

JONATHAN TAYLOR

POETRY, COSMOLOGY, COSMOGONY

Synopsis

This reflective essay investigates the relationship between, on the one hand, my own creative practice and, on the other, cosmological discoveries, both old and new. It presents, contextualises and discusses a series of poems from my new collection, *Musicolespy* (Shoestring Press, 2013), all of which, in very different ways, negotiate and explore the linguistic boundaries and overlaps between poetry and cosmology. Specifically, poetry provides a space in which the sometimes casual, sometimes deep-rooted analogies, metaphors and allusions of popular scientific discourse can be probed, dissected, stretched or exploded. In this way, poetry itself might be seen to embody a kind of pseudo-scientific sphere of experimentation, when applied to scientific language.

Biography

Jonathan Taylor is Lecturer in Creative Writing in the University of Leicester, U.K. He is author of the poetry collection *Musicolespy* (Shoestring Press, 2013), as well as the novel *Entertaining Strangers* (Salt, 2012), and the memoir *Take Me Home: Parkinson's, My Father, Myself* (Granta Books, 2007). He is editor of the anthology *Overheard: Stories to Read Aloud* (Salt, 2012). His academic monographs are *Science and Omniscience in Nineteenth-Century Literature* (Sussex Academic,

2007), and *Mastery and Slavery in Victorian Writing* (Palgrave-Macmillan, 2003). His website is www.jonathanptaylor.co.uk.

Essay

1.

Mysteries do not lose their poetry when solved. Quite the contrary; the solution often turns out more beautiful than the puzzle.

– Richard Dawkins, *Unweaving the Rainbow*

In my new collection, *Musicolepsy* (Taylor 2013), one of my primary aims is to explore the poetry of ‘solutions’ (to use Dawkins’s questionable term) in modern cosmology. This is rich and still relatively under-explored territory; as Steve Sneyd remarks, ‘so much science today, particularly at its more speculative edges, provides treasure ships for the poet to loot’ (Sneyd 2012, 19). My collection does just that – ‘looting’ some of the language of speculative cosmology for its own creative ends. In this way, it also extends a number of the central concerns and images from my earlier monograph, *Science and Omniscience in Nineteenth-Century Literature* (Taylor 2007); in scientific terms, the poetry collection might be said to represent the empirical investigation, through creative practice, of the monograph’s hypotheses.

The collection opens, for example, with a short sequence of ‘cosmological’ poems which draw on some of the images first explored, theoretically speaking, in the monograph. These poems were written for, and first published by, N.A.S.A.’s Chandra X-Ray Observatory at Harvard. In these cases, the poetry was already ‘there,’ waiting to be found – not just in N.A.S.A.-Chandra’s discoveries (or ‘solutions’) themselves, but more significantly in the language used to disseminate

those discoveries to wider audiences, beyond the immediate scientific community – in, for example, N.A.S.A.-Chandra’s official press releases. Poetry represents a space in which it is possible to explore and interrogate the images used by scientists (whether self-consciously or casually) in such forms of ‘popularising’ discourse; in poetry, a writer can extend their metaphors, explore their connotations, allusions and associations. No doubt this is a matter of ‘play,’ in a profound sense; as the poet David Morley comments, ‘creative writing’s job is to reintroduce us to play,’ such that ‘the concision and play of poetic technique’ can be used ‘to understand and communicate the concision and play of the languages of ... science’ (Morley 2007, 54, 242).

Specifically, the ‘play of poetic technique’ can aid in the understanding of popular scientific metaphors and analogies. Through playful techniques such as metaphorical extension, defamiliarisation, allegory, personification, anthropomorphisation, even *reductio ad absurdum*, poetry can shed light on the language associated with dominant scientific paradigms. It can explain, contextualise and crucially historicise this language, in ways which may be unavailable to, hidden from, or unconscious within the scientific paradigms themselves. ‘To search for a meaning,’ writes Michel Foucault in *The Order of Things*, ‘is to bring to light a resemblance’ (Foucault 1989, 29) – and that is precisely what poetry can do in this context: it can search for hidden ‘meanings’ in science, by bringing to light and exploring common scientific ‘resemblances’ (that is, common similes, analogies, metaphors).

