Phillips, M. ‘Evolutionary Operating Systems’. Más allá ae Darwin. Sale Parpallo, Valencia, 24-25/04/09.

Evolutionary Operating Systems

Mike Phillips

“He could see the tall, peeling yellow building at the periphery of his range of vision. But something about it struck him as strange. A shimmer, an unsteadiness, as if the building faded forward into stability and then retreated into insubstantial uncertainty. An oscillation, each phase lasting a few seconds and then blurring off into its opposite, a fairly regular variability as if an organic pulsation underlay the structure. As if, he thought, it’s alive.”

(Phillip K Dick. 1969)

Hello World?

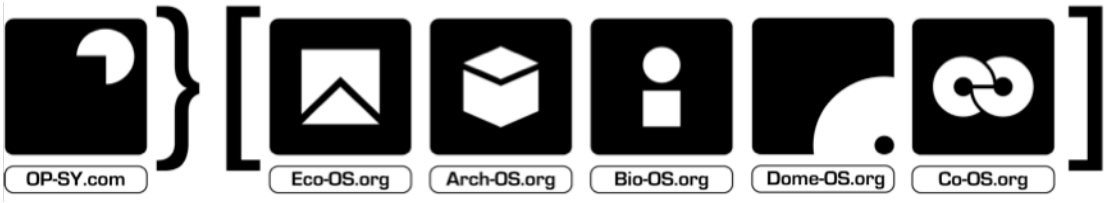

Figure 1: Operating Systems.

‘Evolutionary Operating Systems’ (**http://www.op-sy.com/**) explores the evolution of human perception through the emergence of senses more finely attuned to data! Data generates a dynamic mirror image of our world, reflecting, in sharp contrast and high resolution, our biological, ecological and social activities. As our biological senses have reached their evolutionary limits we increasingly delegate our perception of the world to instruments and processes that define new resolutions and complexities. In delegating these processes we also delegate responsibilities to things that do our seeing for us.

The augmentation of our consciousness through these technologies is manifesting things that lie outside of the normal frames of reference: things so far away, so close, so massive, so small and so ad infinitum. The ‘Operating Systems’ described below enable a series of transformations: from data to code to experience to behaviour. These shifting frames of reference occur as the result of our immersion in digitally augmented environments. An invisible ‘Hertzian’ landscape has been made accessible through instruments that can measure, record and broadcast our deepest fears and desires.

Reluctantly, we are becoming aware of the data shadows that cloud the periphery of our existence. The reluctance is, to some extent, the result of the fear we feel when we catch a glimpse of this data/mirror world out of the corner of our eye. Somewhere there is an attic, and in that attic stands a large ugly data portrait of our world. As an abstract and invisible material our potential to perceive our reality through data marks an evolution in human consciousness. Reified its metaphorical and haptic potential are powerful tools for transformation.

i-DAT, an arts research organisation, is developing a range of tools and processes to dynamically manifest ‘data’ as experience in order to enhance perspectives on a complex world. Collectively described as ‘Operating Systems’ these digital tools are designed to lift the veil on this invisible and temporal world. The Operating Systems project proposes a range of initiatives that have the potential to enhance our ability to perceive and orchestrate this mirror world of data generated by our collective activities. The intention with the range of Operating Systems described below is to make the data generated by human and ecological activity tangible and readily available to the public, artists, engineers and scientists.

Non-sense:

One can imagine the first light sensitive cells clustering within primitive autotrophs as they drift in a primordial pool of soup. Something about the light and the warmth, or the shadows and movement? Simple senses measured what could be measured, light, heat, vibration and chemical changes. All very well for a simple organism concerned with its own survival, but limiting until these perceptions become communal and shared. These simple organisms over populate the pool and they starve, produce too much waste and they suffocate. How could they see that coming? Now, millennia latter, we have a complexity that could be described as a collective consciousness, our own consciousness leaking out into the community of similar augmented minds. Yet, we still have the same biological tools for perceiving the world, senses that feel the same old things, generated the same old feelings and replicate the same old behaviour. Even so, how could we be expected, with our simple bug eyes, to see ourselves over populating and polluting our little pool?

Figure 2: After Fluctibus.

