the LAB

The LAB
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University of ULSTER

**Quaternion Quest
Aisling O' Beirn**

11 September to 15 November 2014

Quaternion Quest

The LAB, brought to you by Dublin City Council, is pleased to present this exhibition of new work by Aisling O'Beirn.

In 1843 the Irish mathematician William Hamilton had been long mulling over the problem of how to multiply in 3D space. Whilst walking from Dunsink Observatory to the Royal Irish Academy, in a moment of sudden realisation and least he forget it, he inscribed the formula for Quaternion multiplication on Broom Bridge.
This equation formed a type of connection in modern mathematics between algebra and geometry.

Aisling O' Beirn's installation and film is a quest to try to understand the equation. It is a mapping of the process and direction she undertook in her endeavour to understand this quaternion formula.

With thanks to Prof. Luke Drury, Dunsink Observatory, Dr. Fiacre O' Cairbre, NUI Manooth, Dr. Áine McManus & Dr. Peter Kootsookos.
The LAB Gallery, brought to you by Dublin City Council is supported by the Arts Council of Ireland. This exhibition is also supported by RIAD, University of Ulster.

$$i^2 = j^2 = k^2 = ijk = -1$$

Aisling O' Beirn is based in Belfast, making work concerned with the politics of space for both gallery and site specific contexts. Recent work has been facilitated by dialogue with Armagh Observatory and Dunsink Observatory. She has exhibited nationally and internationally. She was one of the artists chosen for Northern Ireland's first participation in the 51st Venice Biennale. She is a member of the group Centrifugal consisting of artists architects, theorists and curators from Zagreb Helsinki and Belfast, investigating the notion of periferality in a European context. She is also a cow founder of CROW (City Right of Way) organising monthly walks in Belfast. O' Beirn is also an Associate Lecturer in Sculpture at the University of Ulster and is represented by The Third Space Gallery.

www.thethirdspacegallery.com   www.aislingobeirn.com

If you would like to organise a special tour for your Montessori, school or other group please email us at artsoffice@dublincity.ie

Programme of Events

Exhibition Preview with introduction from Prof Luke Drury
Thursday, 11 September, 6.00pm—8.00pm

Culture Night
Friday, 19 September, 6.00pm—10.00pm
A fun evening for families and friends, we've teamed up with our neighbours, Oonagh Young Gallery, Dance House, Talbot Gallery & Studios and Dublin Buddist Centre to offer a range of great events in this corner of the City. At the LAB you can enjoy tours of the show, a special showing of Niamh Shaw's new production To Space, music from Fight Like Apes, stop motion animation workshops with Aoife Giles and Open Studio with artists Niamh Lawlor, Alicia Falvey and Carol Walsh in our Incubation Space.
For more see www.facebook.com/thelabgallerydublin

Introduction to Knitting
Saturday, 4 October, 2014, 11.00am—1.30pm
Inspired by Aisling O'Beirn's investigations, why not take up a new hobby. This course is especially for beginners and will be delivered by Jewel and Darling. Free but places are limited book here http://labknitting.eventbrite.ie

Special Gallery Tour with the Artist
Thursday, 9 October , 2014, 10.45am—11.45am
Join Aisling O'Beirn for an informal tour of her exhibition along with a more general discussion around arts practice. Tea and Coffee provided.

Hamilton Walk from Dunsink Observatory to Broombridge
Thursday, 16 October, 2014
Join Fiacre Ó Cairbre for the annual Hamilton walk to Broombridge in Cabra, where Hamilton had his famous Eureka moment when he created Quaternions along the banks of the Royal Canal. This event is not organised by the LAB and booking is essential with Fiacre at 01 7083763.

