

# HUMAN GEOGRAPHY

*v1.0*

Bio-OS:



D.I.Y

Human Geography v1.0

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<http://www.i-dat.org>

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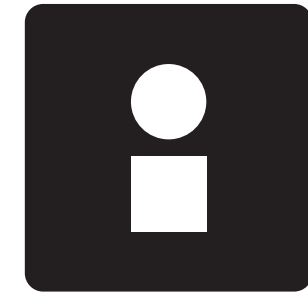
BIO-OS: DIY, HUMAN GEOGRAPHY V1.0 describes the emergence of 'Bio-OS' ([www.bio-os.org](http://www.bio-os.org)) prototype technologies (hardware and software) that make data generated by the human body (heart rate, breathing rate, body temperature and galvanic skin response) tangible. By making this data readily available to the public, artists, engineers and scientists we can better explore its transformative potential for nurturing scientific research, new arts practice and new cultural forms.

This publication is intended to offer a DIY insight to the development of the Bio-OS prototype. The project is supported by Arts Council England and delivered by i-DAT working in partnership with E-Health and Health Informatics at Plymouth University. The project was developed through a series of collaborative 'DataLabs' and artist commissions to co-research and develop the Bio-OS prototypes through practices which embrace interactive art, ubiquitous technologies, data visualisation, transmedia story telling, social gaming and interaction design.

i-DAT's collaborative DataLab is an initiative which aims to foster an open and collaborative environment which brings together artists, researchers and scientists to develop 'provocative prototypes' that lead to new practice, knowledge and resources for the arts and society as a whole. This initiative will enable artists to engage with these new digital opportunities and processes, to foster the creation of new work and engage with new audiences. These activities build dynamic links between academic research and artistic practice to foster transdisciplinary and new cultural forms.

The artists commissioned to collaborate on the DataLab project were: Katy Connor, Hannah Wood and Slingshot.





