WHAT ARE THE *TOPNOI* IN *PHILEBUS* 51C?

In an interesting passage in the *Philebus* (51c, cf. 56b–c, an enlarged and slightly modified list),[1] Plato associates pure beauty with geometrical forms created by certain measuring tools used both by mathematicians and carpenters. The 'beauty of figures' is analysed as 'something straight [*εὐθύ τι*]... and round [*περιφερές*], and the two- and three-dimensional figures (sc. *σχήματα*) generated from these by [*τόρνοις*] and rulers [*κανόσι*] and set-squares [*γωνίαις*].' He continues: 'For I maintain that these things are not beautiful in relation to something, as other things are, but they are always beautiful by nature, by themselves...'

LSJ treats the word *τόρνος* as follows: I, 'carpenter's tool for drawing a circle, like our compasses, prob. a pin at the end of a string', (with Theognis 805 as the earliest attestation)[2] and II, 'turning-lathe', with the *Philebus* passages cited, preceded only by Aeschylus fr. 57.[3]

Most translators follow LSJ in judging the Platonic *τόρνος* to be a lathe;[4] but a considered examination of early usage of the word leads one to the conclusion that the first definition seems likely to be the correct one, as only R. Bury, Smith's *Dictionary of Greek and Roman Antiquities*, and very few others, have realized.[5] As the 'lathe' interpretation continues to be dominant, it will be useful to emphasize why the 'compasses'/'pin and string' interpretation is preferable.

To begin with an examination of the context of the passage under discussion, we note that the other two instruments in 51c are certainly measuring instruments used by masons and carpenters, not cutting tools. *τόρνος* as 'compasses' thus fits the context better than as 'lathe'.

[1] (51b–d) *ΣΩ. Πάνυ μὲν οὖν οὐκ εὐθὺς δῆλά ἐστιν ἃ λέγω, πειρατέον μὴν δηλοῦν. σχημάτων τε γὰρ κάλλος οὐχ ὅπερ ἄν ὑπολάβοιεν οἱ πολλοὶ πειρῶμαι νῦν λέγειν, ἢ ζῴων ἤ τινων ζωγραφημάτων, ἀλλ' εὐθύ τι λέγω, φησὶν ὁ λόγος, καὶ περιφερὲς καὶ ἀπὸ τούτων δὴ τά τε τοῖς τόρνοις γιγνόμενα ἐπίπεδά τε καὶ στερεὰ καὶ τὰ τοῖς κανόσι καὶ γωνίαις, εἴ μου μανθάνεις. ταῦτα γὰρ οὐκ εἶναι πρός τι καλὰ λέγω, καθάπερ ἄλλα, ἀλλ' ἀεὶ καλὰ καθ' αὑτὰ πεφυκέναι καί τινας ἡδονὰς οἰκείας ἔχειν, οὐδὲν ταῖς τῶν κνήσεων προσφερεῖς· καὶ χρώματα δὴ τοῦτον τὸν τύπον ἔχοντα [καλὰ καὶ ἡδονάς] ἀλλ' ἆρα μανθάνομεν, ἢ πῶς;*

(56b–c) *ΣΩ. Τεκτονικὴν δέ γε οἶμαι πλείστοις μέτροις τε καὶ ὀγάνοις χρωμένην τὰ πολλὴν ἀκρίβειαν αὐτῆ πορίζοντα τεχνικωτέραν τῶν πολλῶν ἐπιστημῶν παρέχεται.*

ΠΡΩ. Πῇ;

ΣΩ. Κατά τε ναυπηγίαν καὶ κατ' οἰκοδομίαν καὶ ἐν πολλοῖς ἄλλοις τῆς ξυλουργικῆς. κανόνι γὰρ οἶμαι καὶ τόρνῳ χρῆται καὶ διαβήτῃ καὶ στάθμῃ καί τινι προσαγωγείῳ κεκομψευμένῳ.

[2] This follows Hesychius, who defines *τόρνος* as *ἐργαλεῖον τεκνονικόν, ᾧ τὰ στρογγύλα σχήματα περιγράφεται.*

[3] A related word, *τορνεύω*, is found five times in Plato, and it has some of the same ambiguity of meaning. It translates comfortably as 'make round', 'round off' (see *Critias* 113d8), though it can specifically refer to lathe-working, e.g. *Theages* 124*b*.2. *Epist.* VII, 342c.2, probably refers to rounding by compasses.

