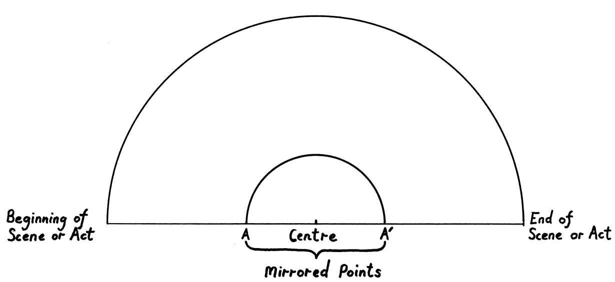
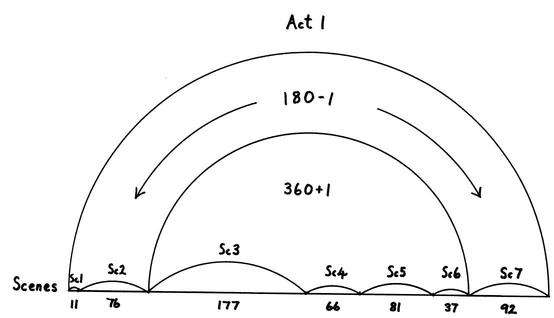
Finding and Constructing the 'Figure' for a Shakespeare Play

Taken from Chapter 12 of 'Number and Geometry in Shakespeares Macbeth' (Sylvia Eckersley, Floris Books, 2007) there follows a concise yet detailed description of how to find and construction a Play-Figure for oneself. As Sylvia Eckersley's research into this subject commensed with an exploration of Shakespeare's Macbeth, this is also her starting point when elaborating the steps that a student may follow with regard to other plays. It is interesting that Sylvia mentions the fact that many of the plays are still awaiting analysis with regard to their geometrical form. This description therefore invites the serious reader to embark upon a quest of their own. Sylvia mentioned especially the need to 'check out' the Historical plays. (Alan Thewless)

The hidden plot of *Macbeth* arose out of the discovery of symmetry, which we find wherever we look: in the whole play; in the single act; in the single scene. This symmetry - first perceptible as echoing sounds, images and meanings - was first demonstrated to the eye by means of scale maps, in which the proportion of the parts to the whole became visible. In this demonstration the compass found a natural role, just as it must have done at the drawing board of a Bramante or a Palladio.





However, a map does not entirely solve the mystery: we are still very far from having discovered the main-spring of the play's organisation. We are impelled to ask: is there indeed a further principle to be found within which the individual details of structure can be comprehended? The compass was first used to demonstrate known relationships: later to find new ones. In this way, the relationship appears as a curved line and the time-stream as a straight one. However, it may suddenly occur to us to ask, 'Why should it be this way round? Why should not the time-stream be curved and the relationships between its parts straight?'

The idea that time is curved is an old one. The heavenly bodies, which create and determine our human sense of time, move in ellipses. When we have journeyed right round the sun in a great curve we experience the same season; this spring we are reminded of last spring, this autumn of last autumn. Our memories of this time last year seem oddly closer than those of a few weeks back; we almost feel we could reach out a hand and touch them. Reason objects, of course, that we only have to look at the nature of memory to explain this phenomenon. These snowdrops remind us of past snow-drops; these blackberries of past blackberries. Yet the signs and symbols of the year are themselves the children of time, and so is memory itself; and even if a mathematician could prove that *real* time has to be straight, we are dealing at present with *poetic* time, which might have its own inner laws. Let us simply suppose then that the time-track of a play could be represented as a curve. We must ask next: what manner of curve?

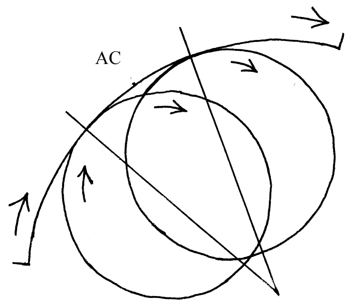
To the ancient Greeks, and to those who inherited their thinking, the circle was the perfect curve. Could a Renaissance play be a great circle? At the end of *Macbeth* we do indeed find very strong echoes of the beginning; yet the complex threefold symmetry, which is unquestionably there in the play, could hardly find complete expression in one great simple circle. We face, in fact, a curious kind of geometrical problem: how can the symmetry of a whole play, of the five acts within it, and each scene within those acts find an elegant counterpart in a continuous curving line?

The problem found a solution, whose mode of arrival we have analysed, after the event, into logical steps as described in the introductory chapter of this book ('Number and Geometry in Shakespeare's Macbeth', Floris Books, 2007): but, as so often with 'scientific' discoveries, it did not entirely correspond to those steps; it resembled more Kekule's dream of the carbon ring, or even the violent storm and shipwreck which lands us, astonished and rubbing our eyes, on the island, of the *The Tempest*.[1]

In studying each play from a geometrical aspect I always asked the same question and kept to the same rules. The question was, 'Do the numbers that the text reveals invite the construction of a figure similar in kind but different in proportions from the one that arises from the text of *Macbeth*?' The rules were: count one for each printed line of text, even if that line is no more than a syllable (for instance the 'sure' of 'leysure' [leisure] in *Macbeth*, Act I Sc. 3, which comes where Banquo says,

Play-line 251 *Banq.*Worthy *Macbeth*, wee stay upon your ley-
252 sure.

The act-totals alone give us enough information to find the basic proportions and outline of the figure. Most acts have the shape of the simple loop, which makes a simple circle and two *wings* which are either exactly equal or differ by one line (with compensation later). But in some plays there are acts with the shape of a double loop as illustrated below.



