

BECKLEY FOUNDATION
SCIENTIFIC PROGRAMME 2017

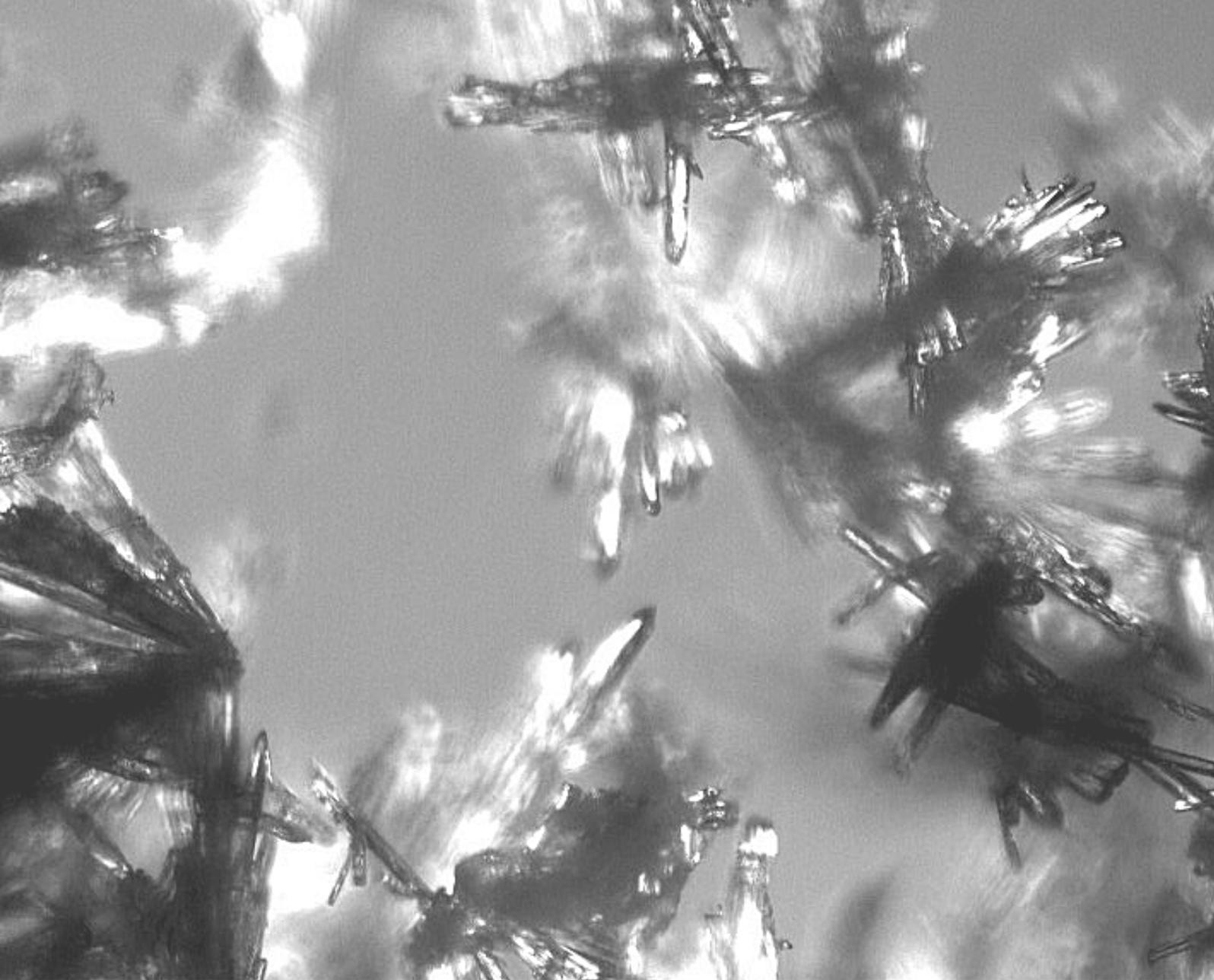


BECKLEY FOUNDATION

The Beckley Foundation is a UK-based think tank and UN-accredited NGO founded by Amanda Feilding in 1998. We conduct pioneering scientific research in order to further our understanding of consciousness and reveal the mechanisms underlying the medical and cognitive benefits of psychedelics, cannabis and MDMA. We advocate the legal regulation of all drugs in order to reduce harms at all stages of the supply chain. Combining science and policy, we are driving evidence-based drug policy reform on a global level.

The Scientific Programme, led by Amanda, develops and conducts psychedelic research through an international network of collaborative partnerships with leading scientists and institutions. Studies focus on cannabis, psychedelics (psilocybin, LSD, ayahuasca, DMT, and 5MeO-DMT), and MDMA. We investigate the action of these substances in the human brain, using the latest developments in neuroscience and brain imaging technology. Our research and clinical trials aim to increase our understanding of consciousness, and to use this knowledge to treat mental and physical illness, expand awareness, and enhance well-being and creativity.

The Policy Programme brings together leading international scientists, politicians and experts to provide a rigorous, independent review of current global drug policies and develop a scientific evidence-base on which to build balanced alternatives. We convene seminars and produce policy reports to shed light on the taboo issues around this complex subject, and demonstrate how the legal regulation of drug markets can reduce the harms caused by both the drugs themselves and by the collateral consequences of prohibition. We collaborate globally with political leaders – most recently advising the Jamaican government in creating its emerging cannabis industry.



Many thanks to our donors!

Our Science and Policy Programmes rely exclusively on the generosity of our supporters. The Beckley Foundation would like to sincerely thank its donors for their kind contributions, and ask all interested parties to help us develop and expand our science and policy programmes.

Donations of any amount are greatly appreciated and will help fund our upcoming studies into the therapeutic effects of psychedelic drugs, cannabis and MDMA.