C.R.O.W– The Natural History Museum to the LAB Gallery
Thursday, 23 October , 2014, 2.00pm
C.R.O.W (City Right of Way), (artists Mike Hogg and Aisling O' Beirn) will be tracing a path between The Natural History Museum and the LAB Gallery on the hunt for Flora or Fauna en route between the venues in response to Saidhbhin Gibson's exhibition Natura Natura.
Book at http://naturanatura.eventbrite.ie

Poetry Evening – LAB Gallery
Wednesday, 5th November , 2014, 6.30pm—7.30pm
'A Mystic Dream of 4' by Iggy McGovern (Quaternia Press 2013) is a sonnet sequence based on the life of William Rowan Hamilton. Join Dr. Iggy McGovern and Prof Luke Drury for readings and discussion. The event is free. Please book here http://mgovern.eventbrite.ie

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The foundation for Aisling O'Beirn's current work centres on the research of Anglo-Irish mathematician Sir William Rowan Hamilton (1805 – 1865), the exhibition title "Quaternion Quest" coming from Hamilton's research into Quaternions. Hamilton was a fascinating genius and his interests were varied: Optics, astronomy, algebra, a range of languages, he also maintained a keen interest in the philosophy of Kant and the poetry of Coleridge [1]. Born in Dominick Street in 1805, Hamilton attended Trinity College Dublin to read Mathematics and Classics and before he graduated he had already been made Professor of Astronomy at Dunsink Observatory [2, 3]. Based at Trinity College Dublin, Hamilton's research centred on the observation that if complex numbers could be interpreted as points in a plane, then could the complexities of 3D co-ordinates be realised and manipulated algebraically? The conclusion was the insertion of a theoretical 4th Dimension. This provided a computational framework for 3D objects that also allowed for significant insight into the rotation of objects in 3D space. The formula for quaternions hit him in a 'eureka' moment on 16th October 1843 whilst crossing Broome Bridge on the Royal Canal, Dublin, on his way to a meeting of the RIA; immediately he inscribed his equation onto the bridge itself. [4, 5]

And here there dawned on me the notion that we must admit, in some sense, a fourth dimension of space for the purpose of calculating with triples ... An electric circuit seemed to close, and a spark flashed forth.

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Hamilton's work developed quite a following and his students created a society dedicated to the appreciation of his work long after he had passed away: The prestigious Hamilton Lecture today continues to celebrate excellence in mathematical research. Quaternions provide a mathematical notation for representing orientations and rotations of objects in 3D space (or Euclidean space), as such, they have found their way into applications such as computer graphics and orbital projections of satellites. It is Hamilton's use of a theoretical fourth dimension that provides the ideal setting for Einstein's theories on Relativity. Einstein proposed that the foundations of geometry have physical significance, and in 1916, published his *General Theory of Relativity*, a theory that proposed space and time were interwoven into a single continuum known as "space-time". Space-time incorporates Cartesian coordinates for all objects in space, the 3 dimensions of (x, y, z) + 1D (t or time) [6, 7]. In other words, we can use geometry to predict and map how bodies move in space.

Over a Century after Hamilton, in the late 1970s, a group of artists proposed that sculpture was evidently more complex than a static object in space. Even worse, a decorous static object, immobile and immutable. Sculpture could, and should, act as an information capsule for how we live in the world. Works that incorporated a function began to appear in the starkness of the gallery space. Influenced by the writing's of Christian Norberg-Schulz (himself greatly informed by the work of Heidegger) on the 'existential space'* pushed artists towards a multiplicity in form that referenced the lived environment and the manipulations that make the environment liveable in, *i.e.* bridges, mazes, tunnels. Underlying many of these works were the psychological factors that engage one with the lived space; the transmutability between the person and their encountered environment being salient [8, 9]. This radical overhaul in how artists looked at sculpture reached its zenith in the influential work of Robert Morris. For Morris, the work should operate within the fundamental concepts of architecture and its natural surroundings; no pure steriometry, no anonymous space, and no absorption in the institution of art, *i.e* the 'white cube' [10]. Works such as Alice Aycock's *The Angels Continue Turning the wheels of the Universe* (1978), a half-bridge/ half-wheel structure, created a form of 'complex' that encompassed both architecture (humanities lived environment) and sculpture (their artistic output and psychologyical frame of reference). Bruce Nauman's *Corridors* examined perception, frustration and confidence[11]. These types of psychological studies in art, were exemplified by the monumental works of Richard Serra. Serra's work dealt with psychological frames, but also optical adjustments; they seem to lean or move. Anthony Caro's sculptures pulsate between linearity and solidity, appearing to transfer between dimensional classifications. When seen at certain angles the work looks to inhabit a 2D frame (and yet we know them to be sculptures); some are articulated, meaning a more complex classification.

