

# Shakespeare's astronomy

Michael Rowan-Robinson

Imperial College London

Note: This talk started life as one of my monthly 'Stars'n Tides' columns in the Southwold Organ, in 2008. I included a few examples in my talk on 'The Invisible Universe' at the Bath INSAP meeting in 2010. Then I gave a short version of it in an interview on BBC Radio 4's 'The World at One' last year on the occasion of Shakespeare's 450<sup>th</sup> birthday, with an actor reading the quotes.

In the time of William Shakespeare, England was a hot-bed of Copernicanism. In the Catholic world Copernicus's *de Revolutionibus* came under fire soon after its publication in 1543 and was to end up on the Index of banned books in 1616. Luther too despised Copernicus and all that he represented. England was really the only safe place to discuss these new ideas and it was in the circle of the Elizabethan mathematician and magus John Dee that discussion of Copernicus's ideas flourished. John Dee (1527-1608) is a perplexing figure. He was tutor and adviser to Queen Elizabeth and amassed one of the largest libraries in Europe. In 1570 he published a *Mathematicall Praeface to Euclid*, which gives a survey of mathematics and its applications, and he trained a number of the navigators of his day. He was interested in astronomy, but also in astrology, alchemy and the occult[, and it is this latter aspect of his interests that feature exclusively in Peter Ackroyd's novel *The House of Doctor Dee*]. It was in England and through Dee's circle that Giordano Bruno encountered the Copernican revolution and incorporated it into his radical philosophy, with disastrous results for him personally. Interestingly there is a direct link between Shakespeare and leading Copernicans. Was Shakespeare influenced by this new world-view ?

The plays of Shakespeare are rich in astronomical references. Of course that's in the nature of Shakespeare, because his plays are also rich in allusions to falconry, agriculture, medicine or almost any other aspect of Elizabethan life. But Shakespeare's astronomy is quite deeply interesting.

To illustrate Shakespeare's interest in the stars, I looked up the index in the Penguin Dictionary of Quotations and found 99 references to 'star' or 'stars'. Of these 12 are from Shakespeare. The next most prolific, at 5 each are Milton, Byron, Wordsworth and Shelley, with Keats on 4 and Coleridge and Tennyson on 3 each. The Shakespeare Concordance shows an astonishing 128 references to star or stars. At first sight the Shakespeare quotations are simple metaphors: 'one particular bright star',

‘cut him out in little stars’, ‘you chaste stars’, ‘Two stars keep not their motion in one sphere’ or they are astrological references: ‘it is the stars, the stars above us’, ‘there was a star danced’, ‘yoke of inauspicious stars’ and ‘the fault, dear Brutus, is not in our stars’. Similarly astrological is another famous quotation from Julius Ceasar ‘When beggars die there are no comets seen, The heavens themselves blaze forth the death of princes’, but that is more interesting because it connects to definite phenomena of the night sky, comets. A more lurid version appears in Act 1 scene 1 of Hamlet, when Horatio says:

‘A little ere the mightiest Julius fell,  
The graves stood tenantless, and the sheeted dead  
Did squeak and gibber in the Roman streets;  
As, stars with trains of fire, and dews of blood,  
Disasters in the sun.’

In Henry VI, Part I, the Duke of Bedford says:

‘Comets, importing change of time and states,  
Brandish your crystal tresses in the sky’

And in King John (V.2) Louis the Dauphin says:

But this effusion of such manly drops,  
Startles mine eyes, and makes me more amazed  
Than had I seen the vaulty top of heaven  
Figured quite o’er with burning meteors.

And that is where Shakespeare shows the superiority of his observation and imagination over those later writers who like the stars. He knows about comets, meteor showers, the constellations and the motion of the sky:

‘The wind-shak’d surge, with high and monstrous mane  
Seemed to cast water on the burning Bear,  
And quench the guards of th’ever fixed pole’

the violence of the storm encountered by Othello on his way to Cyprus indicated by the fact that the Great Bear, which never sets from UK latitudes, seems to disappear below the waves (amusingly, not quite such a good metaphor at the latitude of Cyprus).

‘Heigh-ho! An’t be not four by the day,  
I’ll be hanged; Charles’ Wain is over the new chimney  
And yet our horse not packed’

the porters in the inn-yard in Henry IV part 1 realizing they are running late from the position of the Wain, or Plough, in the sky. In Julius Caesar, Brutus however fails to tell the time in this way (II.1):

‘I cannot by the progress of the stars  
give guess how near to day.’