To donate, please visit [**beckleyfoundation.org/donate**](https://beckleyfoundation.org/donate)

AMANDA FEILDING AND THE BECKLEY FOUNDATION

“Psychedelics are a key to unlock a deeper level of the psyche. They can transform the individual in ways that modern science is only just beginning to understand.”

Amanda Feilding



Amanda Feilding has been called the ‘hidden hand’ behind the renaissance of psychedelic science, and her contribution to global drug policy reform has also been pivotal and widely acknowledged.

Amanda was first introduced to LSD in the mid-1960s, at the height of the first wave of scientific research into psychedelics. Impressed by its capacity to initiate mystical states of consciousness and heighten creativity, she quickly recognised its transformative and therapeutic power. Inspired by her experiences, she began studying the mechanisms underlying the effects of psychedelic substances and dedicated herself to exploring ways of harnessing their potential to enhance wellbeing.

In 1996, Amanda set up *The Foundation to Further Consciousness*, changing its name to *The Beckley Foundation* in 1998. She realised that cannabis and psychedelics could only be re-integrated into society by explaining their benefits in scientific terms. Through the Foundation, she

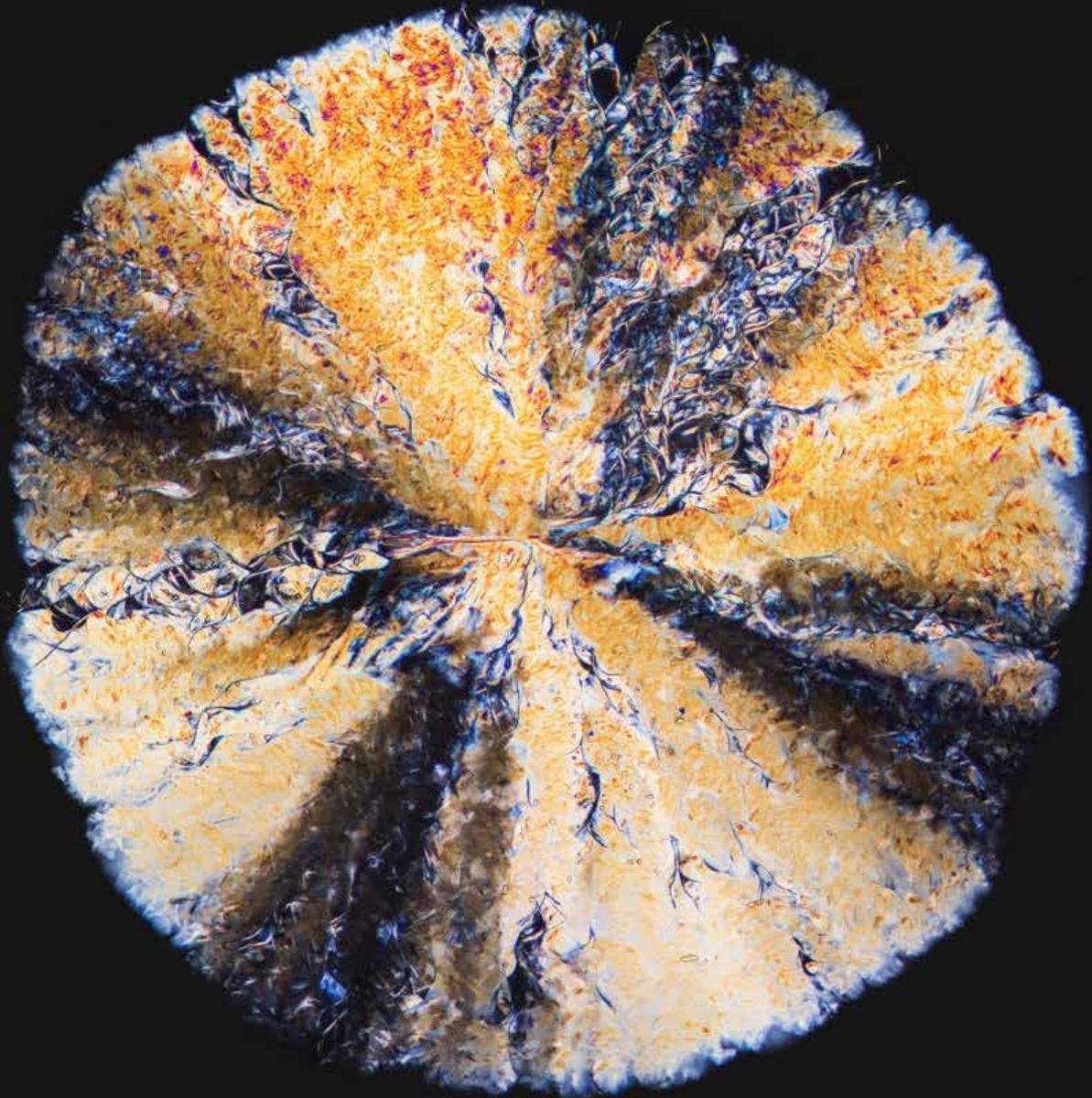
set about using cutting-edge brain-imaging technologies to examine the physiological and neurological changes underlying altered states of consciousness. Her long-held aim is to further our understanding of brain function under the influence of various psychoactive substances, so that we can better harness their great potential to improve the human state.

Having watched the development of the ‘War on Drugs’ with dismay, Amanda felt compelled to do whatever she could to draw attention to its devastating and unintended consequences. Bringing together a network of scientists, politicians and drug policy analysts, she was among the first to begin creating a scientific evidence-base to help reform global drug policies, in order to better protect health, reduce harms and economic costs, and uphold human rights.

From 1998, she initiated and hosted a series of 11 seminars in the House of Lords, discussing key policy issues and drawing attention to the ignored topics of cannabis and psychedelics. These seminars, and the papers arising from them, were highly influential in changing attitudes among thinkers and policy-makers worldwide.