When Robertus de Fluctibus (1574-1637) constructed his model of perception he rendered a powerful diagram that described the limits of our perceptions. Fludd located our consciousness within our skulls, with our senses puncturing the bone box to create the framework of our perception. The physiological and psychological structures he mapped limited the perceptible world to the head. The new model defined by these Operating Systems extends Fludd's diagram by augmenting the holes in our bone box with instruments that

collect data on the world around us. Things so small they are beyond the resolution of our eyes, so big they are beyond our imagination and so complex they are beyond our grasp.

This data extends our understanding of the world. In the case of these Operating Systems the focus is currently XML. The ubiquity of XML based formats is being established within many disciplines, this is already true of GML, and KML - but can be seen in disciplines as diverse as Neuro-science (NeuroML), Chemistry (CML) and Urban XML. Feeds distributed by Operating-Systems are also based on standard XML and RSS formatting. XML has advantages such as hierarchical structure, human readability and well-proven paths for parsing and generation. Data collected or generated is parsed and published through a range of flexible tools (flash, Max MSP, Processing, Java, etc), feeds (xml, rss) and web 2.0 streams, such as Twitter and Facebook, which allow artists, engineers and scientists to develop visualisations, sonifications (music) and interactive projects.

With the necessary increase in sophisticated data visualisations (scientific, economic, social and cultural data) comes a concern for an apparent parallel decrease in visual literacy as scientists and non-scientists alike struggle to decipher the mass of content. This is particularly apparent with 'Climate Change' initiatives where attempts to communicate science through a variety data modelling and visualisation techniques has lead to confusion and disagreement in the public/media arena (Niepold, F. Herring, D. McConville, D. 2007).

This aspiration to extend our collective perception of the world has been with us for a while now. Buckminster Fuller provided the vision of a global consciousness through technological augmentation back in 1962.

"The consequences of various world plans could be computed and projected, using the accumulated history-long inventory of economic, demographic, and sociological data. All the world would be dynamically viewable and picturable and radioable to all the world, so that common consideration in a most educated manner of all world problems by all world people would become a practical event." (R. Buckminster Fuller, 1962)

Things have changed a bit since then, we can see further and smaller and the complexity anticipated by Fuller has mushroomed.

A Mote it is…:

"A mote it is to trouble the mind's eye."

(Shakespeare)

Words spoken by Horartio to describe the apparent manifestation of Hamlet's father's ghost. The apparition is seen but not believed, and the ambiguity of the vision, either inside the minds eye or as a tangible entity, implies that it is just the seeing of it that makes it real - its existence totally dependent on the desire of the viewer. The 'mote' or speck of dust in the eye of the mind of the beholder both creates the illusion and convinces us that what we see is real. Something just out of the corner of our minds eye, those little flecks magnified by our desire to see more clearly. Yet the harder we look the more blurred our vision becomes.

'A Mote it is…', whilst not strictly a product of these Operating Systems, provides a critical framework for the trauma we feel now that our world is clearly more complex than our senses reveal. Things too small or too big to see or touch are being made manifest through instrumentation. The 'Mote' made manifest in the 'A Mote it is…' installation from the 'art in the 'Age of Nano Technology' exhibition[1] was plucked from the authors eye and scanned using an atomic force microscope. The AFM measures the atomic forces between the tip of the sensor and the molecules that constitute the spec of dust. Data captured by the AFM is re-manifest as a vortex of particles and sound, but rendered invisible by the gaze of the viewer. The more we look the more invisible it becomes - look away and it re-emerges from the maelstrom of data. A ghost of the mote can be seen in viewers peripheral vision but never head on.

Figure 3: Extracting a ‘Mote’…

A ‘mote’ is both a noun and a verb. Middle English with Indo-European roots, its early Christian origins and Masonic overtones describe the smallest thing possible and empower it with the ability to conjure something into being (so mote it be...). This dual state of becoming and being (even if infinitesimally tiny) render it a powerful talisman in the context of nano technology.