Such an exploration is by no means necessarily superficial, even where the metaphors and analogies used by scientists are themselves apparently casual, semi-conscious or superficial. Certainly, many of these images are *apparently* used

merely to popularise discoveries, and hence might be at once revealing and misleading; superimposed on data, they may, like all interpretive tools, both elucidate and distort that data. After all, to establish an analogy or resemblance is, by definition, to establish a connection between two things both like and, implicitly, unlike each other – so such analogies and resemblances are, by definition, partly misleading if taken literally. This is perhaps most obviously the case in popular scientific discourse, where the analogies and resemblances used are, at least ostensibly, a matter not only of elucidation, but also of simplification. These images are public-facing: they are, to some extent, there to aid public understanding, to make accessible to a wider audience complex notions, which may be based on inaccessible mathematics and astronomical data. As Morley remarks, there is a ‘two-way traffic’ (Morley 2007, 242) between science and poetry, in that science itself uses poetic techniques to disseminate its findings, with the same intention as poetry: that is, to create vivid and memorable images in its audience’s mind, which bear *some* relation to ‘reality.’ In this sense, it might be assumed that the images used are retrospective, extraneous, decorative – that the metaphors and analogies are secondary to the ‘reality’ of the discoveries themselves.

No doubt there is some truth in this; but, in recent decades, science studies has come to complicate the idea that scientific discovery comes first, language afterwards. In *The Structure of Scientific Revolutions*, Thomas Kuhn paves the way when he famously suggests that scientific paradigms should be defined by their ‘preferred or permissible analogies or metaphors’ (Kuhn 1996, 10). For Kuhn, analogies and metaphors do not function as merely extraneous, retrospective explanations of scientific paradigms; rather, these paradigms are fundamentally linguistic constructions which ‘perceptually and conceptually subdivide [the universe]

... in a certain way' (Kuhn 1996, 129). Kuhn's view is representative of a general trend in modern scientific theory, as Gillian Beer points out in *Darwin's Plots*:

the role of analogy and metaphor in the formation of scientific theory ... has been a preoccupation of philosophers and historians of science during the past thirty years There has been a shift away from the kind of work which saw metaphor as decorative and extraneous to the process of [scientific] thinking (Beer 2000, 83).

In this context, the poet's – and, for that matter, literary critic's and philosopher's – ability to explore creatively the dominant analogies and metaphors of scientific paradigms is not, or not merely, an ability to explore what is superficial, extraneous or decorative. Rather, it is also to explore what is fundamental and formative, since, for Beer, Kuhn and others, scientific analogies and metaphors often define and pre-determine the scientific paradigms which they purport to describe. Scientific paradigms are themselves linguistic constructs, and scientific discourse at all levels uses – is, indeed, shaped by – poetic techniques such as analogy and metaphor. At the most fundamental level, this is what poetry about science can expose: the sometimes-unconscious, sometimes-half-conscious poetic structure of scientific discourse.

What follows, then, are some examples of poetic experiments in this field – some examples of poems which explore the structural overlaps between scientific discourse and poetry, often in very different ways and contexts. They seek to trace parts of what Foucault famously calls 'the web of resemblances' (Foucault 1989, 17), in this case within cosmological discourse.

2.

The opening poem of my collection *Musicolespy*, '!!**&@??,' attempts to extend the metaphors of one of N.A.S.A.-Chandra's popularising press releases *ad absurdum*. It originates in a press release from 11th August 2011, entitled 'A Cosmic Exclamation Point,' concerning two interlocking galaxies, otherwise known as 'VV340' or 'Arp 302.' According to N.A.S.A.-Chandra, the image

provides a textbook example of colliding galaxies seen in the early stages of their interaction. The edge-on galaxy near the top of the image is VV340 North and the face-on galaxy at the bottom of the image is VV340 South. Millions of years later these two spirals will merge. VV340 is located about 450 million light years from Earth (N.A.S.A.-Chandra 2011).