Bio-OS.org

# BIO-OS: D.I.Y

## HUMAN GEOGRAPHY

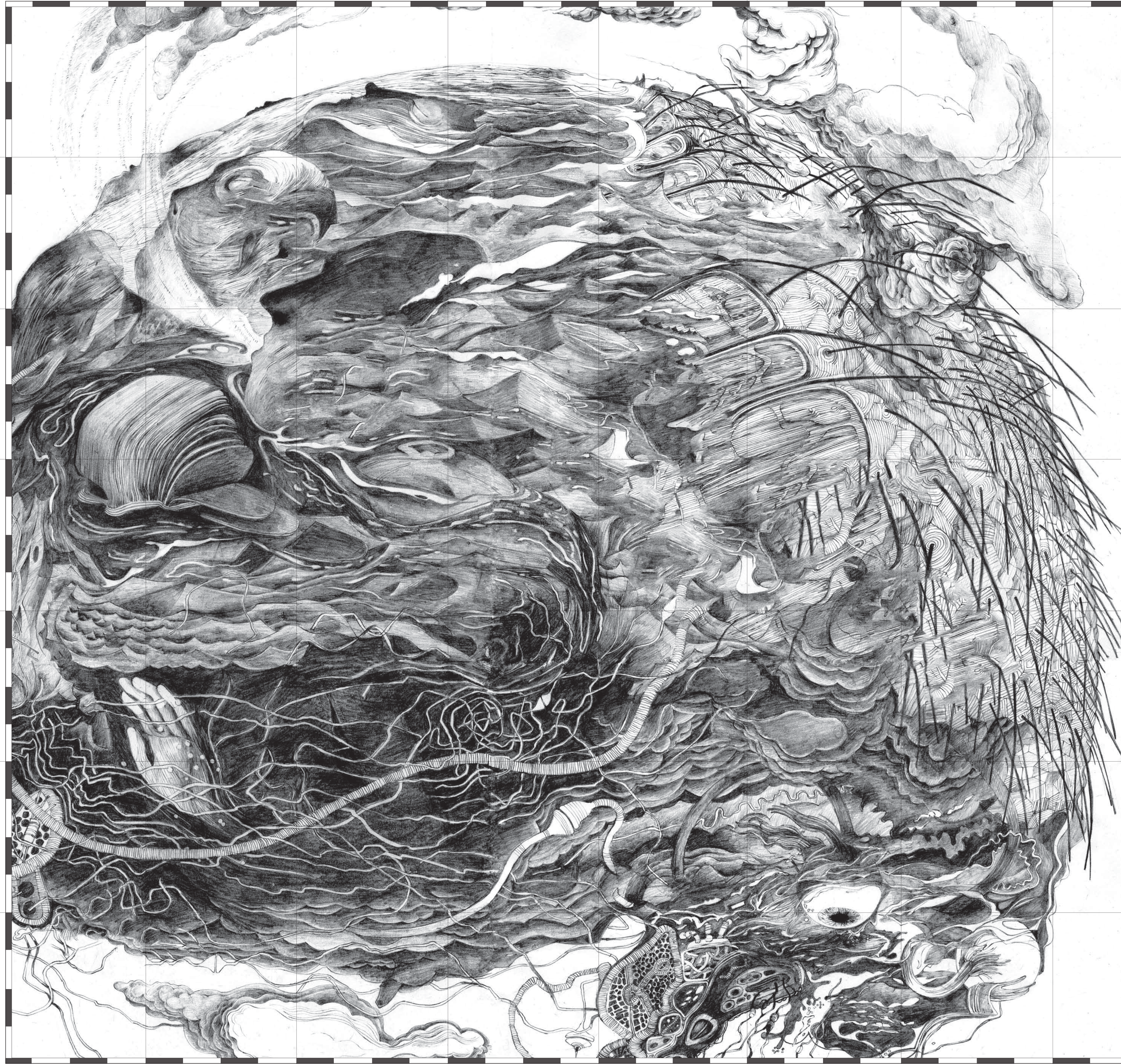
### v1.0

It is a temporal fragmented body that Bio-OS engages with. It sees the body both as a landscape and as an object in a landscape. Bodies in Environments / Bodies as Environments. Within and through these internal and external landscapes the instruments developed for the Bio-OS create a space for creative practice.

The body operates as a conduit for the exchange for ideas, knowledge and the transformation of physical objects. The body is also a node in a more problematic network such as supply chains for food, traffic and amenities. Bio-OS engages with the body and the 'things' that cluster around it through a process of participatory design of 'provocative prototypes' to generate real time data models of human activity. Consequently, Bio-OS enables the human body to become a networked and shared 'thing'.

Through Bio-OS, dynamic visual and sonic experiences derived from human movement are being tailored to enhance public understanding of the collective, mass biology. In this context Bio-OS and its distribution and engagement mechanisms provide an open tool for public engagement with a domain that is primarily owned by medical, scientific fields.

Bio-OS provides accessible tools (through 'hacks', wearable devices, phone Apps and domestic and public health technologies and social media tools) that are being deployed in daily life for monitoring health and activity. Data collected from these tools feed dynamic databases that facilitate a shared understanding of the mass body index through visualisations and sonifications.





# BIO-OS: D.I.Y HUMAN GEOGRAPHY v1.0

As a biological instrument Bio-OS builds on the i-DAT's Operating Systems ([www.op-sy.com](http://www.op-sy.com)) initiative. These are open instruments for gathering data from environments (buildings and landscapes) and organisms (crowds and bodies) that are focused on delivering dynamic and interactive outputs through a range of technologies (such as social networks, streaming media, mobile phone Apps, Full Dome environments, etc). These Operating Systems 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. The Operating Systems project proposes a range of tools and initiatives that have the potential to enhance our ability to perceive and orchestrate this mirror world.

Bio-OS was bought to you through a collaborative process involving:

#### i-DAT: CULTURAL INNOVATOR

i-DAT acts as a catalyst for creative research and innovation across the fields of Art, Science and Technology, facilitating regional, national and international collaborations and projects to generate social, economic and cultural benefit.  
[www.i-dat.org](http://www.i-dat.org)

#### E-HEALTH AND HEALTH INFORMATICS, UNIVERSITY OF PLYMOUTH

The e-health research group based in the Faculty of Health, Education and Society and has two main strands, research on the impact of e-health (led by Ray Jones) and Next Generation Internet Solutions (led by Maged Boulos).  
[www.plymouth.ac.uk/research/ehealth](http://www.plymouth.ac.uk/research/ehealth)

#### MESSAGE RESEARCH GROUP, UNIVERSITY OF PLYMOUTH

Message Research Group sits within the Centre for Media, Art and Design Research (MADR) which has creative practice at its core, employing critical reflection and cultural analysis to generate and disseminate knowledge in order to expand the disciplinary relevance of Media Art and Design.  
[www.message-research.org](http://www.message-research.org)

#### HANNAH WOOD, TRANSMEDIA WRITER

"I'm interested in telling stories across multiple platforms that enable players to interact with narratives in compelling and unusual ways. This project offers an opportunity for players to use their own body as a storytelling platform to interact with a narrative that crosses technological and real world platforms. This asks us to think about the way stories impact on our bodies and how our bodies are written into narratives."