Through the Beckley Foundation, Amanda continues to bridge the divide between science and drug policy: her pioneering psychedelic research is providing the scientific evidence upon which a case for drug policy reform can be built. Such reform will, in turn, allow for further research on currently prohibited substances to progress and hopefully result in the availability of psychedelic-assisted psychotherapy for those in need.

DMT Crystal, Cross polarisation microscope.
Photo by Maurice Mikkers



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“Through The Beckley Foundation, Feilding has spent the last two decades working tirelessly to change the perception of drugs around the world, from advising international governments to conducting ground-breaking studies.”

- The Telegraph

Over 50 papers have been published in influential scientific journals as a result of the Foundation’s collaborative research projects.

THE BECKLEY/IMPERIAL RESEARCH PROGRAMME

The *Beckley/Imperial Research Programme* has been a highly productive partnership between Amanda Feilding and Prof David Nutt, co-founders and directors of the programme, and Dr Robin Carhart-Harris, lead investigator. The collaboration began in 2005, when Amanda approached David about forming a partnership to investigate the effects of psychedelics and cannabis on brain function. New scientists have since joined the team.

The Programme has carried out pioneering brain imaging studies with psilocybin, MDMA, LSD, and DMT, using fMRI and MEG. These have greatly expanded our understanding of how psychedelics work in the brain, and have provided invaluable insights into the nature of different states of consciousness and how they can aid the treatment of mental illnesses.



In 2012, the findings of the psilocybin brain imaging study were published to world acclaim, and led to the Medical Research Council awarding a grant to study the efficacy of psilocybin for the treatment of depression. This pilot study was published in 2016 in *The Lancet Psychiatry*, with remarkably positive results: 67% of subjects with treatment-resistant depression were in remission one week after taking psilocybin, and 42% remained depression-free three months later. This is an unprecedented achievement, as participants had suffered from depression for an average of 18 years and had failed to respond to any other treatment. This study is now being extended and developed into a placebo-controlled trial.

Also in 2012, we conducted an imaging study of the brain on MDMA ('Ecstasy'), as part of the Channel 4 programme *Drugs Live: The Ecstasy Trial*. The study examined for the first time how the resting brain responds to MDMA, and also included a series of cognitive tests investigating the drug's effects on empathy, trust and memory. This provided fundamental information about the neural underpinnings of MDMA's effects and its psychotherapeutic value. The programme, which was presented by Jon Snow, was viewed by over 2 million people.

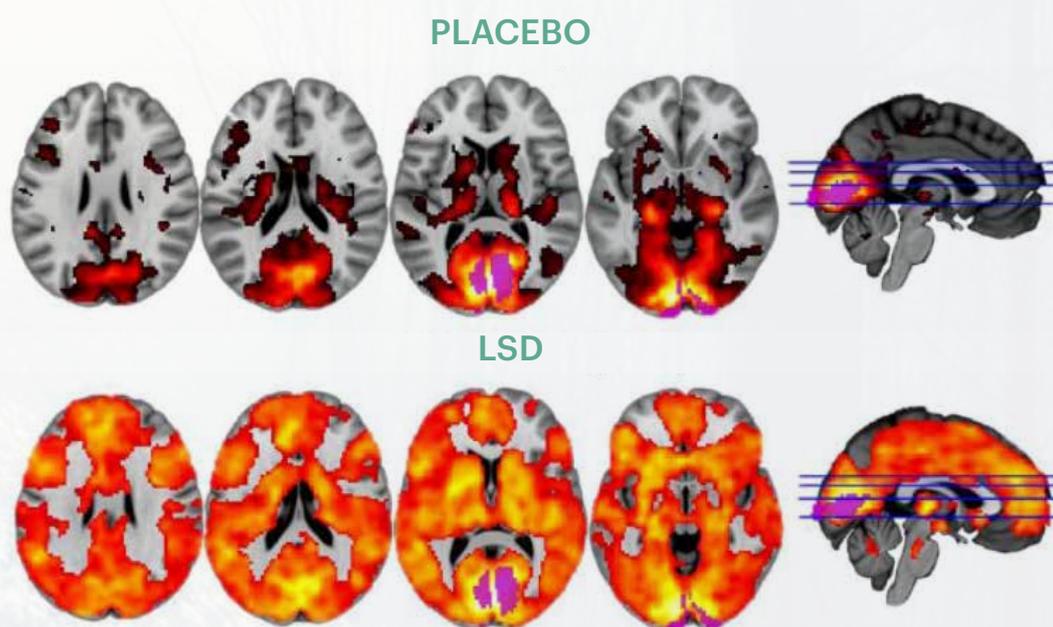
In 2014, the *Beckley/Imperial Research Programme* started the *first-ever brain imaging study with LSD*, a long-standing ambition of Amanda's. Results were published in PNAS in 2016 and launched at the Royal Society, London, to global acclaim. We showed marked changes in brain blood-flow, neural activity, and network communication patterns that correlated strongly with the drug's hallucinatory and other consciousness-altering properties.



LSD was shown to decrease connectivity between key regions of the brain's *Default Mode Network* (DMN) that are involved in processing various aspects of selfhood – such as autobiographical memories and self-awareness. This effect correlated strongly with the subjective experience of 'ego dissolution', implying the importance of the DMN for maintaining the boundaries of the ego.

At the same time, LSD causes a dramatic increase in connectivity between other regions of the brain that are normally highly segregated. This induces more free-flowing patterns of cognition, allowing users to become more creative and break-free from rigid modes of thought and behaviour – such as those underlying psychological disorders such as depression and addiction.

These results have significant implications for the neurobiology of consciousness, as well as for potential applications of LSD as an invaluable tool for psychotherapy.