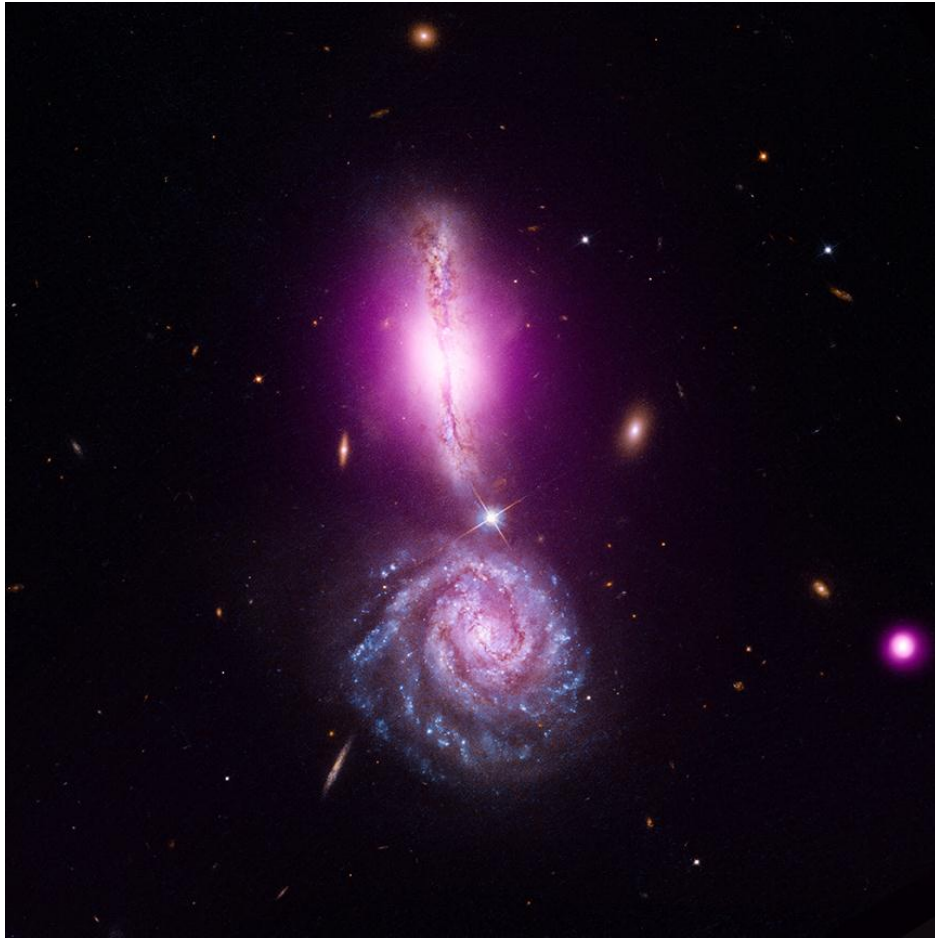


Fig. 1, 'VV340,' courtesy of NASA Chandra X-Ray Observatory, Composite of X-ray NASA/CXC/IfA/D.Sanders et al; and Optical NASA/STScI/NRAO/A.Evans et al.

What fascinates me here is the analogy between galaxies and punctuation – galaxies as 'Exclamation Points.' Here, it seems, is a strangely literal example of the universe being 'subdivided ... in a certain way' by language, as Kuhn puts it; by imposing a linguistic symbol on this cosmic phenomenon, the press release implies an allegory, at least in nascent form, about the crucial role of language in scientific perceptions of the universe. I felt that such an allegory might be poetically explored and, indeed, extended much further, to encompass many other cosmological bodies, including some of those listed alongside VV340 in Halton Arp's strange book, *Atlas of Peculiar Galaxies* (Arp 1966). The allegory might also be extended backwards:

although here it features in a very modern context, it also seems distantly (and maybe unconsciously) related to the Christian idea of the universe as the 'Word of God' – that is, from John 1: 'In the beginning was the Word, and the Word was with God.' No doubt there is an irony embedded in this implicit connection with Christian creationism; as the critic Elizabeth Leane suggests, 'physics popularisers ... [often] fight against popular creationism, but fight for scientific cosmology by turning to the rhetoric of creationism' (Leane 2001, 88). Having said that, in the case of N.A.S.A.-Chandra's press release, the rhetoric is subtly altered, complicated, maybe even subverted. The Word of God, in this modern context, seems to be under erasure, as a series of punctuation marks – reminiscent, perhaps, of the way in which swearing is notated in, for example, old comic books:

!!**&@??