This creates three sections along the great circle: a middle section, where the act-centre lies, and two outer *wings*.

To find the size of the small circles in a particular play we must look first for the shortest act. The loop it makes must contain a circle with fewer line than the act - and all the small circles in the other acts must be the same size.

Then we proceed by simple trial and error (though quite soon we guess right first time). Firstly, we try out the largest possible small circle out of the range of workable ones (the small circles must be easily related in number to 360 and so 240, 300, 400, 450, 540 would do, also 200, 600 & 520, as below).

Possible number of lines in each small circle	Ratio between degrees and lines
240	360 : 240 = 3 : 2 Therefore there are 2 lines to every 3 degrees
300	360 : 300 = 6 : 5 Therefore there are 5 lines to every 6 degrees
360	360 : 360 = 1 : 1 Therefore there is 1 line to every 1 degree
400	360 : 400 = 9 : 10 Therefore there are 10 lines to every 9 degrees
450	360 : 450 = 4 : 5 Therefore there are 5 lines to every 4 degrees
540	360 : 540 = 2 : 3 Therefore there are 3 lines to every 2 degrees
200	360 : 200 = 9 : 5 Therefore there are 5 lines to every 9 degrees
600	360 : 600 = 3 : 5 Therefore there are 5 lines to every 3 degrees
520	360 : 520 = 9 : 13 Therefore there are 13 lines to every 9 degrees (this ratio is awkward)

We subtract a small circle of the chosen size from each act in turn, and add up the bits left over. If any act is so long that two circles can be subtracted from it, then we subtract two instead of one, because almost certainly we are looking at a double loop. To create the great circle, the loops or double loops 'take hands' and together should add up to a neat number with a few lines over for the 'overlap'. At the final addition of the 'bits over' (each representing 2 wings or a threefold area), we are holding our breath; either it will work or it won't. If it does, we have arrived at a great circle of such a size that it bears a simple ratio[2] to the small circles that will lie within it (I think great circles are unlikely ever to be less than 500 or greater than 1000, but there are many plays I have not studied). If it doesn't we must choose small circles of a different size and recalculate the great circle by the same method. When it works - and it always does, very soon, it is as if dancers have been waiting in the wings of a theatre, ready to fall into place.

If all the acts are expressed in single loops then drawing the figure is relatively easy since the ratio of great diameter to small diameter is the same as the ratio of great circumference to small circumference. If one or more of the acts is expressed in a double loop, then the final form of the figure takes longer to establish since we have to study the text with great care to find exactly where the axes of the twin circles lie. However, the main proportions of the figure are determined just as quickly as those of a one-loop-per-act figure. Very often the calibrations of the circles, great or small - at least down to 5 or 10 line sections - can be achieved by the pure geometrical construction of regular polygons: hexagons, pentagons, octagons etc.

When the figure has been constructed we may think that out of the mist of numbers this tangible shape has arrived. It is here, this is the end of the quest. But we are quite wrong, because it is only the beginning.[3] Not until one can directly relate the text to each position on the figure can one enter into the whole world of meaning which the figures reveal. Certain laws begin to emerge, for instance there always seems to be a relationship between the moment when one enters into a small circle, out of the great circle, and the moment when one leaves it. There is also a relationship between these crossing points and the nadir of the small circle (the point on the small circle which is nearest the centre point of the whole figure)[4] which, when the small circles are single, is also the centre of the act. Where there are two circles in an act, this relationship still holds good although the centre of the act will then come on the great circle. This characteristic of a double-circled act is also important when one is considering the problem of acts with an uneven total. A perfect act, containing a single inner circle, is theoretically only possibly where the act total is even. Then the *wings* of the act, which lie on the great circle, will be equal to one another, and the law of symmetry is obeyed. If, on the other hand, there are two circles in the act and the act centre falls on the great circle between them, then the act can happily be odd. The single central line points to a kind of general axis; this axis is not the diameter of a circle and does not require 180 degrees on each side of it and an even number of lines on each side. However it is not exactly a rule to state that there are even numbers for single-circled acts, odd numbers for double-circled acts.

Anomalous situations can easily arise, for instance in Act IV and Act V of Cymbeline, where Act IV is a single-circled act having 621 lines, and Act V is a double-circled act having 920 lines, but when they do it is quite clear that the number in the single-circled act is Janus like: from the point of view of obvious sense it belongs where it is but, in fact, it also makes sense in connection with the odd numbered act and can be borrowed by this act to make everything balance.

If the figure is more than an arbitrary construction we would expect the words, sounds and images that light up along the ten points of each concentric circle somehow to confirm those inter-act connections. Indeed, whatever is linked in the sphere of geometry, whether by invisible curves or straight lines or by actual intersections of the time-stream (as at the crossings of act-loops, or at the many crossings of act-circles with one another) we expect to find also linked in the sphere of verse.

In setting out to explore the geometrical relationships of a figure in terms of the textual relationships of the play it will be not unlike exploring the countryside with the help of a map. First we pinpoint on the map the place where we want to go, then we go there in reality, and experience that place with all our senses. Finally, we compare it, using the instrument of memory, with other places we have been to lately, in some valley, or island, or sea-girt kingdom.

---

[1] Sylvia in fact conceived the solution during the course of a violent thunderstorm. (A.T.)

[2] A 'simple ratio' can still include numbers greater than 10.

[3]Note. What is true of all the comedies and tragedies in the First Folio that I have studied in detail, may also be true of the Histories. This field awaits exploration.

[4] Sylvia sometimes referred to this as the 'pit' of the act-loop. (A.T.)