Increase in brain connectivity between the visual areas and the rest of the brain after LSD-PNAS (2016)



BECKLEY / IMPERIAL RESEARCH PROGRAMME CURRENT AND FUTURE RESEARCH

Collaboration between Amanda Feilding, Prof David Nutt (Co-Directors of the Programme) and Dr Robin Carhart-Harris (lead investigator) at Imperial College London

The efficacy of psilocybin-assisted psychotherapy: a randomised controlled trial

Led by Dr Robin Carhart-Harris

In 2016 we published data giving preliminary indication that psilocybin, when administered in safe and supportive conditions, can alleviate treatment-resistant depression. In this pilot study, 12 patients who had been suffering for an average of 18 years from moderate to severe treatment-resistant depression were given only two oral doses of psilocybin, 7 days apart. Strikingly, one week following treatment 67% patients remained depression-free. After 3 months, 42% of patients were still in remission. We now have plans to expand this research into a larger-scale placebo-controlled trial that could lead to the development of psilocybin-assisted psychotherapy as a novel psychiatric treatment approach.

The effect of DMT on the human brain using a combination of fMRI and EEG

Led by Chris Timmerman

This study is using electroencephalography (EEG), functional magnetic resonance imaging (fMRI), and questionnaires to examine how alterations in brain activity relate to changes in subjective experience under DMT. It is hoped that the results will give insight into

the therapeutic properties of this powerful psychedelic compound and reveal the different mechanisms underlying the effects of LSD and DMT.

Effect of LSD and DMT on cortical pyramidal cell and vessel activity

Led by Tobias Buchborn and Prof Thomas Knopfel

Using the cutting-edge technique of optogenetic electrophysiology, which uses light to control cells in living tissue, we are investigating the effects of LSD and DMT on blood vessels and on the activity of a subset of neurons in the mouse brain. This research will be the first to 'zoom in' to the molecular level in order to determine what occurs after psychedelics bind to their neuronal receptors.

Reconstruction of the visual hallucinations experienced on LSD

Led by Leor Roseman, a collaboration between UC Berkeley and the Beckley/Imperial Research Programme

Study participants will watch videos while their brain activity is monitored using fMRI. Using this neuroimaging data, a sophisticated artificial intelligence model will try to delineate what the subject is seeing with their eyes closed under LSD and will reconstruct a video of this psychedelic imagery.

Optimising LSD micro-dosing: a brain imaging study

Led by Amanda Feilding

We are planning the first controlled, double-blind study to investigate the physiological, neurological and psychological effects of low doses of LSD. To date, micro-dosing has never been studied in a controlled laboratory setting. With traditional cognitive tests and questionnaires, we aim to characterise how low psychedelic doses affect mood, thinking, and perception. We will also make use of the ancient game of Go to investigate whether LSD can increase intuitive pattern recognition and creativity.

To explore the neural and vascular activity underlying the possible enhancement of cognition under LSD, participants will also undergo fMRI brain imaging. This study will generate the first scientific knowledge of this novel approach to taking psychedelics and will pave the way for future research that will explore the diversity of its applications – therapeutic, cognition boosting, and creativity enhancing.



The total number of atoms in the universe is 10^{82} , but the number of possible Go games is 10^{360} . That's roughly equal to the number you'd get if you squared the number of atoms in the universe, then squared that number again.



THE BECKLEY/SANT PAU RESEARCH PROGRAMME

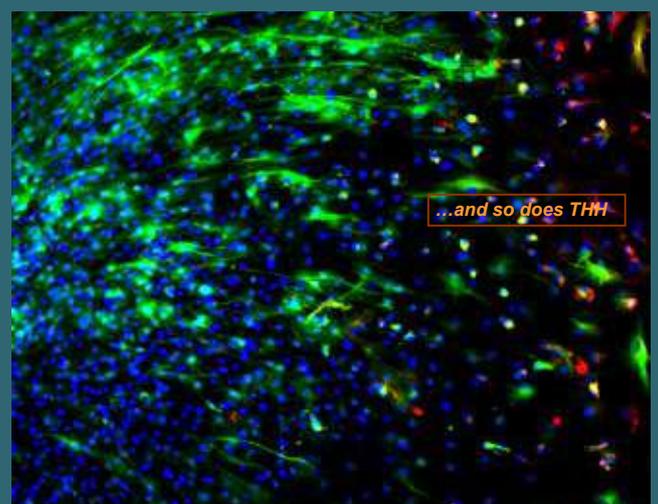
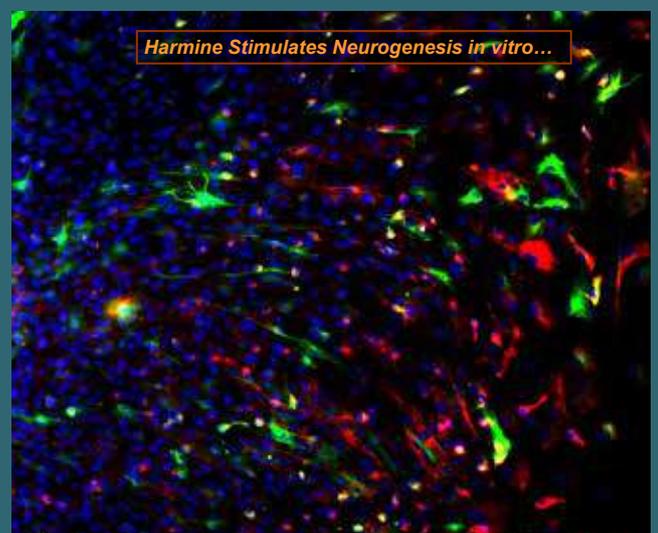
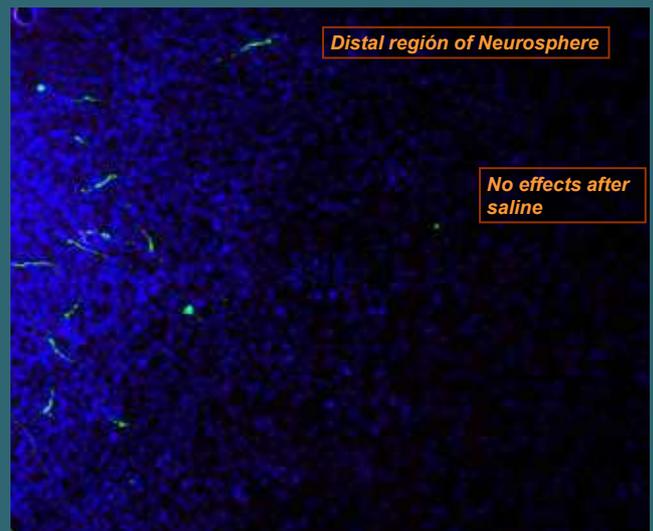
The collaboration between Dr Jordi Riba and Amanda Feilding was initiated in 2013 to investigate the actions of ayahuasca, DMT, and 5-MeO-DMT at a molecular, structural, and functional level in the brain, and to examine their effects in both new and experienced users. Using pharmacological techniques and brain-imaging methods such as fMRI and spectroscopy, we are investigating how the changes in neural activity caused by these substances lead to an increase in mindfulness capacities and other interesting psychological phenomena.