After N.A.S.A.-Chandra X-Ray Observatory, 'A Cosmic Exclamation Point,' 11 August 2011.

In the beginning was the Word, and the Word was with God.

– John, 1

302 in Arp's *Atlas of Peculiar Galaxies*
is UGC-9618, 450 million
light years away in Boötes constellation,
plunging shard VV340 North
piercing spiral eye VV340 South,
its million years of shrieking and shock
expressed as infrared exclamation mark,

in a night sky light-years-full of cosmic
punctu-radi-ation: stars asterisks,
Saturn in parenthesis, comets dashes,
binaries colons or semi-colons
depending on relative masses,
Horsehead Nebula a question,
black holes full-stops in gravitation,
Arp's gallery of galaxies

ampersands, dittos, obeli, ellipses –

and a typo-cosmographist might decipher
the universe as a Word under erasure,
a daring act
of apocalyptic swearing.

3.

If ‘!!**&@??’ explores a pseudo-Christian subtext in a modern cosmological context, the second poem in my N.A.S.A.-Chandra sequence, ‘Black Hole in B-Flat,’ attempts to reconnect one of N.A.S.A.-Chandra’s discoveries with a much older, mystical and philosophical tradition of astronomy. It originates in one of N.A.S.A.-Chandra’s most well-publicised discoveries. In 2003, scientists detected ‘for the first time, sound waves from a supermassive black hole’ (N.A.S.A.-Chandra 2003). The black hole emitting soundwaves was in the Perseus Cluster, and the soundwaves were said to be a B-flat, 57 octaves below middle-C. What poetry allows me to do is explore the uncanny resemblances between this modern cosmological discovery on the one hand, and older notions of the Music of the Spheres on the other:

Black Hole in B-Flat

Astronomers using N.A.S.A.’s Chandra X-ray Observatory have found, for the first time, sound waves from a supermassive black hole
– N.A.S.A.-Chandra, 9 September 2003

For 2.5 billion years you’ve groaned,
B-flat 57 octaves below middle-C.

For 2.5 billion years you’ve moaned
for no-one, because no-one
could hear you from Perseus Cluster

250 million light years away,
your galactic ground-bass a million billion
times lower than human hearing,
dog hearing, even Keplerian hearing,

who would have been hard pushed
to retain an equal temperament
in the face of such monotony –
more monkish medieval drone
than planetary polyphony,

as if Palestrina never happened,
and Bach dozed off at the organ
shortly after the Big Bang,
his elbow resting on a pedal point
over which he dreamt his flickering fugues,
short-lived as novas,
 short-lived as life,
 short-lived as anything but you,
 and all-too-soon
 sucked back down
 into your B-flat abyss.

4.

Another N.A.S.A.-Chandra press release which uses apparently-obsolete language and imagery – language and imagery which modern science is supposed to have superseded – is suggestively entitled ‘Ghost Remains After Black Hole Eruption’:

N.A.S.A.’s Chandra X-ray Observatory has found a cosmic “ghost” lurking around a distant supermassive black hole. This is the first detection of such a high-energy apparition, and scientists think it is evidence of a huge eruption produced by the black hole. This discovery presents astronomers with a valuable opportunity to observe phenomena that occurred when the Universe was very young. The X-ray ghost [is] so-called because a diffuse X-ray source has remained after other radiation from the outburst has died away “We’d seen this fuzzy object a few years ago, but didn’t realize until now that we were seeing a ghost,” said Andy Fabian of ... Cambridge University in the United Kingdom. “It’s not out there to haunt us, rather it’s telling us something – in this case what was happening in this galaxy billions of year ago” (N.A.S.A.-Chandra 2009).