Shakespeare seems to have a country boy’s knowledge of the sky and its phenomena. There is a lovely couplet in *Two Noble Kinsmen*, a joint work by Shakespeare and Fletcher. The Jailer’s Daughter says:

‘I am very cold, and all the stars are out too,  
The little stars and all, that look like aglets-‘

The implication of the exceptionally cold night that the sky is especially clear so much fainter stars can be seen. [This sounds so like Shakespeare and I don’t think Fletcher went in for stars much.]

In *Timon of Athens* (IV.3) Shakespeare shows that he is aware that the moon shines by reflected light:

The moon’s an arrant thief,  
And her pale fire she snatches from the sun.

Julius Caesar says ‘I am constant as the northern star’, so Shakespeare knew the night-sky rotates about Polaris, the Northern Star, although Caesar himself is unlikely to have said this because in his time, due to the precession of the equinoxes, the pole was not particularly near Polaris.

Shakespeare again refers to the Pole Star in Sonnet 116

O no, it is an ever fixed mark  
That looks on tempests and is never shaken;  
It is the star to every wand’ring barque,  
Whose worth’s unknown, although his height be taken.

Shakespeare knows that mariner’s can use the elevation of the Pole Star to estimate their latitude.

The conspirators in Julius Caesar show that they are aware that the direction of sunrise varies with the season (II.1):

‘Decius: Here lies the east. Doth not the day break here ?  
Casca: No.  
Cenna: O pardon, sir, it doth; and yon grey lines  
That fret the clouds are messengers of day.  
Casca:  
You shall confess that you are both deceived.  
(he points his sword)  
Here, as I point my sword, the sun arises,  
Which is a great way growing on the south,  
Weighing the youthful season of the year.  
Some two months hence up higher towards the north  
He first presents his fire, and the high east  
Stands, as the Capitol, directly here.  
(he points his sword)’

Shakespeare is, however, not very complimentary about astronomers. Biron in Love’s Labour Lost (I.1) says:

Study is like the heavens’ glorious sun,  
That will not be deep searched with saucy looks.  
Small have continual plodders ever won  
Save base authority from others’ books.  
These earthly godfathers of heaven’s lights,  
That give a name to every fixed star,  
Have no more profit of their shining nights  
Than those that walk and wot not where they are.  
Too much to know is to know naught but fame,  
And every godfather can give a name.

To which the King wittily replies:

How well he’s read, to reason against reading.

Obviously there is almost always a strong astrological content and Shakespeare makes no distinction between astronomy and astrology. In Cymbeline, Imogen says:

‘O, learn’d indeed were that astronomer,  
That knew the stars as I his characters;

He'd lay the future open.'

And in Sonnet 14:

Not from the stars do I my judgement pluck,  
And yet methinks I have astronomy;  
But not to tell of good or evil luck,  
Of plagues, of dearths, or seasons' quality.

Ben Jonson is even more scathing about astronomers:

SORDIDO. Tut, these star-monger knaves, who would trust them? One says dark and rainy, when 'tis as clear as chrystal; another says, tempestuous blasts and storms, and 'twas as calm as a milk-bowl; here be sweet rascals for a man to credit his whole fortunes with! You sky-staring coxcombs you, you fat-brains, out upon you; you are good for nothing but to sweat night-caps, and make rug-gowns dear! you learned men, and have not a legion of devils 'a votre service! a votre service!' by heaven, I think I shall die a better scholar than they:  
(Everyman Out of his Humour)

The astronomical universe that Shakespeare refers to is, naturally enough, a strictly Aristotelian one:

'Doubt that the stars are fire,  
Doubt that the sun doth move  
Doubt truth to be a liar  
But never doubt I love.'

So this letter from Hamlet to Ophelia assumes we all know that the stars are made of fire and that the sun moves around the earth. Any deviation from the motion of the spheres must be associated with magic:

'And certain stars shot madly from their spheres  
To hear the sea-maid sing'.

I mentioned Shakespeare's references to the stars controlling our fates and these seem like the conventional astrological view of the period. But there is one very dramatic counter to this, in *Lear*:

'This is the excellent foppery of the world ... we make guilty of our disasters the sun, the moon and the stars, as if we were villains by necessity, fools by heavenly compulsion, knaves, thieves and

treachers by spherical predominance, drunkards, liars and adulterers by enforced obedience of planetary influence. ... I should have been that I am had the maidenliest star in the firmament twinkled on my bastardizing.'

This is an amazing assault on the astrological fatalism that we hear from the mouths of so many of Shakespeare's characters. Of course it comes from the mouth of the villain of the play, Edmund, so does not necessarily represent Shakespeare's own sceptical view.

