

A very similar situation in Aristophanes may serve to confirm the above thesis that a largely illiterate public might nevertheless have responded to Plautus' cerebral idea of naming the protagonist of his comedy of circular fallacy after the mathematican who elaborated the first detailed analysis of the phenomenon in question.[25] In the latter part of the *Birds* one of the group of people who pester Peisthetaerus with unwanted advice on how to construct his ideal town is Meton, the famous 5th cent. Athenian astronomer, mathematician, and engineer. Meton's intervention is dramatic but brief (from line 995 to line 1009) because Peisthetaerus promptly declines his recommendations and escorts him from the stage. Nevertheless, while still on stage Meton persuasively plays the town-planner, employing specialized technical language with great precision. Without necessarily understanding very much of it, the audience would clearly enjoy the comic effect of Peisthe-

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25. I do not wish to suggest that Plautus' employment of mathematics in the *Menaechmi* has been inspired by Aristophanes' inventive allusion to Meton in the *Birds*; it is my belief, however, that Plautus' comic flair has been informed more or less directly by Aristophanes. The heavily politicized content and the topicality of Aristophanes' plays resulted to the excision of Old Comedy from the repertories of the travelling Hellenistic *thiasoi*; on the evolution of comic drama in the 4th century and the new trends emerging as a result of the pan-Hellenization of Comedy, see most recently I.M. Konstantakos, "Conditions of Playwriting and the Comic Dramatist's Craft in the Fourth Century", *Logeion* 1 (2011) 145-183; in the light of the rapid abandonment of Old Comedy in the Hellenophone world of the 4th century, it is improbable that Aristophanes' plays were staged at Rome at all, or even with the minimal frequency required for familiarizing the Roman audience with the Old Comedy dramaturgy; the absence of Old Comedy revivals from the repertories of the *ludi* does not mean though that the Romans of the Middle Republic were ignorant of Aristophanes' plays as texts: Lucilius, the father of Roman Satire, and a generation younger than Plautus, was traditionally held in antiquity to have modelled his caustic speech under the influence of the Old Comedy language (cf. Hor. *Sat*. 1.4.1ff.), and his deep knowledge of Aristophanes is firmly acknowledged nowadays; cf. B. Zimmermann, "Lucilius und Aristophanes", in G. Manuwald (ed.), *Der Satiriker Lucilius und seine Zeit*. Zetemata 10, München 2001, 188-195; A. Sommerstein, "Hinc Omnis Pendet? Old Comedy and Roman Satire", *CW* 105 (2011), 25-38. Lucilius knew Aristophanes as thoroughly as to model his style on the Aristophanic verse, and he did so knowing that he would gain popularity by embracing a language of social criticism already popular with his fellow-countrymen; it is logical then that Plautus, who wrote his last plays around the time Lucilius was born, to have had first-hand knowledge of Aristophanes' plays, supplied to him likely by the very travelling *thiasoi* that brought for him copies of New Comedy Greek plays.

taerus' dismissal of Meton's earnest and elaborate teaching, particularly if — as one might envision — the performance included gesticulation or the employment of geometrical instruments, whose grossly inflated size would tend to elicit laughter by their mere appearance.[26] This example from Aristophanes suggests, in short, that ignorance and inability to comprehend, particularly when projected with self-confidence and flair, can make for memorably comic entertainment.

The playwright Aristophanes, evidently more knowledgeable than his audience and not entirely unfamiliar with geometrical theories such as those of Meton, employs the ignorance of his audience to facilitate critique, albeit facetious, of popular ideas, inventions, and even the inventors and scholars themselves. This is so characteristic as to be a virtual trademark of the genre. Meton's likening of the layout of streets to the rays of light from a star, quite likely a reflection of his own city-planning ideas, could well represent an oblique gesture in the direction of a contemporary controversy in optics about the physical properties of light and whether its movement tends to be straight or circular. Meton was famed for his mathematical idea of the squaring of the circle but the entire controversy could well, in typical Aristophanic fashion, simply amount to a parody, not implying any taking of positions.[27] Critics have also noted that Meton's name was quite popular in his time, beyond a narrow circle of scholars and scientists, because his mathematical theories had practical applications. He set up timing devices in the Pnyx in Athens for everybody to consult and, inevitably, to gossip about. The Athenian public's familiarity with Meton, though most likely less than obsessive,

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26. A meticulous analysis of Meton's learned instruction is to be found in R.E. Wycherley, "Aristophanes, *Birds*, 995-1009", *CQ* 31 (1937), 22-31; Wycherley is impressed by the comic effectiveness of Meton's spiel, whose scholarly precision makes for "good burlesque": "(W)e have a professor of mathematics lecturing in a comically pompous and learned strain to an unwilling and impatient hearer. The unceremonious interruption and ejection which follow are all the more effective if they cut short an elaborate and painstaking demonstration" (p. 28).