#### KATY CONNOR, INSTALLATION ARTIST

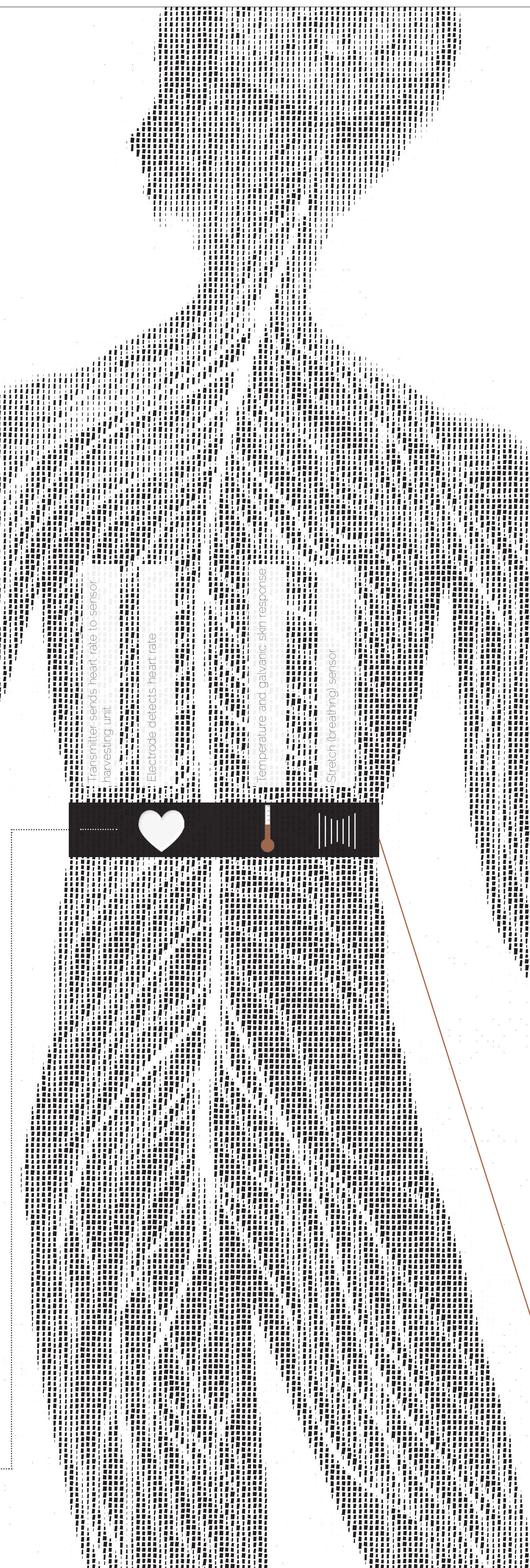
"I am profoundly interested in media technologies and data visualisation, but more significantly in how our bodies engage with this machinery. Often, this kind of interaction is in a medical context."  
[www.katyconnor.com](http://www.katyconnor.com)

#### SIMON EVANS, SLINGSHOT, STREET AND PERVERSIVE GAMES COMPANY.

"Slingshot use cities as platforms, encouraging players to interact with the urban space in novel ways. The project will allow us to extend this interaction, deepening the connection between people's bodies and urban space. This will raise some interesting questions about how cities shape bodies and the rhythms of our everyday lives?"  
[www.slingshoteffect.co.uk](http://www.slingshoteffect.co.uk)

#### Bio-OS DATA INPUT: SENSOR STRAP

The Bio-OS strap is a modification based on the Polar Wireless ECG System. In addition to its existing electrodes on the reverse side of the strap which detect heart rate, it has been customised with temperature and Galvanic Skin Response sensors and a stretch sensor which measures breathing through the level of chest expansion. The transmitter on the strap sends the heart rate signal to the Bio-OS Data Input sensor harvesting unit wirelessly, whilst the other sensors transmit through a cable to the unit.



#### Bio-OS DATA OUTPUT: TRIGGERS

The Bio-OS Server can trigger a range of outputs or actions from the system, such as sending an email, a txt message, a facebook post or notification, or it can trigger actual physical installations such as switch a light on or off, open or lock a door, set off an alarm and so on.



#### Bio-OS DATA PROCESSING: DATA SERVER

The Bio-OS Server allows remotely measured bio signal data to be uploaded into a database. The server supports multiple sensing devices (data inputs) and so allows aggregation of bio data from many different sources (users, devices etc). It has a 'Trigger Logic Editor' which allows system administrators (including artist and scientific end-users) to edit the set of rules held in the trigger database. These triggers cause actions to automatically occur when changing bio data values meet particular predefined conditions. For example, an action might occur if a person's heart rate is above 90 bpm and they are in a particular location.



The Server also has a 'Data Injector' which allows bio data readings to be manually inserted into the Data Storage Server through a simple web page. This might be for testing and experimentation purposes, for real time intervention during a live study/activity or simply for the manual storage of non-sensed bio values.

#### Bio-OS DATA INPUT: SMARTPHONE & SOFTWARE (APP)

The Bio-OS Data Input smartphone and mobile software application requires an Android phone 15 or greater. It runs the Bio-OS data app, which receives, displays and transmits the biological data from the sensor harvesting unit. It also attaches a GPS location and a date / time stamp.

A whole world of possibilities are opened up by coupling the computing power and connectivity of an Android device with its built in sensors (display, camera, GPS, Bluetooth, WiFi, gyroscope, accelerometer etc) with the external IOIO board sensor harvesting unit.



#### Bio-OS DATA INPUT: SENSOR HARVESTING UNIT

The Bio-OS Data Input sensor harvesting unit integrates a IOIO board which enables the unit to send the biological data to an Android phone via a USB connection. When you connect the IOIO board to the phone via USB, it interprets the IOIO board as an external USB Device (computer). This allows for data transfer between the devices and enables the phone to act on external inputs, control external devices, or as in this case, transmit data to a remote server for processing.

The unit also integrates the Polar Heart Rate Monitor Interface (HRMI) board which is a peripheral device that converts the ECG (magnetic wave) signal from the Bio-OS strap transmitter into heart rate data. It implements an algorithm for computing the average heart rate.