Earlier in the scene, the Earl of Gloucester has piously remarked:

'These late eclipses in the sun and moon portend no good to us. Though the wisdom of nature can reason it thus and thus, yet nature finds itself scourg'd by the sequent effects.'

Edmund ridicules the idea that eclipses portend anything. Gloucester knows very well that there is a natural explanation for eclipses, but still thinks they must mean something.

Othello invokes eclipses to express his anguish (V.2):

O insupportable, O heavy hour!  
Methinks it should be now a huge eclipse  
Of sun and moon, and that th'affrighted globe  
Should yawn at alteration.

Bit of an astronomical blunder here, because the sun and moon could not be simultaneously eclipsed (they can be eclipsed two weeks apart and this happened in 1598 and, less impressively, in 1605 when *Lear* was being written<sup>1</sup>).

In *Antony and Cleopatra* III.13, Antony uses an eclipse metaphor to express his sense of impending doom:

'Alack our terrene Moon is now eclipsed,  
And it portends alone the fall of Antony.'

Cleopatra also uses an astronomical metaphor as she resolves to die (V.2):

'now from head to foot  
I am marble-constant: now the fleeting Moon  
No planet is of mine.'

Time and again Shakespeare calls on astronomical phenomena to convey the emotional state of his characters. This is unique to Shakespeare.

A more measured critique of astrological fortune-telling comes from Pandolf in *King John* (III.4):

‘No natural exhalation in the sky,  
No scope of nature, no distempered day,  
No common wind, no customed event,  
But they will pluck away his natural cause,  
And call them meteors, prodigies, and signs,  
Abortives, presages, and tongues of heaven  
Plainly denouncing vengeance upon John.’

And in *All’s Well That Ends Well*, Helen says (I.1):

Our remedies oft in ourselves do lie  
Which we ascribe to heaven. The fated sky  
Gives us free scope, only doth backward pull  
Our slow designs when we ourselves are dull.

Apart from these critical asides, Shakespeare seems at first sight unaware of the new astronomy that had burst into European consciousness with Copernicus in 1543. And why should he, he was not a university man. The romantic poets, incidentally, show little evidence of ever having much looked at the night sky and write about the stars in rather general terms. Of course they inhabit a very different, post-Aristotelian universe. In Byron’s great poem ‘Darkness’ we get a real feel of the evolution of stars and of the universe. Tennyson and Hardy are the two writers who, after Shakespeare, demonstrate a real love, and deep knowledge of, the night sky.

The reason I comment on Shakespeare’s lack of awareness of the new astronomy is that he does seem to have a link to the English Copernicans and it would be surprising if he had not heard their ideas. The evidence for this link is also a key piece of evidence that the actor William Shakespeare of Stratford is truly the author of the plays of Shakespeare. It seems hard to doubt this when we read the eulogy of Ben Jonson, but people do persist in doubting that Will S. could have written these great plays. The evidence is in the names of those two treacherous friends of Hamlet, Rosencrantz and Guildenstern. These are not random names, but are in fact the names of two of the ancestors of the great Danish

astronomer, Tycho Brahe, who was a contemporary of Shakespeare. Tycho was in correspondence with the leading English Copernicans and in 1590 wrote to Thomas Savile enclosing his 1588 book describing his hybrid model of the solar system, along with four copies of his portrait, which is framed by a stone arch with heraldic shields bearing the names of his ancestors Sophie Gyldenstjerne and Erik Rosenkrantz. Tycho specifically asks Savile to remember him to John Dee and Thomas Digges. Thomas Digges (1546-1595), a member of John Dee's circle and whose guardian John Dee had become after the death of his father, had in his 1576 pamphlet *A perfit description of the caelestiall orbis*, taken the Copernican system to its logical conclusion and asserted that the stars extend to infinity.

Thomas's father Leonard was a well-known mathematician and has been credited with the invention of the telescope prior to Galileo. Thomas published new editions of his father's mathematical and scientific works and added material of his own. He also was also an MP from 1572-1586 and a friend of the poet Sir Philip Sidney.

One copy of Tycho's portrait ended up in the possession of Thomas Digges' younger son Leonard. Now the Digges and Shakespeare families were connected. Leonard Digges praised Shakespeare in a rather touching poem in the Folio edition of 1623. [It is said that Shakespeare lived near to the Digges' home when he was in London.] After Thomas Digges's death, his widow Anne married Thomas Russell, whom Shakespeare appointed overseer of his will. It seems likely that Shakespeare got the names for these two characters in his Danish play from Thomas Digges. They are in fact among the few characters in the play with Danish-sounding names. This link would make the Stratford actor Will Shakespeare definitively the author of Hamlet. However there is another route for Shakespeare to have encountered these names. In 1592 two members of a Danish diplomatic mission to London were Frederick Rosenkrantz and Knud Gyldenstjerne, two cousins of Tycho's, and perhaps Shakespeare came across these names then<sup>2</sup>.

