

DECEMBER 2016 • VOL. 57 • ISSUE 6

WHEN ART MET SCIENCE

How conversations with scientists
inspired a group of artists



Beneath the crust Exploring the North American craton

Women then and now The past 100 years – and the next?

Diamonds in the sky The 2016 Presidential Address on white dwarfs



COVER What do art and science have in common? Conversations between artists and astronomy and planetary science researchers suggest that creative thinking and curiosity drive both groups. The cover shows *Fusion*, oil on canvas, 76x76 cm, by lone Parkin RWA, one of the artists involved in an RAS-funded exploration of the links between these two cultures. Find out more on pages 6.28–6.31. (lone Parkin RWA)

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ASTRONOMY & GEOPHYSICS publishes news reviews and comment on topics of interest to astronomers and geophysicists. Topical material is preferred. Publication will be as fast as is compatible with authors' responses. Contact the Editor or see <http://www.ras.org.uk> for further information.

EDITOR Sue Bowler
 School of Earth and Environment,
 University of Leeds, Leeds LS2 9JT, UK
 Tel: +44 (0)113 343 6672
 Email: s.bowler@leeds.ac.uk

MANAGEMENT BOARD
 Chair: **Ian Crawford** Birkbeck College,
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The Council of the RAS

ROYAL ASTRONOMICAL SOCIETY
 Burlington House, Piccadilly, London
 W1J 0BQ
 Tel: +44 (0)20 7734 4582 or 3307
 Fax: +44 (0)20 7494 0166
 Email: info@ras.org.uk
 Web: <http://www.ras.org.uk>

OPENING HOURS (Monday to Friday)
Offices: 9.30–17.00
Library: 10.00–17.00

STAFF CONTACTS
Executive Secretary
 Pamela Mortimer pm@ras.org.uk
**Deputy Executive Secretary/
 Press Officer**
 Robert Massey rm@ras.org.uk

OXFORD UNIVERSITY PRESS
 Produced for the RAS by OUP, Great
 Clarendon Street, Oxford OX2 6DP, UK
 Tel: +44 (0)1865 353895
 Email: astro@oup.com

This journal is available online at:
<http://www.astrogeo.oxfordjournals.org>

Subscriptions: http://oxfordjournals.org/our_journals/astrogeo/access_purchase/price_list.html

OXFORD
 UNIVERSITY PRESS

DESIGN AND PRODUCTION
Paul Johnson
<http://www.higgs-boson.com>

A&G is published bimonthly
ISSN 1366-8781 (print)
ISSN 1468-4004 (online)

DISTRIBUTOR Mercury Media
 Processing, 1634 E. Elizabeth Ave,
 Linden, NJ 07036, USA. Periodicals
 postage paid at Rahway, NJ and at
 additional entry points. US Postmaster:
 send address changes to A&G, c/o
 Mercury Media Processing, 1634 E.
 Elizabeth Ave, Linden, NJ 07036, USA.

PRINTED by Rotolito Lombarda, Italy



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Creativity and curiosity: when art meets science



LONE PARKIN RWA

Artists **Lone Parkin, Alison Lochhead** and **Gillian McFarland** describe how they have generated a body of work in connection with astronomers, cosmologists and planetary geologists.

We are fascinated, as artists, by exploring the fabulously rich imagery of space, engaging in creative dialogue with space researchers and gaining new insights into the dynamic forces of the universe. The immensity of the subject matter is almost overwhelming: our initial response is one of utter awe and wonder. How do we begin such a journey of aesthetic exploration?