[4] A partial list: B. Jowett, *The Dialogues of Plato* (Oxford, 1871); G. Burges, *The Works of Plato* (London, 1848–54); H. Fowler, *Plato, Philebus* (London, 1925); R. Hackforth, *Plato's Examination of Pleasure: A Translation of the Philebus* (Cambridge, 1945), though, inconsistently, in 56b–c, he translates *τόρνος* as 'peg and cord'; A. E. Taylor, *Philebus and Epinomis* (Folkestone/London, 1956); J. Gosling, *Philebus*, translation with notes and commentary (Oxford, 1975) – like Hackforth, he changes the lathe to compasses in 56b–c; R. Waterfield, *Philebus* (London, 1982). All *ad loc.* E. R. Dodds also accepts this translation, in *Euripides, Bacchae*[2] (Oxford, 1960), p. 210.

[5] R. Bury, *The Philebus of Plato* (New York, 1897); J. Yates and J. Flather, 'Circinus', in W. Smith, *A Dictionary of Greek and Roman Antiquities*[3] (London, 1890), i. 429–30; C. Badham, *The Philebus of Plato*, with introduction and notes (Oxford, 1860), 90 (in a note confused by a mistranslation of *γωνίαις*); G. Stallbaum, *Platonis Philebus rec., proleg. et commun. illustr.* (Leipzig, 1820), p. 295. These usually quote Hesychius and give little more by way of argument.

The second *Philebus* passage, 56b–c, invites a similar inference. The list there begins with κανών and τόρνος, but adds three more instruments – διαβήτης ('compass, so called from its outstretched legs', LSJ);[6] στάθμη ('carpenter's line or rule... properly... the line rubbed with chalk or red ochre, being distinguished from the rule... by' this passage, LSJ); and προσαγωγεῖον ('carpenter's or stonemason's square', LSJ)[7] τι κεκομψευμένον. Though Plato is referring to instruments that would be used for ship and house building, it is striking that all four of these pieces of equipment accompanying τόρνος were used for measuring (cf. μέτροις τε καὶ ὀργάνοις in 56b) straight or curved lines or angles or lengths, and were not cutting tools. If the τόρνος is a lathe, it is certainly the odd man out in this list.

Furthermore, both passages may owe something to the gnomic triad of 'straight' items in Theognis 805f.: he who seeks an oracular response from Delphi must be more honest (εὐθύτερον)[8] 'than peg and line [τόρνου] and plumb-line [στάθμης] and square [γνώμονος]'. Thus, it seems we have a traditional triad measuring the round, the straight, and the angular – much like Plato's triad of instruments in *Philebus* 51c.

We are left with a problem in the later *Philebus* passage – two words denoting 'compasses'. Even so, we find the triad pattern still present in this list of five, with the first two elements doubled. We have two different instruments for generating straight lines (rule and plumb-line); two for generating circles; and finally, a type of square. That τόρνος and διαβήτης are found in the same list shows that they are different

[6] Perhaps it should be noted that English usage does not distinguish between the singular and plural of this word. The διαβήτης could also be used to measure uniform lengths, widths (like dividers and callipers), and angles.

[7] Though this rare word (modified by κεκομψευμένῳ, 'ingenious' or 'sophisticated', which suggests its unusual or *ad hoc* nature) has been subjected to varied interpretation in the scholiastic and lexicographic traditions, Waterfield (*ad loc.*, n.) correctly notes that a second century Boeotian inscription (*IG* 7.3073.118, 139) shows clearly that προσαγωγεῖον there denotes a try-square. The tradition in late antiquity is somewhat bizarre, describing this tool as a kind of vice to straighten bent wood – see scholia, in C. F. Hermann, *Platonis Dialogi* (Leipzig, 1870–80), vi. 255 *ad loc.*: τεκτονικόν ἐστιν ὄργανον, ὃ προσάγοντες εὐθύνουσι τὰ στρεβλὰ ξύλα, borrowing, or borrowed by, Suidas, followed by D. F. Ast, *Lexicon Platonicum* (Leipzig, 1836), iii. 190. Why or how successfully one might straighten out bent wood is not at all adumbrated. Even without the inscription as evidence, Badham, op. cit., *ad loc.*, followed by Bury, rejects this, and suggests that the πτοσαγωγεῖον is 'an instrument for taking the angles of curves', i.e. the calliper. The inscription, though, suggests that this instrument was used to bring stones together at right angles: εὐγωνίους πρὸς τὸ προσαγωγεῖον, 118: 'with angles regular according to the square', cf. *IG* 2(2).1666 A64. In line 139 we have, καθ' ἕκαστον τῶν λίθων ἐν ὀρθῷ πρὸς τὸ προσα[γωγεῖον], 'by each of the stones in uprightness according to the square'.