Peter Usher in *Hamlet's Universe*<sup>3</sup> wants to take this connection a lot further and gives an allegorical interpretation of Hamlet, in which Claudius represents the Aristotelian, earth-centred world view encapsulated by Claudius Ptolemy, Rosencrantz and Guildenstern represent Tycho's hybrid model in which the planets revolve around the sun and the sun revolves around the earth, and Hamlet himself represents the new universe of Copernicus and Thomas Digges. Thus Hamlet has to kill off the competing but outdated world-views. It doesn't seem a very

brilliant allegorical outcome when Hamlet dies shortly after Claudius. There is also a suggestion that the *Tempest* may be partly based on an account of a voyage to Norway by James I which ran into bad weather and included a visit to Tycho Brahe on his island observatory, ie we have to identify Tycho with Prospero. However there is little reference to the stars in the *Tempest*. The *Tempest* is Shakespeare's farewell to the theatre and it seems more plausible to identify Prospero as Shakespeare himself.

To see Hamlet as an allegory about world-systems seems to be missing the point about what is so great about the character of Hamlet, and the extraordinary psychological depth of his four great soliloquies. But there are a couple of lines in Hamlet which give pause for thought. On the very first page, Bernardo says:

‘Last night of all,  
When yond same star that's westward from the pole  
Had made his course t'illuminate that part of heaven  
Where now it burns ...’

Once again Shakespeare showing that he is familiar with the rotation of the night-sky, but which star is Bernardo talking about? Prominent constellations near the pole are the Plough, which Shakespeare talks about elsewhere as the Bear or the Wain, and Cassiopeia, but these do not have any star that stands out. Several of the characters complain about how cold it is, so we are talking about a time around midnight during the winter. This would mean that Cassiopeia lies ‘westward of the pole’. Now Tycho had discovered and studied a very bright supernova in Cassiopeia in 1572. John Dee and Thomas Digges also wrote about this new star and Digges, like Tycho, demonstrated that it lay beyond the zone of the planets, so was in conflict with Aristotle's assertion that nothing could change in the celestial sphere. This new star would for a few weeks have been very obvious above the well-known W of Cassiopeia. Could Bernardo have been referring to Tycho's star? The only problem is that Shakespeare was only eight years old in 1572. Could someone have pointed out Tycho's astonishing new star to him and did this stick in his mind, or did Thomas Digges talk about it to Shakespeare when he was writing Hamlet?

By the way there is also a reference to ‘a new star’ in Ben Jonson's *Volpone*, written in 1605. It comes in a long comic list of prodigies:

SIR POLITICK WOULD-BE: Now heaven!  
What prodigies be these? The fires at Berwick!  
And the new star! these things concurring, strange,  
And full of omen! Saw you those meteors?

PEREGRINE: I did, sir.

SIR P: Fearful! Pray you, sir, confirm me,  
Were there three porpoises seen above the bridge,  
As they give out?

PER: Six, and a sturgeon, sir.

The second quotation which suggests the influence of Thomas Digges is Hamlet's famous remark: 'I could be bounded in a nutshell and count myself king of infinite space'. To us this sounds like natural, if dramatic, imagery. But the idea of infinite space, introduced by Thomas Digges in 1576, was extremely novel and revolutionary to times which were still drenched in centuries of Aristotle's finite universe. Infinite space would have been a mind-blowing idea in the late 16<sup>th</sup> and early 17<sup>th</sup> century, Here perhaps we do have a reference to the new astronomy of Copernicus, Tycho and Digges.

I've admitted that Edmund's assault on astrology in Lear does not come from a reliable witness. But perhaps we have to look again at Hamlet's letter to Ophelia. He writes:

'Doubt that the sun doth move'

meaning that you can't doubt that, therefore you can't doubt my love. However as Polonius and Claudius come to realize, and Hamlet makes pretty clear to Ophelia and the audience, he does not love Ophelia. Is Shakespeare saying to us that perhaps we do have to question whether it is the sun that moves? That would be amazing, but it would only make sense if Shakespeare was confident his audience would know what he was talking about. Somehow I doubt that Copernicanism had spread very far from John Dee's circle in England.

Shakespeare's astronomy is rich and diverse, rooted in knowledge of the night sky, permeated with what was still the majority Aristotelian world-view of the day. If he knew of the ideas of Copernicus, as seems highly likely, he gave them at most a passing reference.