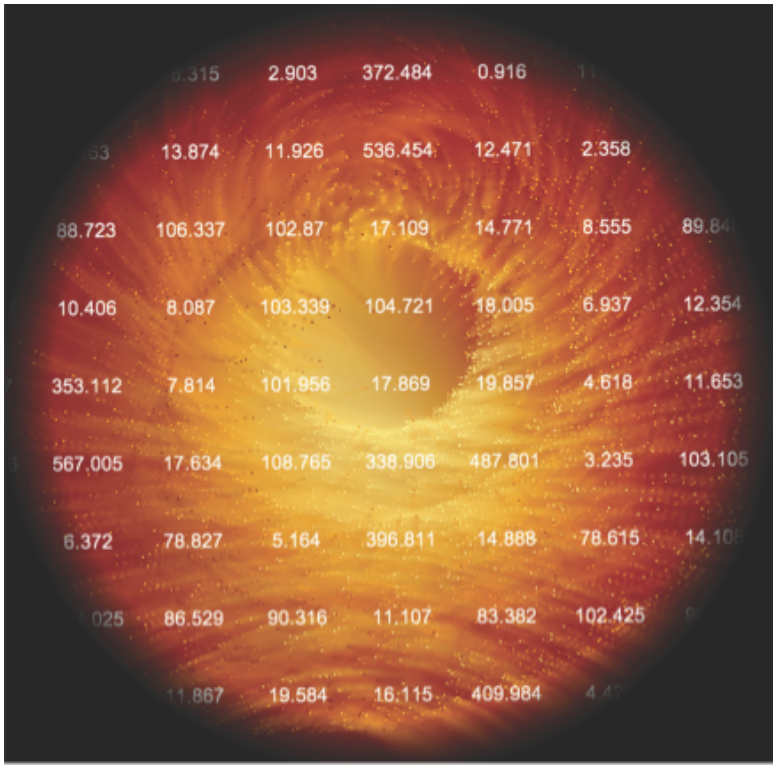

Figure 4: ‘A Mote it is…’

Our reliance on such instruments mark a dramatic shift from the hegemony of the eye to a reliance on technologies that do our seeing for us - things so big, small or invisible that it takes a leap of faith to believe they are really there. Our view of the ‘real world’ is increasingly understood through manifestations of data, things that are measured and felt rather than seen. What we know and what we see is not the same thing.

“In short, the universe is but a watch on a larger scale; all its motions depending on determined laws and the mutual relation of its parts. Confess the truth, have you not hitherto entertained a more exalted idea of the works of nature? Have you not considered them with more veneration than they deserve? I have known some people esteem them less as their knowledge encreaed. For my part, said she, I contemplate the universe with more awful delight now I find that such wonderful order is produced by principles so simple.” (Fontenelle, 1803)

Operating Systems:

The Operating Systems are:

Arch-OS:

Arch-OS (www.arch-os.com) uses embedded technologies to capture audio-visual and raw digital data through a variety of sources which include; the 'Building Management System (BMS), digital networks, social interactions, ambient noise levels, environmental changes. This dynamic data is then manipulated and replayed through audio-visual projection systems. By making the invisible and temporal aspects of a building tangible.

Sample Arch-OS Data:

bms_.WindVane :: 258.85 :: 2011-04-18 14:05:00, bms_.WindSpeed :: 1.72 :: 2011-04-18 14:05:00, bms_.Water_Kitchen_Hot :: 115.05 :: 2011-04-18 14:05:00, bms_.Water_Kitchen_Cold :: 30.26 :: 2011-04-18 14:05:00, bms_.Water_Hot :: 4.09 :: 2011-04-18 14:05:00, bms_.Water_Cold :: 0 :: 2011-04-18 14:05:00, bms_.Temp_AtriumC_gnd :: 18.38 :: 2011-04-18 14:05:00, bms_.Temp_AtriumC_5th :: 21.14 :: 2011-04-18 14:05:00, bms_.Temp_AtriumC_3rd :: 20.9 :: 2011-04-18 14:05:00, bms_.Temp_AtriumB_gnd :: 17.14 :: 2011-04-18 14:05:00, bms_.Temp_AtriumB_5th :: 21.71 :: 2011-04-18 14:05:00, bms_.Temp_AtriumB_3rd :: 20.17 :: 2011-04-18 14:05:00, bms_.Temp_AtriumB_1st :: 19.37 :: 2011-04-18 14:05:00, bms_.Temp_AtriumA_gnd :: 13.88 :: 2011-04-18 14:05:00, bms_.Temp_AtriumA_5th :: 22.11 :: 2011-04-18 14:05:00, bms_.Temp_AtriumA_3rd :: 17.79 :: 2011-04-18 14:05:00, bms_.Rain_Sensor :: 1.5 :: 2011-04-18 14:05:00, bms_.OutAirTemp :: 9.5 :: 2011-04-18 14:05:00, bms_.OutAirHum :: 54.09 :: 2011-04-18 14:05:00, bms_.LT3_AirTemp :: 20.29 :: 2011-04-18 14:05:00, bms_.LT3_AirHum :: 43.59 :: 2011-04-18 14:05:00, bms_.LT2_AirTemp :: 23.28 :: 2011-04-18 14:05:00, bms_.LT2_AirHum :: 45.34 :: 2011-04-18 14:05:00, bms_.LT1_AirTemp :: 18.79 :: 2011-04-18 14:05:00, bms_.LT1_AirHum :: 31.02 :: 2011-04-18 14:05:00, bms_.LectureC_CO2 :: -60.86 :: 2011-04-18 14:05:00, bms_.LectureB_CO2 :: 2 :: 2011-04-18 14:05:00, bms_.LectureA_CO2 :: -121.36 :: 2011-04-18 14:05:00, bms_.Elec_A_YDay :: 280.64 :: 2011-04-18 14:05:00, bms_.E_Meter_BlockC :: 90.2 :: 2011-04-18 14:05:00, bms_.E_Meter_BlockB :: 222.76 :: 2011-04-18 14:05:00, bms_.E_Meter_BlockA :: 232.6 :: 2011-04-18 14:05:00, bms_.E_MainMeter :: 0 :: 2011-04-18 14:05:00, bms_.AtriumC_heating_flow :: 40.4 :: 2011-04-18 14:05:00, bms_.AtriumC_control_valve :: 11.39 :: 2011-04-18 14:05:00, bms_.AtriumB_heating_flow :: 17.01 :: 2011-04-18 14:05:00, bms_.AtriumB_control_valve :: 30 :: 2011-04-18 14:05:00, bms_.AtriumA_heating_flow :: 15.31 :: 2011-04-18 14:05:00, bms_.AtriumA_control_valve :: 30 :: 2011-04-18 14:05:00, bms_.WindVane :: 258.85 :: 2011-04-18 13:05:01, bms_.WindSpeed :: 1.72 :: 2011-04-18 13:05:01, bms_.Water_Kitchen_Hot :: 115.05 :: 2011-04-18 13:05:01, bms_.Water_Kitchen_Cold :: 30.26 :: 2011-04-18 13:05:01, bms_.Water_Hot :: 4.09 :: 2011-04-18 13:05:01, bms_.Water_Cold :: 0 :: 2011-04-18 13:05:01, bms_.Temp_AtriumC_gnd :: 18.38 :: 2011-04-18 13:05:01,

The i-500 (www.i-500.org), a public art commission for Curtin University's new Resources and Chemistry Research and Education Buildings, draws on the Arch-OS experience. Working in close collaboration with Woods Bagot Architects the i-500 project visualises scientific research as an integral part of the architectural environment. Nested at the heart physical building the i-500 enables a zone of contemplation and reflection.

Figure 5: i-500 Server.

S-OS:

The S-OS project provides an Operating System for the social life of a City (in this instance the City of Plymouth). It superimposed the notion of an 'OnLine' Social Operating System onto 'RealLife' human interactions, modelling, analysing and making visible the social exchange within the City. S-OS is a collection of creative interventions and strategic manifestations that provides a new and more meaningful 'algorithm' for modelling 'Social Exchange' and proposes a more effective 'measure' for 'Quality of Life'.

The algorithm used: **A(n):= nr [r = 1,2,…..N]**

…where A(n) is probably the value of the Quality of Life, and [r = 1,2,…..N] are the numerous calculations that happen within a city. These calculations constitute an invisible fabric woven through the everyday processes of social exchange (a smile, a swap, a sneer) and can be understood as a Social Operating System when made manifest through the use of digital technologies. S-OS was developed to propose and calculate a new 'Social Exchange Index' based on a unique methodology that links the strategic S-OS applications and processes to the Governments 'Quality of Life Indicators'. These indicators are used by government to measure 'success' and progress towards economic, social and environmental sustainability, calculating 'quality' by measuring 'quantity'. They suggest that happiness lies somewhere at the end of a bell curve and that true love can be found in a slice of a pie chart.