F. Paley's interpretation is puzzling: a 'contrivance for applying the plummet' (quoted in Bury *ad loc.*). Neither Plato nor the inscription suggest the plumb line, though the plumb bob can be combined with the square.

English translations reflect the confusion in late antiquity: 'square': Hackforth, Gosling, Waterfield; 'calliper': Taylor (but with 'screw' as an alternative possibility!), cf. Gosling n. *ad loc.*; 'vice': Fowler, Jowett ('machine for straightening wood'); 'rule with plumb bob': Burges.

My anonymous referee writes, plausibly, that τινι προσαγωγείῳ 'suggests prima facie that there are various kinds of προσαγωγεῖα – (presumably devices "applied" for checking accuracy, alignment, etc.)... One thinks of "formers" devised for a particular purpose, e.g. for the profile of a moulding.'

[8] Literally, 'straighter', but here in a metaphorical, ethical sense: 'more exactly true', 'more perfect', 'more honest'. If this were not meant metaphorically, 'straighter than a peg and line' would be nonsense. Whether τόρνος is compasses or lathe, it is always involved with circles – see the standard etymological dictionaries, P. Chantraine, *Dictionnaire Étymologique de la langue Grecque*[4] (Heidelberg, 1950), s.v.; H. Frisk, *Griechisches Etymologisches Wörterbuch* (Heidelberg, 1961), s.v.

tools, though similar in function. Thus it is likely, not doubtful, that the τόρνος here is the 'more primitive' pin and string,[9] since the διαβήτης is clearly the kind of compasses with legs extended, as its derivation (from διαβαίνω, 'stride, walk, or stand with legs apart', LSJ s.v. I) shows. This is consistent with the archaic nature of the Theognidean measuring instrument triad.

Finally, early attestations of τόρνος, after Theognis, also show that the 'compasses' meaning of the word was more common than the 'lathe' meaning in archaic Greece. Willink, writing on *Bacchae* 1066–7, the famous crux involving τόρνος, has argued strongly that the word there refers to a lathe, not a compass.[10] To establish his lathe interpretation, he looks at early attestations of τόρνος, and finds that all readings of the word as peg and line 'softly and silently vanish away' in favour of the lathe translation.[11] This overstates the position considerably, as Roux notes;[12] an analysis of Willink's readings of τόρνος as lathe in the earliest attestations of the word will show that they are not convincing.

In his view, the Theognis passage is 'simply' a list 'of useful inventions and therefore unhelpful.'[13] Actually, as we have seen, the list includes two measuring instruments and τόρνος. Such an environment for τόρνος would put the burden of proof on those who would interpret the word as anything but a measuring instrument. Furthermore, the context of the passage requires a measuring instrument: he who consults an oracle must be 'straighter' (in an ethical sense, i.e. more exactly true, more perfect, more honest) than compass and plumbline[14] and set-square. The measuring instrument generates the perfect line or angle or circle that the woodworker must follow. To say that the oracle-consulter must be straighter, more perfect than a lathe does not give good sense.

In Herodotus 4.36, another early attestation of the word, 'compasses' is almost certainly the correct interpretation.[15] Foolish map-makers depict the earth so that it is κυκλοτερέα ὡς ἀπὸ τόρνου, 'circular, as if [drawn] by a pair of compasses'. Again 'lathe' seems most unlikely; it is hard to imagine Herodotus describing an exact circle on a (flat) piece of papyrus and saying that it looked as if it had been created by a lathe (in three dimensions).[16]

Euripides fr. 382 is similar, describing the letter theta as κύκλος τις ὡς τόρνοισιν ἐκμετρούμενος – 'a kind of circle, as if measured out by compasses'. Willink has the theta resemble a lathe-turned disk; and is driven to distort ἐκμετρέω ('measure out') to 'accurately define'. The 'lathe' interpretation requires 'carved' or 'shaped', not 'measured out'. Thus, far from there being no passage in Greek literature in which τόρνος means 'compass', the only other attestation of the word in the author under consideration has the meaning 'compasses'.[17]

[9] Cf. Yates and Flather, op. cit., p. 430.

[10] C. W. Willink, 'Some Problems of Text and Interpretation in *Bacchae*. II', *CQ* 60 (1966), 220–42, pp. 237–40.

[11] Willink, art. cit., p. 237.

[12] Jeanne Roux, *Euripide, Les Bacchantes* (Paris, 1970–2), ii. 573.

[13] Willink, art. cit., p. 237.

[14] Cf. the figurative sense of words related to the carpenter's instruments that draw a straight line, i.e. rule, canon. 'Normal' of course derives from *norma*, the Roman carpenter's square.