27. This view has been argued in, M. Guillén de la Nava, "Aves 1004: La polémica científica como ingrediente cómico", in: A. López Eire (ed.), *Sociedad. Política y Literatura: Comedia Griega Antigua. Actas del I Congreso Internacional: Salamanca, noviembre 1996*, Salamanca 1997, 287-294.

is documented by references to him in other literary texts apart from the *Birds*, e.g. Phrynichus' *Monotropos*.[28]

Finally, a study of the language of Aristophanes' plays confirms that he drew distinctions between the various levels of technicality of the words he used. Though primarily concerned with the comprehensibility of such words among non-specialist spectators (the majority of the attendees), he remained attentive to the necessity for creating an appropriately 'scholarly' linguistic environment when science was being discussed.[29] Legal terminology, by contrast, is abundantly present in Aristophanes, because the law, unlike science, was particularly appealing to the average Athenian, the citizen of the polis who frequented the courts and was obliged regularly to attend the meetings of the Council.

To return to Cylidrus and the forces that set apart his role in the plot from his broader mission in the play of the *Menaechmi*. Cylindrus is the only cook in Roman Comedy whose name is not related to his culinary profession, nor has its provenance in the name of a New Comedy cook. The divergence from this firmly established pattern is meant to be noticed and questioned upon by the experienced audience. The puzzlement is engrossed by the choice of the particular name which is unique and odd in the corpus of the surviving Roman plays, for it does not mirror, as it usually happens with the character names of a *palliata*, the dramatic identity of the character bearing it, as cook; rather, the name is conspicuously non comic: Plautus named this cook after a geometric form. The present article attempts to justify this notable peculiarity in the context of the *palliata* plot. I have argued that the name Cylindrus taken together with the name of the leading characters of the play, the twin brothers Menaechmi, is expected to help the audience recall the famous mathematician Menaechmus. Menaechmus had been the teacher of Archimedes who a few years prior to the staging of the *Me-*

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28. See the discussion in A. Pereiro Pardo, "Méton y la comedia Antigua", in: A. López Eire (ed.), *Sociedad. Política y Literatura: Comedia Griega Antigua. Actas del I Congreso Internacional: Salamanca, noviembre 1996*, Salamanca 1997, 307-312.

29. The limited employment of specialized vocabulary from technology and science in Old Comedy is noted and discussed in A. Willi, *The Languages of Aristophanes. Aspects of Linguistic Variation in Classical Attic Greek*, Oxford 2003, 51-95; for Willi the relative absence of specialized technical vocabulary in Aristophanes reflects the imperfect development of the language of technology in most areas in late 5th c. Athenian society; one of his examples is the geometer Meton and the very little technical vocabulary he uses on stage.

naechmi had destroyed the Roman fleet that was besieging Syracuse by using concave mirrors, a device developed from various discoveries concerning the conic sections and cylinders made by Menaechmus. Plautus thus invites his audience to recall the siege of Syracuse (an event that took place in 213–211 BC) and the impressive accomplishment of Archimedes. More importantly, the Cylindrus-Menaechmus combination is meant to craft an analogy between the two leading and interlocking themes of the play, the motif of the doublets and duplication; and the succession of errors as a result of the repeating cases of mistaken identity caused by the omnipresence of doubles, challenges the most erudite among the spectators to make the correlation of Menaechmus' accomplishment to solve the problem of duplication of the cube and his fondness for circular reasoning, inasmuch as advertises Plautus's familiarity with specialized technical knowledge — familiarity traditionally denied to the former slave actor and playwright.

The *Menaechmi* is a funny play not because of the contribution of the typically brilliant 'cunning slave' and his ingenious machinations, but because of the awkwardness and lack of reason and wit that governs the actions of the actors and the plot of the play. All characters in the *Menaechmi* lack wit. No one is smarter than anyone else; in fact, no one is smart, and no one moves on the basis of reasoning — too ironic for a play whose main characters are named after the inventor of analytical reasoning, but too cleverly crafted to center on the playwriting genius of Plautus who in the composition of the *Menaechmi* succeeds in producing a successful play without a leading character or characters but with an artistically and precisely articulated leading theme: error.

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