The following poem, then, explores the ways in which the language of modern cosmology is haunted by ghosts of its past; in this case, the analogy used to encompass a particular phenomenon is explicitly indebted to apparently 'older,' proto-rationalist forms of knowledge and language – that is, the language of the supernatural. Moreover, the poem also explores ways in which the universe itself, for modern cosmologists, is a kind of museum, or living record of the past – how, that is, modern cosmology represents an attempt to read the past of the universe from the present; as John Barrow notes, modern cosmology depends on the assumption that the 'present structure of the universe ... [is somehow a] reflection ... of the way the universe began,' so that 'it might be possible to determine something about the initial state of the universe by observing it today' (Barrow 1994, 18). This assumption is the poem's starting-point:

History Lesson

N.A.S.A.'s Chandra X-ray Observatory has found a cosmic 'ghost' lurking around a distant supermassive black hole.

– N.A.S.A.-Chandra, 28 May 2009

Telescoped, the universe is a vast memory,
an over-long school-lesson in cosmic history,
background radiation droning on and on
from 300,000 years after the big bang,
remembering anything big enough (not us);

black-holes are hangover-haunted by X-ray fuzz,
groaning about binges on long-ago nights
which climaxed in billions of star-bursts of vomit
heaving energy across light-years of galaxy
as if these mouths had consumed something too spicy;

supernovae remember how they first happened,
old men reminiscing in star-remnants' patterns
about halcyon days, when they were suns too,
until thermonuclear dementia tore through

their molten synapses

– and we know that
when any-sun forgets so much is lost, past,
local light-years of knowledge, years in the million,
till nothing is left except a history of billions.

5.

Whereas 'History Lesson' concludes with a sense of human insignificance ('nothing is left except a history of billions'), in other poems, I do manage to find space within contemporary scientific discourse for more human, subjective, personal emotions.

This is a matter, in a broad sense, of personification or anthropomorphisation, where human emotions and experiences can somehow be located within, or connected to, scientific imagery – where, that is, the subjectivity of human emotions and experiences can meet the supposed objectivity of scientific discourse.

For instance, the poem 'Thermodynamic Equilibrium' mixes the language of mathematics and physics with a more personal subtext. It looks forward (rather than backward, as in the previous poems) to the idea of universal 'heat death,' whereby, according to the Second Law of Thermodynamics, one possible ending of an ever-expanding universe is a state of thermodynamic equilibrium. According to the Second Law, 'energy has a tendency to migrate as heat from hot to cold, [but] the reverse migration is not spontaneous' (Atkins 2010, 32); so one logical end-point of an ever-expanding universe is a state in which all bodies gradually attain the same, levelled-out temperature. The poem refers to the great physicist Ludwig Boltzmann, originator of the famous equation $S = k \cdot \log W$, which is inscribed on his tombstone, and which is one of the major expressions of the Second Law of Thermodynamics:

Thermodynamic Equilibrium

You knew your laws of thermodynamics:

that energy transfers from hotter bodies
to colder ones – a process not
spontaneously reversible;

so perhaps you knew too that

it'd only be after 10^{100} years
or thereabouts, following the dark era
of leptons and photons hanging out,

it'd only be in that final heat death
of maximum entropy, when
microstasis equals macrostasis

and nothing, no stars, no planets,
no graves can happen any longer
forever and ever and ever,

only then would we again
be the same temperature,
and $S = k \cdot \log W$ –

where entropy (S)
is Boltzmann constant (k)
times the natural logarithm of microstates
consistent with macrostate (W) –

will no longer pertain.

6.

If the personal connotations in this poem are muted, implied rather stated, in the poem 'Cine-Camera,' they come to the surface. Whereas, in the previous poems, the scientific images are, to a greater or lesser extent, primary and dominant, here the

personal experiences become the primary focus, in the context of an extended cosmological conceit. Even more so than ‘Thermodynamic Equilibrium,’ the poem allows me to explore personal and subjective themes within a scientific linguistic frame – and no doubt this is part of poetry’s special territory in relation to science.