The idea for our project began in 2015 when the Herschel Museum in Bath approached Gillian McFarland to generate arts educational workshops. Ideas gathered momentum, serendipity intervened and new connections were made. Gillian, Alison and I introduced ourselves to Martin Barstow of the University of Leicester, then President of the RAS. We were awarded initial funding from the RAS to enable us to begin our research. We are now involved in conversations with a number of astronomers from the university and the National Space Research Centre. We have visited Sara Russell of the Natural History Museum and handled meteorite samples from the collection. Carolin Crawford of the Institute of Astronomy, Cambridge invited us, through Acuity Arts, to give presentations of our work and we are now involved in creative dialogue with a group of postdoctoral researchers from the IoA. We are working towards an exhibition during the Cambridge Science Festival 2017, again invited by the IoA. Longer term plans involve developing a touring exhibition through Acuity Arts, devising educational science/art workshops and delivering



1 (Left) Lone Parkin's *Elemental Perspectives II*, mixed media on paper.

2 (Above) Pouring molten iron for one of Alison Lochhead's works.

talks with the aim of widening access and encouraging the participation of a new audience engaging in the arts and sciences.

At the University of Leicester we have had conversations about a range of subjects. Martin Barstow has spoken with us about white dwarfs, ephemeral galactic gas halos, cosmic timescales, image capture and use and analysis of ultraviolet, X-ray and visible light. Nial Tanvir has described the Andromeda Galaxy, gamma-ray bursts, matter and anti-matter and how time and space become entangled at the edge of the known universe. John Bridges has introduced us to the Mars Science Lab, HiRISE images and digital elevation models for the surface of Mars, as well as the Stardust samples, X-ray data and first-hand observations of the atomic lattices of martian meteorites.

Mark Simms, from the National Space Research Centre, has given us insights into image-making technology, showing us X-ray images of exploding stars, their blast waves and debris rings and describing the new-generation X-ray camera MIXS, which will study the composition of Mercury.

We heard stimulating presentations at the Institute of Astronomy from postdoctoral researchers: Denis Erkal on galaxy formation, the filamentary structure of the cosmic web and the Illustris Simulation; Tom Haworth on how light affects the chemistry of star formation, using Hubble Deep Field images; Amaury Triaud on the search for Earth-like planets; Morgan Fraser on optical astronomy of supernovae and transients; and Deyan Mihaylov on gravitational waves and black hole mergers (see box "The astronomers' views").

This rich intake of ideas, inspiration and aspiration from the scientific community has helped us drive creative processes within our own studio practice as artists – our creative laboratory. What has struck all of us – artists and scientists – is the similarities of approach, the parallels of process, the desire not just to observe but to look beyond. We are excited by the anomalies found within a broader pattern of order and are intrigued by ambiguity and uncertainty. There is a spark across the art–science "divide" – and this has provided a catalyst for change within our work as artists.

Gillian McFarland

Gillian has been working with experimental glass-blowing techniques. She works with a master craftsman, Graeme Hawes, to produce "space globe" pieces that echo ideas of the expansion and contraction of raw materials. She says of her

work: "The glass-blowing process is to me an enactment of post-Big-Bang processes with extreme heat, constant rotation and spinning, the materials pushing outwards in the turmoil to separate or converge, pushing forms and colours into a sense of order." During the firing process,

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"We are excited by the anomalies found within a broader pattern of order"



3 (Above) Gillian McFarland's glass *Formations*.

4 (Right) Detail from Ali Lochhead's mixed-media sculpture *IV*.

fragments of materials such as sulphur, iron oxide and silver nitrate are sprinkled onto the surfaces of the glass bulb and then disperse across the surface, fracturing and affecting the colour, transparency and opacity of the final piece (figure 3). She has experimented with leaving some of these forms in the furnace longer than required to achieve a perfect sphere; the glass globe then begins to collapse and fold back in on itself. Compelling and beautiful, these orbs generate in the observer the desire to touch and handle them – as if to hold the universe in the palm of your hand – and simultaneously sense the extremes of scale, the minuteness of the human in the vastness of space and the fragility of substance.