Our latest study, in collaboration with the Spanish National Research Council, revealed for the first time that components of the visionary Amazonian brew ayahuasca have the potential to promote the birth of new neurons (neurogenesis). Preliminary results show that the addition of harmine and tetrahydroharmine to cell cultures containing neural stem cells dramatically increases the growth of new neurons and their maturation.

If these findings can be replicated *in vivo*, our research could open up a new avenue of treatment for psychiatric and neurodegenerative disorders, such as depression, Alzheimer's Disease, and Parkinson's Disease.

Additional studies in development include:

- A clinical trial investigating the effect of *pharmahuasca* for the treatment of post-traumatic stress disorder resulting from childhood trauma
- The first ever study to investigate the neurobiological and immunological effects of 5-MeO-DMT
- A brain imaging study investigating the phenomenology of experiencing 'entities' after DMT intake



COLOR CODE

Blue staining: cell nuclei (marks all cells)

Green staining: young neurons

Red staining: mature neurons

SELECTION OF FURTHER COLLABORATIONS

CLINICAL TRIAL INVESTIGATING LSD FOR THE TREATMENT OF ALCOHOLISM

Collaboration with Dr Snehal Bhatt, Dr Lindsay Worth, Dr Claire Wilcox, and Dr Michael Bogenschutz, University of New Mexico, USA

Clinical research with LSD carried out in the 1950s and 60s gave promising indication that this prototypical psychedelic could be highly effective to treat, and perhaps even cure, alcoholism. A recent study by Dr Bogenschutz and colleagues also generated preliminary findings that psilocybin can decrease drinking and cravings, and increase an individual's ability to abstain. This study will be the first modern trial to investigate the efficacy of LSD in alcoholics under double-blind, placebo-controlled conditions. It has several aims: to characterise the acute effects of different doses in this population, and to evaluate the short-term persisting effects of LSD treatment on psychological and brain imaging measures and on drinking outcomes. The results of this study could greatly contribute to re-establishing the value of LSD as a psychotherapeutic tool for healing addiction and other psychological illnesses based on excessively rigid thought patterns and behaviours.

BECKLEY/EXETER RESEARCH PROGRAMME

Co-directed by Prof Celia Morgan and Amanda Feilding

We are currently investigating the potential of CBD to help individuals overcome nicotine addiction. Preliminary results have shown that CBD can reduce the number of cigarettes smoked by approximately 40%, and that this effect can be maintained to some extent in the weeks following treatment. We are now recruiting more participants and have added a brain imaging component to assess the brain activity patterns underlying the probable therapeutic effects of CBD.

We are also undertaking an exciting new project at the *Beckley/Exeter Cannabis Centre* at the University of Exeter. Working with partners in the US, Canada and Israel, we plan to bring the latest innovative technology to cannabis research

in the UK. Using highly specialised equipment to analyse the cannabinoid, terpene and flavonoid content of different cannabis strains, we will formulate cannabis-based medicines to treat specific conditions such as pain, insomnia, and anxiety, and boost cognitive functioning including memory.

EFFECTS OF AYAHUASCA ON QUALITY OF LIFE, WELLBEING, AND HEALTH

Collaboration with the International Centre for Ethnobotanical Education, Research, and Service (ICEERS)

For years people have spoken about the profound healing potential of ayahuasca, but few studies have attempted to explore this systematically. This project evaluates the long-term effects of ayahuasca, when ingested in a ritual setting, on the personal development and mental and emotional wellbeing of Western users. Collecting data from hundreds of participants over two years, we aim to generate much-needed scientific evidence about ayahuasca's benefits and risks, while also examining its potential to treat depression, anxiety, grief and post-traumatic stress disorder.

PSILOCYBIN FOR SMOKING CESSATION

A Beckley-sponsored study with Prof Roland Griffiths and Dr Matt Johnson, Johns Hopkins University, USA

The recently completed pilot study, which started in 2008, was the first modern study to harness the profound psychological effects of a psychedelic to aid the treatment of addiction. Combining cognitive behavioural therapy (CBT) with psilocybin, results revealed the remarkable efficacy of psilocybin-assisted psychotherapy in helping people overcome nicotine addiction. At 12 months following the therapeutic sessions, 80% of participants had remained completely abstinent from smoking. The team is now conducting a larger placebo-controlled trial with 80 participants, who will receive fMRI neuroimaging to help understand the neurobiological changes underlying the effectiveness of psilocybin in the cessation of nicotine addiction.