In both ‘Thermodynamic Equilibrium’ and ‘Cine-Camera,’ the linguistic frame is that of modern cosmology’s massive time spans – its ‘history of billions’ – and both poems attempt to relate these time spans to human, subjective experience. Whilst ‘Thermodynamic Equilibrium’ travels forwards, though, to the final ‘heat death’ of the universe, ‘Cine-Camera’ does the opposite: it embodies a kind of poetic cosmogony, travelling backwards, ultimately to the very beginnings of the universe:

Cine-Camera

We walk about, amid the destinies of our world-existence, encompassed by dim but ever present Memories of a Destiny more vast – very distant in the bygone time, and infinitely awful.

– Edgar Allan Poe, *Eureka*

Cine-cameraing backwards,
that was what we demanded
on those projected afternoons,
as forward history was consumed

by a flickering bluish flame
imposed on our childish games
like some retrospective truth;
but we craved comedy not combustion,

and at ten it was always amusing
to see slides un-sliding,
sandcastles untrampling,
father’s faces unlining,

leavings un-waving –
and I thought the back-spooling
might undo forever
if father were distracted from projector,

forgetting the off-switch,
before the first cartridge,
re-embryoing the family,
Super-8 de-historied –

then faster, wars parting like seas,
flattened empires arising like soufflés,
apes gladly unshackled
from learning, dinosaurs slinking back

to the sea, fish consumed by fires –
then faster still, systems, stars,
sucking in cheeks with pop and crackle,
tracing the way home, in a borealitic smile

13.7 billion years long,
where the film almost comes
to a halt, what is left of the universe
cooly pin-pirouetting in slow reverse

through its last million years
and coalescing lakes of quark tears
to the final 10^{-6} of a second,
slowing almost to the point of points,

that pre-Planck moment,
when density, temperature were infinite,
and encased in prismatic rainbows
were all laws, histories, camera frames,

and we – supernovae, black holes, galaxies,
slid slides, crushed sandcastles –
merely the epiphenomenon
of that first shattering, that blue flaming.

7.

If 'Cine-Camera' moves backwards through cosmic history to a 'first shattering,' my poem 'Mysterium Cosmographicum' moves backwards on a smaller scale, through human history. It does this in order to explore an earlier model of the universe, from

Renaissance astronomer Johannes Kepler (1571-1630), a figure who, in a sense, 'haunts' the collection as a whole. One of the things poetry is able to do, of course, is explore and even revivify older metaphors of science in modern language – just as, in a different way, 'Black Hole in B-Flat' makes conscious the connections between modern cosmology and the ancient mystical tradition of the 'Music of the Spheres.' Whereas a progressive model of scientific discourse defines itself precisely by the supersession of 'obsolete' forms of knowledge, poetry can expose the hidden connections between modern science and older traditions and concepts. Indeed, it can demonstrate the continuing vitality, in intellectual, linguistic and aesthetic terms, of such traditions and concepts, even where their absolute scientific 'truth' has since come into question. Simultaneously – and these two facets of scientifically-informed poetry are not mutually exclusive – poetry can also demonstrate the ways in which *all* scientific analogies about the universe are transient and historically-determined linguistic constructs imposed on the fundamentally unknowable – all scientific models are, in a sense, universes 'made only out of paper,' to quote my own poem. In broad terms, then, what I attempt to explore in this final poem is a general allegory about scientific analogies, their linguistic bases, their historical transience, their strengths and limitations, and – just as importantly, at least in poetic terms – their conceptual and aesthetic beauty.

The poem focusses on Kepler's work *Mysterium Cosmographicum* (1596), where he sought to demonstrate the perfect analogy between the five Platonic Solids (tetrahedron, cube, octahedron, dodecahedron, icosahedron) and the orbits of the five planets (that is, the five planets which were then known). In other words, he mapped onto his calculations of the orbits of the five planets the perfect geometry of the Platonic solids; as Arthur Koestler explains,

There existed only five perfect solids – and five intervals between the planets. It was impossible [for Kepler] to believe that this should be by chance, and not by divine arrangement It ... answered the question why the distances between the orbits were as they were. They had to be spaced in such a manner that the five solids could be exactly fitted into the intervals, as an invisible skeleton or frame. And lo, they fitted! Or at least they seemd to fit, more or less (Koestler 1968, 252-3).