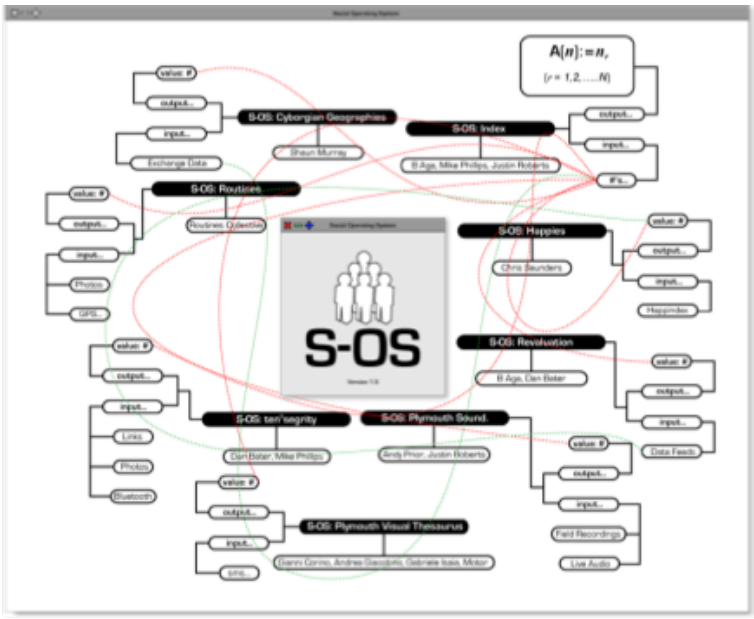

Figure 6: S-OS Diagram.

Eco-OS:

Figure 7: Ecoid.

Eco-OS further develops the sensor model embedded in the Arch-OS system through the distribution sensor devices - Ecoids. Ecoids can be distributed through an environment (work place, domestic, urban or rural) and connected through the formation of Wireless Sensor Networks (WNS) that enable the coverage of an extensive territory. Eco-OS explores ecologies. Eco-OS further develops the sensor model embedded in the Arch-OS system through the manufacture and distribution of networked environmental sensor devices. Eco-OS provides a new networked architecture for internal and external environments. Networked and location aware data gathered from within an environment can be transmitted within the system or to the Eco-OS server for processing.

Like a matryoshka doll these Operating Systems endlessly fold in on themselves. Through ECO-OS, an ecological Operating System, the manifestation of collective activity and the calculation of social exchange are literally placed in the broader landscape. Eco-OS further develops the sensor model embedded in the Arch-OS system through the manufacture and distribution of networked environmental sensor devices.

Sample Ecoid feed:

29259 :: -1 :: 2010-12-16 23:55:32, 29259_light :: 13 :: 2010-12-16 23:55:31, 20925_light :: 65534 :: 2010-12-13 15:59:55, 20925 :: 259 :: 2010-12-13 15:59:55, 28584_humidity :: -1 :: 2010-12-13 01:24:23, 28584_temp :: -1 :: 2010-12-13 01:24:23, 28584_light :: 65534 :: 2010-12-13 01:23:08, 28584 :: 259 :: 2010-12-13 01:23:08, 12132 :: -1 :: 2010-09-21 10:33:25, 10656_light :: 259 :: 2010-09-21 10:24:35, 10656 :: -1 :: 2010-09-21 10:24:35, 10656_humidity :: -1 :: 2010-09-21 10:24:35, 10656_temp :: -1 :: 2010-09-21 10:24:35, 1_humidity :: 0 :: 2010-09-21 10:10:12, 1_temp :: 0 :: 2010-09-21 10:10:12, 2_light :: 0 :: 2010-09-21 10:10:12, 2 :: 0 :: 2010-09-21 10:10:12, 2_humidity :: 0 :: 2010-09-21 10:10:12, 2_temp :: 0 :: 2010-09-21 10:10:12, 1 :: 0 :: 2010-09-21 10:10:12, 1_light :: 0 :: 2010-09-21 10:10:12, cpstest :: 3 :: 2010-09-21 10:05:25, 23859_stretch :: 1023 :: 2010-04-28 10:32:58, 15228_stretch :: -1 :: 2010-04-28 10:32:58, 23859_strech :: 1023 :: 2010-04-28 10:12:39, 23859_humidity :: 1023 :: 2010-04-28 10:12:39, 23859_temp :: 881 :: 2010-04-28 10:12:39, 23859_light :: 1021 :: 2010-04-28 10:12:39, 15228_strech :: -1 :: 2010-04-28 10:12:39, 15228_humidity :: -1 :: 2010-04-28 10:12:39, 15228_temp :: -1 :: 2010-04-28 10:12:39, 15228_light :: -1 :: 2010-04-28 10:12:39, sensorName :: sensorValue :: 2010-02-18 12:25:06, 5049_strech :: -1 :: 2010-01-27 13:03:48, 5049_humidity :: -1 :: 2010-01-27 13:03:48, 5049_temp :: -1 :: 2010-01-27 13:03:48, 5049_light :: -1 :: 2010-01-27 13:03:48, 24570_strech :: 992 :: 2010-01-27 13:03:48, 24570_humidity :: -1 :: 2010-01-27 13:03:48, 24570_temp :: 611 :: 2010-01-27 13:03:48, 24570_light :: 192 :: 2010-01-27 13:03:48, :: :: 2010-01-27 11:58:55, 17316_strech :: -1 :: 2010-01-27 11:26:37, 17316_humidity :: -1 :: 2010-01-27 11:26:37, 17316_temp :: -1 :: 2010-01-27 11:26:37, 17316_light :: -1 :: 2010-01-27 11:26:37, 12132_strech :: 129 :: 2010-01-27 11:26:37, 12132_humidity :: -1 :: 2010-01-27 11:26:37, 12132_temp :: 617 :: 2010-01-27 11:26:37, 12132_light :: 113 :: 2010-01-27 11:26:37, ,