EFFECTS OF DIFFERENT CANNABIS STRAINS ON THE BRAIN

Collaboration with Prof Val Curran, University College, London

This study used brain imaging to compare the effects of two different strains of cannabis – one with high THC content and minimal CBD and the other with a balanced CBD/THC ratio – on brain function. High-THC cannabis was found to impair certain brain networks, while CBD helped counteract some of these negative effects. These findings, which were initially broadcast to the public on the Channel 4 TV programme *Drugs Live: The Cannabis Trial* (2015), are important for developing harm-reduction strategies, given the popularity and availability of high-THC cannabis in both the UK and the USA.

MDMA FOR THE TREATMENT OF POST-TRAUMATIC STRESS DISORDER (PTSD)

Collaboration with Prof John Bisson, Dr Ben Sessa and Dr Mat Hoskins, Cardiff University

This study will investigate the efficacy of MDMA-assisted psychotherapy for participants with chronic, treatment-resistant PTSD, examining the brain mechanisms underlying MDMA's therapeutic effect. Specifically, it will probe activity in the amygdala, the brain region known to play a primary role in emotional and fear responses. One of our previous brain imaging studies in healthy subjects showed that MDMA decreases activity in the amygdala and lessens the impact of traumatic memories. This study will determine whether decreased amygdala activity in those suffering from PTSD will be associated with a reduction in

their stress response to painful memories under MDMA.

NEUROVASCULAR AND NEUROIMAGING EFFECTS OF 1P-LSD IN THE RAT BRAIN

Collaboration with Dr Chris Martin, Sheffield University

Using 1p-LSD, a structural analogue of LSD, this study is exploring the effects of psychedelics on neuronal activity and brain blood flow. We are investigating whether psychedelics work directly on blood vessels to increase/decrease blood flow and capillary volume, or whether this is secondary to neuronal activity. Findings will have important implications for the understanding of how psychedelics affect consciousness.

SELF-BLINDED LSD MICRO-DOSING SURVEY

Collaboration with Balazs Szigeti, University of Edinburgh

There has been a recent explosion of interest in taking small amounts of LSD, psilocybin, or other psychedelics with reports that it can lift depression and anxiety, and improve concentration and cognition. This study will offer a protocol to interested participants that will guide them through how to prepare and execute their own blinded study of the effects of micro-dosing compared to placebo. At the end of each week, they will complete questionnaires about their well-being and write reports of their experiences. The data collected from this study will help inform the design of our placebo-controlled brain imaging study of the effects of micro-dosing taking place as part of the *Beckley/Imperial Research Programme*.

PSILOCYBIN AS A TOOL FOR ENHANCED CREATIVITY AND POSITIVE LEARNING MECHANISMS

Collaboration with Prof Jan Ramaekers and Dr Kim Kuypers, Maastricht University

This project will examine, using behavioural measures and brain imaging (MRI spectroscopy and fMRI), whether psilocybin can help individuals to devalue previously learned associations by increasing creative thinking. This research could therefore both determine the efficacy of psilocybin to enhance creativity and reveal potential therapeutic targets for altering the maladaptive thought patterns that characterise mental illnesses, such as post-traumatic stress disorder and depression.

BECKLEY/SECHENOV RESEARCH PROGRAMME

Cerebral Circulation and Cranial Compliance

Collaboration with Prof Yuri Moskalkenko, Sechenov Institute of Evolutionary Physiology & Biochemistry, St. Petersburg

This long-standing collaboration between Amanda Feilding and Prof Yuri Moskalkenko investigates cerebral circulation and the relationship between the changes in 'cranial compliance' and dementia. 'Cranial compliance' is an important physiological index of the health of cerebral circulation, reflecting the mobility of the blood and cerebrospinal fluid. Led by Professor Yuri Moskalkenko, this study has developed a non-invasive Cranial Compliance Monitor, which tracks the health of cerebral circulation, and could be used in the future to help detect the effects of trauma, stroke, and age-related cognitive decline. This programme has also investigated the effects of trepanation on the index of cranial compliance.



“The best way to overcome the taboo and re-integrate psychedelics into the fabric of society is by undertaking the very best scientific research”

Amanda Feilding

SELECTED SCIENTIFIC PAPERS

BECKLEY/IMPERIAL RESEARCH PROGRAMME

Co-directed by Amanda Feilding & Prof David Nutt

Psilocybin with psychological support for treatment-resistant depression: an open-label feasibility study. Carhart-Harris RL, Bolstridge M, Rucker J, ...Feilding A, ... Nutt DJ (2016). *The Lancet Psychiatry*, 3(7), 619-627

Neural correlates of the LSD experience revealed by multimodal neuroimaging. Carhart-Harris RL, Muthukumaraswamy, S, Roseman L, Kaelen M, ..., Feilding A, Nutt DJ (2016). *PNAS*, 113(17), 4853-4858

LSD modulates music-induced imagery via changes in parahippocampal connectivity. Kaelen M, Roseman L, ...,Feilding A, Muthukumaraswamy S, Nutt DJ, Carhart-Harris R (2016). *European Neuropsychopharmacology*, 26(7), 1099-1109

Increased global functional connectivity correlates with LSD-induced ego dissolution. Tagliazucchi E, Roseman L, Kaelen M, ..., Feilding A, Nutt DJ, Carhart-Harris R (2016). *Current Biology*, 28(8), 1043-1050

The entropic brain: a theory of conscious states informed by neuroimaging research with psychedelic drugs. Carhart-Harris RL, Leech R, Hellyer P, ..., Feilding A, Nutt DJ (2014). *Frontiers in Human Neuroscience*, 8(20), 1-22

Neural correlates of the psychedelic state as determined by fMRI studies with psilocybin. Carhart-Harris RL, Erritzoe D, Williams T, ... , Feilding A, Wise R, Nutt DJ (2012). *PNAS*, 109(6), 2138-214