In order to show how they fitted in *solid* form, Kepler also designed a physical model – a kind of analogy-made-real – of his perfectly-proportioned solar system for his patron, the Duke of Württemberg. The model, which would be richly decorated, would be a wonderful status symbol for the Duke, Kepler thought – because, as well as demonstrating his new astronomical findings, it was also a kind of mini-bar. That is, the model actually dispensed drinks. Unfortunately, it was never made.

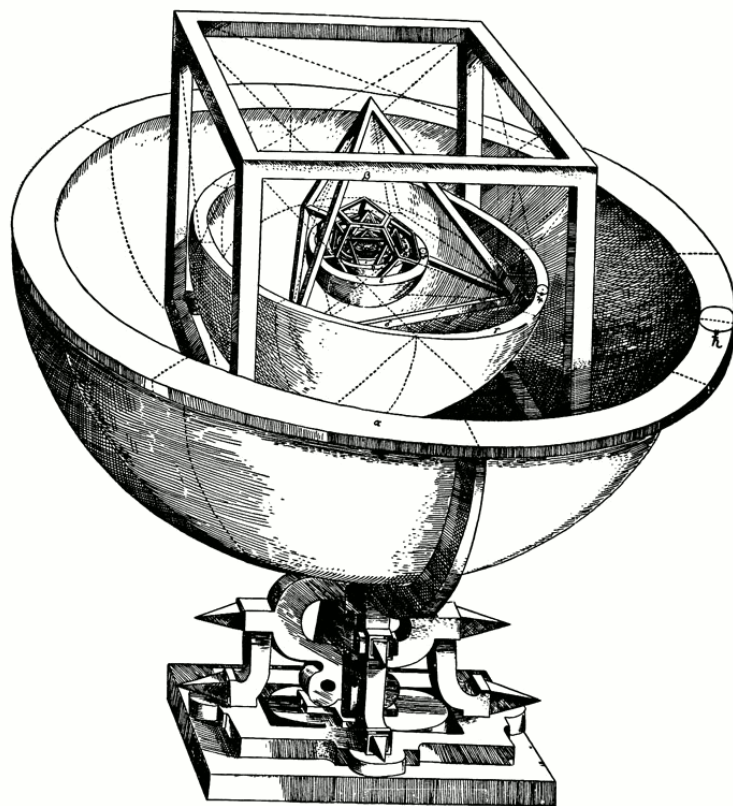


Fig. 2, 'Mysterium Cosmographicum'

Mysterium Cosmographicum

To Frederick, Duke of Württemberg, 25th February 1596.

Your Grace,
My Natural Sovereign,

described herein, as you requested,
is my remarkable recipe for the Universe,
polyhedra of which should be constructed
by different craftsmen, so that the perfect
geometry of Platonic solids with five orbits
remains secret:

starting-point is Earth's orbit
figured as hemisphere in dodecahedron,
inscribed in Mars's orbit inside tetrahedron,
the circle surrounding which is Jupiter,
inscribed in a cube encircled by outer
casing, the circumgyration of Saturn;

in turn,

Earth's circuit encloses icosahedron,
then hemisphere for Venus, octahedron,
inside of which is the orbit of Mercury,
with our glorious Sun, decorated tastefully,
centred, as Copernicus well knew it to be.

And from the Sun, Moon and planets,
Your Grace will be pleased to hear,
issue seven Solar System drinks,
aether in each planetary hemisphere
channelled through concealed pipes
to Saturn's rim and convenient taps,
Venus dispensing mead, Mercury brandy,
Mars vermouth, Sun *Aqua vitae*,
Moon water, Jupiter a fresh white wine,
Saturn a bad-beer-trap to ridicule ignorance
of those who, unlike yourself, know nothing of science
or alcohol.

And the totality of this Universe
will be no more than an ell in diameter,
with diamonds for Saturn, jacinth for Jupiter,
pearl for the Moon, all orbits and polyhedra,
of course, intricately fashioned in silver,
so Your Grace will own something more glorious
than any Creation bowl of Timaeus

or that overrated ugly Mug of Nestor.

I have built a prototype so you can see
what I describe more clearly;
at present, however,
my Universe is made only out of paper.

*Your Obedient Servant, Johannes Kepler,
Mathematicus of the Illustrious Estates of Styria.*

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