From Aristotle he derived much more than just an astronomical world-view. Aristotle's ethics, perhaps imbibed via Montaigne. In his 'Shakespeare – the invention of the human', the American literary critic

Harold Bloom sees a strong link between Shakespeare and Montaigne. Of Hamlet Bloom writes:

‘This most extraordinary of all the Shakespearean characters ... is, amidst much else, a despairing philosopher whose particular subject is the vexed relationship between purpose and memory. And his chosen mode for pursuing that relationship in the theatre, of which he will display a professional’s knowledge and an active playwright’s strong opinions. His Wittenberg is pragmatically London, and his university must certainly be the London stage. We are allowed to see his art in action, and in the service of his philosophy, which transcends the scepticism of Montaigne and, by doing so, invents Western nihilism.’

Thus Bloom links Shakespeare with Aristotle, via Montaigne, and makes Hamlet the originator of the existential terror of Pascal and Sartre. The issue of whether Shakespeare was strongly influenced by Montaigne is much debated. There is little dispute that Shakespeare’s late play *The Tempest* was influenced by Montaigne’s essay ‘On Cannibals’. Gonzalo’s description in Act II Scene I of an ideal commonwealth is almost a direct quotation from Montaigne. Montaigne’s essays were first translated into English in 1603 by John Florio, who was a tutor to Shakespeare’s patron, the Earl of Southampton. For Hamlet, written in 1600-1, to have been influenced by Montaigne, as argued by Bloom and others, requires Shakespeare to have seen an earlier draft of Florio’s translation. As Bloom writes<sup>4</sup>:

Presumably, Shakespeare had read Montaigne in Florio’s manuscript version. Nothing seems more Shakespearean than the great, culminating essay, ‘Of Experience’, composed by Montaigne in 1588, when I suspect Shakespeare was finishing his first Hamlet.’

In 1925 George Coffin Taylor examined Shakespeare’s plays and matched passages in them to Montaigne’s essays. In his *Shakespeare’s Debt to Montaigne* Taylor found fifty-one passages in Hamlet and twenty-three in Lear that matched<sup>5</sup>. He assembled a list of hundreds of words and phrases, many obscure, that appear in Florio’s 1603 translation of Montaigne and that are used by Shakespeare in plays written after 1603, but which never appear in plays prior to that date. To a scientist this looks like good evidence that Shakespeare had read Montaigne.

There are two direct references to Aristotle in Shakespeare's plays. In *The Taming of the Shrew* Lucentio's man Tranio says (Ii):

‘Let's be no Stoics nor no stocks, I pray,  
Or so devote to Aristotle's checks  
As Ovid be an outcast quite abjur'd.  
Balk logic with acquaintance that you have,  
And practise rhetoric in your common talk;  
Music and poesy use to quicken you;  
The mathematics and the metaphysics,  
Fall to them as your stomach serves you.’

Tranio is advising against excessive study but he is aware that Aristotle has written books on Logic, Rhetoric, Poetics and Metaphysics.

Even more interesting is the reference in *Troilus and Cressida*, where Hector says (Iiii):

‘Paris and Troilus, you have both said well;  
And on the cause and question now in hand  
Have glaz'd but superficially; not much  
Unlike young men, whom Aristotle thought  
Unfit to hear moral philosophy.’

Now this is a direct quote from Aristotle's *Ethics*, a work that was freely available in English translation in Shakespeare's lifetime. Perhaps we have been misled by Ben Jonson's famous line in his dedicatory poem to the First Folio:

‘And though thou hadst small Latine, and less Greeke’

to assume that Shakespeare was uneducated and unread. When Friar Lawrence eulogizes the benefits of plants and herbs in *Romeo and Juliet* (IIiii) he is expounding an Aristotelian harmony and balance. At the same time in the character of Holofernes in *Love's Labour's Lost* he parodies the pedantry of the schoolmen.

So Shakespeare encapsulates the intellectual world of Aristotle, but seems to hint at the arrival of the Copernican system. As he was writing his exact contemporary Galileo was plotting the overthrow of Aristotle's physics.

26/8/15

1. Hanno Wember *Illuminating Eclipses* Brief Chronicles II, 31, 2010
2. James R. Voulkel *Johannes Kepler and the new astronomy*, OUP 1999
3. Peter Usher *Hamlet's Universe* Aventine Press 2006
4. Harold Bloom *Shakespeare: the Invention of the Human* Fourth Estate 2008
5. G.C. Taylor *Shakespeare's debt to Montaigne* Harvard University Press 1925