The Effects of Acutely Administered 3, 4-MDMA on Spontaneous Brain Function in Healthy Volunteers Measured with ASL and BOLD Resting State Functional Connectivity. Carhart-Harris RL, Murphy K, Leech R, ..., Feilding A, Curran HV, Nutt DJ (2015). *Biological Psychiatry*, 77(8), 554-562

COLLABORATION WITH JOHNS HOPKINS UNIVERSITY

Pilot study of the 5-HT_{2A}R agonist psilocybin in the treatment of tobacco addiction. Johnson MW, Garcia-Romeu A, Cosimano MP, Griffiths RR (2014). *Journal of Psychopharmacology*, 28(11); 983-992

COLLABORATION WITH UCL LONDON

Investigating the interaction between schizotypy, divergent thinking and cannabis use. Schafer G, Feilding A, Morgan CJ, ..., Curran HV (2012). *Consciousness and Cognition*, 21(1), 292-298

THE BECKLEY/SANT PAU RESEARCH PROGRAMME

Co-directed by Amanda Feilding and Dr Jordi Riba

Assessing the Psychedelic “After-Glow” in Ayahuasca Users: Post-Acute Neurometabolic and Functional Connectivity Changes Are Associated with Enhanced Mindfulness Capacities. Sampedro F., de la Fuente Revenga M., Valle M., ..., Feilding A., Riba J (2017) *The International Journal of Neuropsychopharmacology*, in press

Ayahuasca: pharmacology, neuroscience and therapeutic potential. Domínguez-Clavé E, Soler J, Friedlander P, ..., Feilding A, Riba J (2016). *Brain Research Bulletin*, 126(1), 89-101

Inhibition of alpha oscillations through serotonin 2A receptor activation underlies the visual effects of ayahuasca in humans. Valle M, Maqueda A, Rabella M, ..., Feilding A, Riba J (2016). *European Neuropsychopharmacology*, 26(7), 1161-1175

Exploring the therapeutic potential of Ayahuasca: Acute intake increases mindfulness-related capacities. Soler J, Elices M, Franquesa A, Friedlander P, ..., Feilding A, Pascual JC, Riba J (2015). *Psychopharmacology*, 233(5), 823-829

COLLABORATION WITH KING'S COLLEGE LONDON

Cannabidiol inhibits THC-elicited paranoid symptoms and hippocampal-dependent memory impairment. Englund A, Morrison PD, Nottage J, ..., Feilding A, ..., Kapur S (2013). *Journal of Psychopharmacology*, 27(1), 19-27

Communication breakdown: delta-9 tetrahydrocannabinol effects on pre-speech neural coherence. Stone JM, Morrison PD, Brugger S, ..., Feilding A, ..., Ffytche DH (2012). *Molecular Psychiatry*, 17(6), 568-569

COLLABORATION WITH SECHENOV INSTITUTE OF PHYSIOLOGY

The effect of craniotomy on the intracranial hemodynamics and cerebrospinal fluid dynamics in humans. Moskalenko YE, Vainshtein, GB, Kravchenko TI, ..., Feilding A, Halvorson P, Medvedev SV (2008). *Human Physiology*, 34(3), 299-305

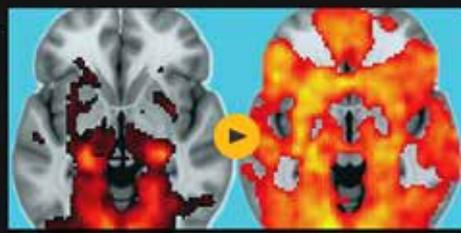
Biomechanical properties of the human cranium: aging aspects. Moskalenko YE, Vainshtein, G B, Halvorson, P, ..., Feilding A, ..., Panov AA (2008). *Journal of Evolutionary Biochemistry and Physiology*, 44(5), 605-614

Will LSD ever be accepted as a treatment?

By Jon Kelly
BBC News Magazine

13 April 2018 | Magazine

Tripping on LSD could unlock child-like creativity - video



A long-awaited study has produced groundbreaking images of the heightened brain activity unleashed by LSD. David Nutt, a former drugs adviser to the government, says the research shows how an acid trip works on the brain and will improve understanding of how the drug can be used in the name of science and health.

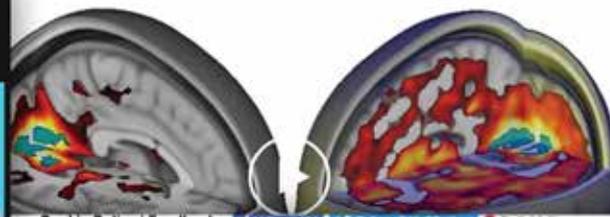
LSD's impact on the brain revealed in groundbreaking images

This is your brain on LSD, literally



By James Griffiths, CNN

Updated 1056 GMT (1856 HKT) April 13, 2016



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LSD's impact on the brain revealed in groundbreaking images

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IT SU

Brain scans reveal how LSD affects consciousness

Friendly Appro

Drug researcher David Nutt discusses brain-imaging studies with hallucinogens.

Zoe Cormier

11 April 2018

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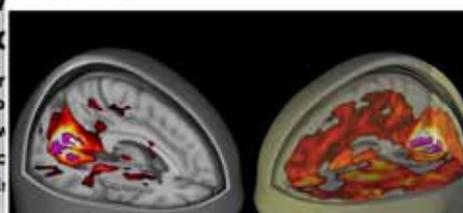
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RECENT COVERAGE OF BECKLEY IN THE MEDIA

Online and Print Media

- LSD: over **3,500 articles** in international and national press, including *The Sunday Times*, *The Guardian*, *Washington Post*, *Telegraph*, *CNN*, *Scientific American*
- Psilocybin for Depression: **1,740 articles** including *The Guardian* (**54,000 shares**) *The Spectator*, *The Mail Online*, *The Mirror* and *The Sun*
- Ayahuasca and Neurogenesis: Articles in *The Daily Express* and *IFL Science* (**40,800 shares**)