In her punctured paper works, Gillian is exploring the idea of “history and time wrapping around in every direction we gaze ... a repeated action radiating outwards that can be viewed from both sides of the sheet of paper ... where a squeeze in one dimension becomes a bulge in another”. These works on paper bring to mind orbits, with the sense of tracking regular pathways across an otherwise empty space. The images provoke and intrigue – asking questions about what is revealed and concealed beneath the surface of things. They are spellbinding, meditative pieces.

Ione Parkin RWA

Royal West of England Academician Ione is an abstract painter interested in creating an aesthetic synthesis from the diversity and interconnectedness of the natural world. Through this project she has become fascinated by ideas about the early formation of the universe: the massive clouds of cosmic dust and gas; vast webs of colour and shimmering light; luminous visions



of immensity; scale and unfathomable distance; the forces that drive the perpetual cycles of destruction and creation and how the raw beauty of astronomical entities can be produced by such violent and extreme reactions. Luminosity and radiance are important to her and she aims to create a sense of light held within, and emanating from, the painting. She feels that each painting is part of a greater whole – a fragment of infinity – and each image could continue way beyond the confines of the canvas itself (see the cover image this issue). The observer looks down onto swirling turbulent movements, vast distances and nebulous, coalescing cloud-like forms – Ione's own blend of materiality and atmospherics.

In her mixed media works on paper, she is inspired by planetary surfaces and the

underlying processes involved in creating those surfaces – from the inside out. Her creative interpretation involves a multi-layered approach, including crumpled

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“The raw beauty of astronomical entities can be produced by violent reactions”

paper, raw pigments, graphite and powdered metals, to render, mimic and respond to those surfaces – as if creating fragments of flayed planet-skin – and generate a

body of work that represents “Speculations on Undiscovered Planets”. She has been experimenting with pearlescent paints and crackle glazes, sometimes working on the reverse of the paper to reveal fissures and cracks on the visible surface. These are restless images – a seething surface of tectonic tensions expressing the primal power of extreme environments.

Alison Lochhead

Alison is a sculptor and works with the

The astronomers' views

Four astronomers (all Institute of Astronomy, Cambridge) discuss their collaborations.

Amaury Triaud

"Humans need to express themselves. Some are artists; I am a scientist. Finding out what lies above our heads and understanding it is essentially my medium. Although our ways of expression may differ, both the arts and the sciences require, above all, curiosity and creativity. It is therefore natural that a conversation should arise between our small group of astronomers and Gillian, Alison and Ione. We are all interested in something that transcends our perceptions and explores the realm of what is possible.

"Both our approaches act as a mirror that reflects and celebrates the fact that we are human. I perceive art and sciences as complementary, and regularly frequent exhibitions. I am fascinated by the creation of the human mind, and by noticing a pattern, a reason, a story behind an artist's work. I think it helps prepare my brain for alternate explanations, to see a scene from a different perspective. Similar thought processes happen when interpreting data, or preparing a new sample ahead of an observing campaign.

"Viewing Alison's sculptures, I perceived a drive for experimentation and excitement about any result, a trait found in many scientists. In Ione's paintings I saw exploration and fascination for the grand beauty of the cosmos, its textures, its colours, its organization. Gillian's creations made me reflect on my own work, her glasswork and paperwork being reminiscent of two topics that I am investigating at the moment: planetary atmospheres and celestial mechanics.

"The more I observe the universe, the more fascinated I get. In a similar fashion, gazing at great art reveals ever more."

Denis Erkal

"One of the most striking aspects of this collaboration is how similar science and art really are. While the methods of scientists and artists are different, we are both trying to use our work to explore the world around us and our place in that world. Hearing Ione, Gillian, and Alison describe their work processes made it apparent that this similarity is even deeper. With each project, both artists and scientists embark on a creative journey with uncertainty about the final product. Furthermore, since the journey itself is a learning experience

that uncovers new ideas, it can be difficult to determine when that final product is complete. While there are interesting and direct connections between our research and the work of Ione, Gillian and Alison, I am particularly excited about how they will take our discussions and create something new."