[15] This is the definition given by the perspicacious J. E. Powell in *A Lexicon to Herodotus* (Hildesheim, 1977), p. 359.

[16] Cf. Tyrrell, op. cit., p. 128. Herodotus 'is thinking of a plane surface accurately measured out by an instrument.' Once again, we have a measuring instrument.

[17] For Euripides, cf. also τορνευ- in *H.F.* 978.

Bacchae 1066–7[18] is a puzzle that perhaps remains unsolved. Two 'schools' of interpretation have emerged, once again split on whether to translate τόρνος as compasses (with the received text) or lathe (with emendation).[19] The first part of the sentence, following a compasses interpretation, makes good sense: Maenads pull Pentheus' tree to the ground, 'And it was made into a circle, as a bow [is], or as a convex wheel, being marked off ["written"] by a peg and line...' A lathe would not 'write', and so, if we keep γραφόμενος, it is very difficult to translate τόρνος as anything but 'compasses'. But the rest of the sentence, περιφορὰν ἕλκει δρόμον is unintelligible as the text stands. There is no consensus on the best strategy for emendation.[20] We should perhaps be content to obelize until the problem is convincingly solved.[21] It *can* be emended in such a way as to conform to the 'lathe' interpretation, but can hardly then count as evidence for that interpretation.

Thus, if we set aside *Ba.* 1066–7 as problematic, we find that Willink's dismissal of τόρνος as 'peg and line' is much too sweeping. Before Plato, we have Theognis, Herodotus and Euripides clearly using the word as 'compasses', against one attestation as 'lathe' in Aeschylus. Such a tradition for τόρνος as peg and line provides a solid background for the same translation in Plato.

Thus, it seems clear that the *Philebus* attestations of τόρνος should be moved from LSJ II up to I. We can translate *Philebus* 51c as follows: the 'beauty of figures' is 'something straight... and round, and the surfaces and solids created from these by compasses [more precisely, pegs and lines] and carpenters' rules and squares.' As Bury notes, the τόρνος creates both 'surfaces' (circles) and 'solids' (spheres), while the triangles, squares and cubes will be created by the rule and square. It is entirely appropriate to Plato's idealism that perfect spheres and cubes are created only by measuring instruments, not by carpenters with hammers, lathes, and saws.[22]

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[18] κυκλοῦτο δ', ὥστε τόξον ἢ κυρτὸς τροχὸς
τόρνωι γραφόμενος περιφορὰν ἕλκει δρόμον.
1066 κυκλοῦται P 1067 περιφορᾶν P

[19] Dodds, op. cit., pp. 210–11, argues for the received text, against Willink and a number of other scholars, e.g. E. S. Robertson, 'Notes on the *Bacchae* of Euripides', *Hermathena* 3 (1879), 387–93; R. Y. Tyrrell, *The Bacchae of Euripides* (London, 1928), pp. 129–31 (though cf. a convincing argument for the compass, p. 128); L. R. Palmer, 'Mortar and Lathe', *Eranos* 44 (1946), 54–61; A. Y. Campbell, 'Notes on Euripides' *Bacchae*', *CQ* 49 (1956), 56–67, pp. 64–6; C. W. Willink, art. cit. pp. 237–40; Roux, op. cit., i. 189; ii. 569–74.

[20] Not surprisingly, γραφόμενος has been a favoured target for emendation – e.g. Palmer (γλαφόμενος); Campbell (⟨σ⟩τρεφόμενου); Roux (τανύμενος).

[21] Roux, op. cit., writes that the 'lathe' interpreters 'ont contribué à éclairer le sens général de la comparaison, mais sans parvenir à résoudre les difficultés que soulèvent dans le détail l'établissement du texte, sa construction et sa traduction', 569. One of the *Bacchae*'s recent editors states flatly, of this passage, '*hos versiculos non intelligo, atque minime mihi placet iste tornus*': E. C. Kopff, ed., *Euripides, Bacchae* (Leipzig, 1982), p. 41.

[22] Plato, of course, was much more interested in geometry than technology. Cf. J. Mittelstrass, 'Die geometrischen Wurzeln der Platonischen Ideenlehre', *Gymnasium* 92 (1985), 399–418. For the ideal beauty of the circle and sphere in Plato's thought, see *Tim.* 33b; *Leg.* 897d–e; *Symp.* 190–1 (the original male–female unity is circular); *Rep.* 616b–c; cf. L. Ballew, *Straight and Circular* (Assen, 1979), pp. 45, 86–7, 114; C. J. Jameson, 'Well-rounded Truth and Circular Thought in Parmenides', *Phron.* 4 (1958), 15–30.