If the Hamilton equation is a bridge between the geometry of space and algebra, in this body of work we see artist Aisling O'Beirn metaphorcally bridging the gap between theory and fact in a large sculptural work *Bridge* (2014), that inhabits most of the space at The LAB. A bridge-type form, though permeable (adaptable too), the bridge sequesters itself between the balcony and ground-floor galleries. From certain points the bridge appears to twist in on itself, finding a certain resolution for that space alone. In the video work *Quaternion Quest* (2014), the artist's use of the mathematical grid as back-drop to a variety of orbital objects speaks much to the physicality of objects in space. The Gimbal remains a common theme throughout this exhibition and the revolutions inherent within this form make reference to celestial bodies and their quantum mechanics [12]. Sections of *Quaternion Quest* (2014) appear to be made up of a series of still images rather than a single film; their truncated methodology translating to gaps in the understanding, and the back and forth between artist and mathematician (Prof. Luke Drury with whom O'Beirn collaborated) is interspersed with Gimbals and other symbols that float through the exhibition as the artist reasons out the complexities of Quaternions. O'Beirn's work has a rather surreal type of Pop-art about it, as if random objects fell into a space that they reasonably should not inhabit. The artist uses the methodologies of knitting (*Knitted 1-6* (2014)), building (*Bridge*) and a host of hand-worked objects to explore the complexities of objects in 3D (Euclidian) space: The artist makes use of knitting to illustrate the X, Y and Z axes. The action (knitting) becomes a convolution of a 3D workable space, the manipluation of the steel needles pushing and pulling on the wool, building up a form, and rather aptly, a helix is oftentimes the result. The helix is furthur referenced in the exhibition by the presence of a 'slinky'; a form itself reminiscent of the earth's (proposed) 4D trajectory around the sun [13].

Most mathematicians will say that the fourth dimension cannot physically be quantified. If they had to describe it, it would appear something like an axis perpendicular to X, Y and Z; this axis is often referred to as 'W' [14]. To construct such a 4D form represents a never-ending folding and unfolding of the object, allowing it to be at once inside and outside (visible from many different angles), and we see this struggle in much of O'Beirn's sculptures (see *Peter's Cube* (2014)). The making and unmaking of work, the constant questioning and historical referencing allows much of this work to be viewed in a phenomenological manner, and in this manner it owes much to the work of the 1970s existentialists. Work inhabits the World, it remains a complex interval into the World-space and therefore to ultimately understand a work of art, one must first attempt to understand the World to which it belongs.

Hilary Murray
September 2014

*Christian Norberg-Schulz' 'Intentions in Architecture' (1963) constituted an ambitious project to develop an overarching ''system'' that would account for the various poles of architectural activity. The framework for this study included a combination of scientific ideas derived from sociology, psychology and semiotics and attempted to develop a comprehensive structure, an 'architectural totality', that would account for all the dimensions of architecture: the technical structure, environment, context, scale and ornament. 'Existence, Space and Architecture' (1971) attempted to ''develop the idea that architectural space may be understood as a concretization of environmental schemata or images, which form a necessary part of man's general orientation or 'being in the world'' (Habib et al., 2012).

*A gimbal is a pivoted support that allows the rotation of an object about a single axis. A set of three gimbals, one mounted on the other with orthogonal pivot axes, may be used to allow an object mounted on the innermost gimbal to remain independent of the rotation of its support (e.g. vertical)

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