Bio-OS:

Bio-OS takes a more granular view of the social environment, focusing at a resolution of the individual. By exploring manifestations of physical, psychological and behavioural aspects, Bio-OS takes a holistic, multisensory systems view of an entity to build reflexive data models of a body over time. Bio-OS allows intimate biological information to be collected from the users body. This is achieved through:

• the use of biological databases that monitor dietary habits, through food consumption (calorie intake, etc) and exercise.

• biological sensors which measure psycho/physical changes within the body (psychogalvonometer, blood pressure, electrocardiogram, respiration, EEG, etc).

• behavioural sensing, through audio visual monitoring (eye-tracking, speech patterns, motion tracking, etc).

• temporal behaviour, through reflexive pattern tracking (models of activity over a period of time).

Bio-OS offers subtle and complex combinations of biological (in its broadest sense) sensing technologies to build data models of a body over time. These data models are stored locally as bioids and collected within the users personal data-base building a biological footprint alongside their individual ecological footprint. The users Avatar can be used to reflect and distribute the biological model. Bio-OS implements processes collectively referred to as the 'Internet of Things' and builds on i-DAT's success in developing Web 2.0/Social Media tools where shared narratives generate a rich mix of quantitative (measurable data for traditional evaluation purposes) and qualitative (stories, images and memories) data. Collectively these processes establish an open participatory 'techno-ethnography', mechanisms for evaluating engagement and participation through a rich mix of qualitative and quantitative data.

Dome-OS:
At the core of these developments is the Immersive Vision Theatre, a transdisciplinary instrument for the manifestation of material, immaterial and imaginary worlds. The 'Full Dome' architecture houses two powerful high-resolution (fish-eye) projectors and a spatialised audio system. A number of initiatives are being investigated to enable the rendering of real-world data into forms suitable for projection into immersive domed environments. Outside of WorldWind (NCSA) and Uniview (SCISS) there are few software applications specifically designed to solve this problem, even fewer applications exist to take real-time, real-world data feeds and visualise these in a suitable manner for projection in a dome. Even as new game engine technologies open up opportunities for dome environments, the problem presents a series of complex challenges across multiple domains.

Example Dome-OS projects include:

Scale Electric:
Scale Electric utilises the AFM in the Wolfson Nanotechnology Laboratory in Plymouth to produce data of molecular scans. This data is imported into the Blender game Engine (open source 3D modelling software) to generate landscape. Dome corrected these real time visualisations place visitors to the IVT in a nano landscape.