Morgan Fraser

"Art and science – and, in particular, visual sciences such as astronomy – have a long and interrelated history. From this perspective, it is fascinating to draw parallels and connections between the art that Ione, Gillian and Alison are producing, and some of the scientific projects I am involved in. My own research focuses on supernovae, the brilliant explosions of massive stars at the end of their lives. Among other things, these explosions produce heavy elements such as silicon and iron. These same elements are the raw materials for Alison's sculptures and Gillian's glass. There is an appealing symmetry to the universe producing materials, which then become artworks depicting the universe! Ultimately, the value of art lies in its ability to inspire, provoke thought and discussion and to enrich our world."

Thomas Haworth

"Richard Feynman once wrote: 'Is no-one inspired by our present picture of the universe? If the value of science remains unsung by singers, you are reduced to hearing not a song or poem, but an evening lecture about it. This is not yet a scientific age.'

"This quote has stayed with me since I first read it. To me, projects like this collaboration are steps towards the scientific age that Feynman envisioned, in which the majesty of the universe, discovered and understood by science, is enjoyed. And one in which science is not just a tool wielded by the few, but a pleasure experienced by the many.

"It is great that this collaboration is interested in the processes of the universe, not just pretty, static snapshots. Identifying processes that can be manifested in art has given me a refreshing view of familiar concepts. For example, galaxies, stars and planets – bastions of order in the universe – all form from the fragmentation, perhaps the destruction, of larger media, be it the cosmic web, a giant molecular cloud or a protoplanetary disc. There is a universal process of smaller scale order inefficiently resulting from larger scale disorder through gravity. This idea can be expressed through art in different ways."

transformation of materials such as iron, rock, clay and minerals in a kiln or furnace (at temperatures of 1300–1500°C). She is inspired by the impact of heat, explosion and disintegration, where creation and destruction are inextricably linked. She observes the results of pouring molten iron over the different materials (figure 2) – some fuse together, some pull apart, some melt, some retain their integrity. "I want to explore all these different materials. I want to understand how these materials are identified and the images produced which indicate the presence of differing materials, where and why these materials are where they are, how they link back across time and have resonance with our planet." She is also pursuing ideas about extremes of scale – the micro/macro perspectives that play out over vast distances.

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"It is almost as if she is cooking up meteorites and asteroids in the kiln in her barn"

"Space is constantly changing through explosions, impacts, altering forms and materials which transform from solid to gas to a huge range of states of being."

Alison's approach is profoundly exciting to witness. Her barn studio in the wilds

of west Wales is home to explosions that echo those in deep space – almost as if she is cooking up meteorites and asteroids in the kiln (figure 4).

Her work shatters any cosy view of art and challenges us to contemplate broader truths about our fragility in the grand scheme of things.

The conversations we had with astrophysical researchers demonstrated the creative scientific approaches they used to try to answer "what if?" questions about the universe. As artists, all three of us have taken an intuitive approach, following exploratory processes; we bring a lateral

response, not a literal one. We are offering a physical, tactile experience rather than an explanation, bringing to our fingertips a sensation of things far beyond our reach. We are, in our various ways, asking the "what if?" questions within our work, eager to find new aesthetic solutions and to discover what we didn't know we were looking for. Astronomy targets some of the biggest and most significant questions it is possible to ask. How can we, as artists, respond? With creative courage and, above all, curiosity. ●

AUTHORS

Ione Parkin RWA <http://www.ioneparkin.com>
Alison Lochhead <http://www.alisonlochhead.co.uk>
Gillian McFarland <http://www.gillianadair.co.uk>

FURTHER INFORMATION

Acuity Arts juliet@acuityarts.co.uk
Creativity and Curiosity Facebook conversations between artists and astronomers <http://bit.ly/2feSCAF>
Exhibition at Christ's College for Cambridge Science Festival 2017