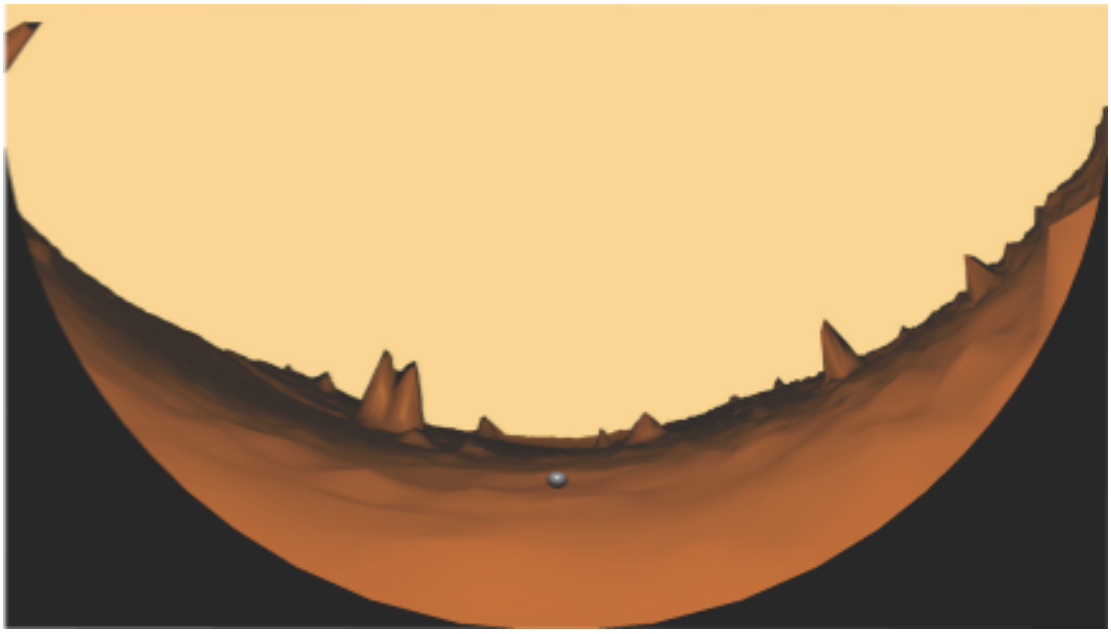

Figure 8: Scale Electric.

Fly Thru:
Drosophila (Fruit Fly)[2]. The Fly Thru is a volumetric rendering composed of 600 slices at 6 µm. The fruit fly was encased in resin at Department of Theoretical Biology at University of Vienna, and sliced into slivers. Each slice was photographed through a microscope and then reassembled at i-DAT where its 600 slices were reassembled into dome corrected flythrough.

Figure 8: FlyThru.

Defrag and Reboot:

The power of Op-Sy is that it bring together a range of sensing technologies and generates and publishes real time data. That in it self is not that innovative, many instances of this can be found in commercial and artistic practice. The impact of Op-SY is that it enables a coupling of quantitative data with qualitative data. The things that we feel but cant put a name to can be coupled with our experience. The intention is that this new collective understanding of the world will change our behaviour. It is not about Intelligent Buildings, but intelligent people. Our insubstantial uncertain evolution depends on it.

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1: Art in the age of nanotechnology at the John Curtin Gallery, Perth Western Australia. 05/02 – 30/04 2010

2: Fly Thru: Drosophila (Fruit Fly): Musaab Garghouti (i-DAT), Pate Carss (i-DAT), Peter Smithers (School of Biomedical and Biological Sciences, & Dr. Brian Metscher (Dept. of Theoretical Biology, University of Vienna). Volumetric rendering composed of 600 slices at 6 µm. Software : DICOM data to OSG, Drishti & 3d Studio Max.

Biography:

Mike Phillips is Professor of Interdisciplinary Arts at the University of Plymouth. R&D orbits digital architectures and transmedia publishing, and is manifest in a series of 'Operating Systems' to dynamically manifest 'data' as experience in order to enhance perspectives on a complex world. The Operating Systems project explores data as an abstract and invisible material that generates a dynamic mirror image of our biological, ecological and social activities.

Mike Phillips is director of i-DAT.org, an Arts Research Organisation that acts as a catalyst for creative innovation across the fields of Art, Science and Technology, facilitating regional, national and international collaborations and cultural projects. As a networked organisation and 'cultural broker' i-DAT's transdisciplinary agenda fosters 'open innovation' and knowledge exchange between companies, institutions, communities and individuals. i-DAT is developing new 'tools' for production, dissemination and participation that challenge traditional models of creation and consumption, and embrace the shifting relationships between audiences and cultural producers. i-DAT's projects can be found on the i-DAT web site at: www.i-dat.org.

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