Television and Video

- LSD: live coverage on *BBC News* and *CNN*
- Psilocybin and Depression: *BBC Newsnight*
- Guardian* Video: "LSD 's impact on the brain revealed in groundbreaking images" (over **6 million views**)

Podcasts and Radio

- Psychedelic Research: *Memory Motel*, *Altered States: Philosophy Talk* (Stanford University)
- New Psychoactive Substances: *BBC Breakfast*, *Talk Radio*, *Talk Radio* (Europe)

Social Media

- Twitter: Tweets earn **533,000 impressions** per month. Followers include politicians, international journalists, healthcare professionals, academic researchers and leading research institutions
- Facebook: Post reach of up to **160,000**. Fans include scientists, policymakers, top journalists and medical cannabis campaign groups

Amanda Feilding has been featured by:

- The New York Times, National Geographic, The Economist, The Sunday Times, New Statesman, The Guardian, Vice, BBC Radio 4, The Independent, The Telegraph, Huffington Post, Wired, Huck Magazine

WHAT DO WE KNOW ABOUT PSYCHEDELICS?

Insights from our Science Research Programme

PSYCHEDELICS CAN POSITIVELY CHANGE PEOPLE IN THE LONG TERM

After decades of misconception and media misrepresentation about how psychedelics alter consciousness, our cutting-edge scientific studies have begun to reveal that psychedelics occasion

powerful, often transcendent, experiences that can lead to positive changes in mood, well-being, and personality that are immediately apparent, and that can last for days, weeks, or even years. These data indicate that psychedelics may lead to a paradigm shift in our current approach to mental health-care.

We have generated experimental evidence showing that LSD can increase both optimism and openness, and, interestingly, that these psychological changes were associated with increased connectivity between brain regions that under normal conditions do not communicate.

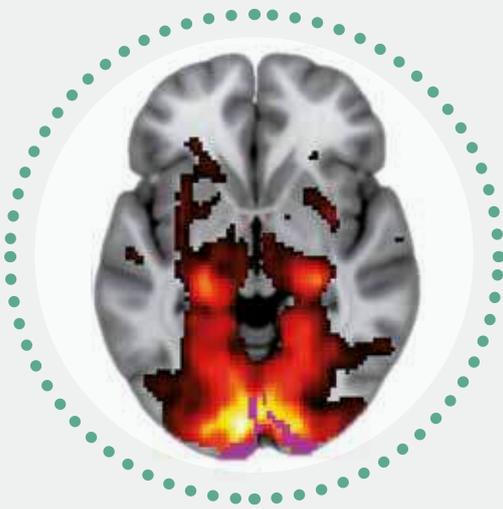
Further, our data show that ayahuasca can expand the capacity for 'mindfulness' by allowing one to learn how to 'decentre'. By observing one's thoughts and feelings from a position of detachment, rather than being defined by them, one can become more self-accepting and can limit reactive and judgemental tendencies.

It is becoming increasingly clear that these long-term benefits arise from mystical-type experiences that are often at the core of a psychedelic trip. In the Beckley Foundation-sponsored Johns Hopkins smoking-cessation study, those who had mystical experiences under psilocybin were more likely to demonstrate continued abstinence 6 months later. A closely related concept to 'mystical experience' known as 'ego-dissolution', or the feeling that one's self is no longer distinct from the outside world, is one of the most interesting, and poorly understood, aspects of the psychedelic experience. Our preliminary data show that ego-dissolution after LSD and psilocybin has a complex neural signature. We have linked the phenomenon with a decrease in blood supply to the Default Mode Network, resulting in a decreased integrity of that network and increased communication across the entire brain. Psychedelic-occasioned mystical experiences and ego-dissolution should be explored further to determine the extent to which they predict the long-term benefits of psychedelics.

PSYCHEDELICS GREATLY AFFECT BRAIN NETWORKS

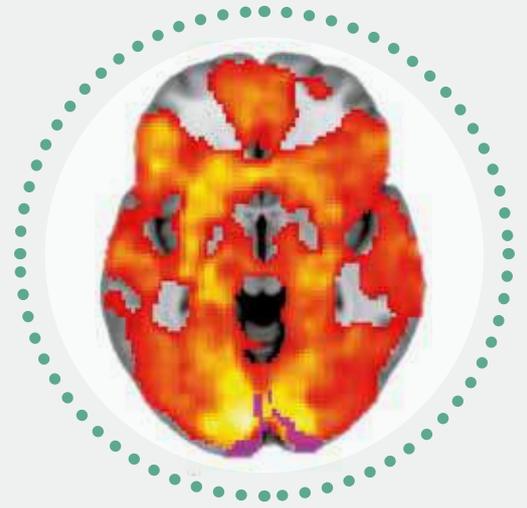
Our *Beckley/Imperial Research Programme* has been, and continues to be, at the forefront of neuroimaging research with psychedelics. Data emerging from this programme has greatly broadened our understanding of the patterns of brain activity underlying the effects. We have shown that brain networks, which are normally distinct and organised by function (such as visual, motor, and default-mode), lose their distinct identity under the influence of psychedelics. Brain regions *within* networks communicate less, while regions from separate networks communicate more. For example, we saw that under LSD, compared with placebo, the visual cortex began to communicate more with 22 different brain regions, and that this enhanced connectivity was associated with subjects reporting 'seeing' more complex visual imagery with their eyes closed.

In general, this enhanced whole-brain communication after ingestion of psychedelics may help to explain the sense of 'unity' or 'oneness', increased creativity, and greater openness to new concepts and ideas that are all characteristic of the psychedelic state. It may also reveal how psychedelics can help people to break free from excessively rigid patterns of thought and behaviour underlying conditions such as depression or addiction.



PSYCHEDELIC-ASSISTED PSYCHOTHERAPY IS ENHANCED BY MUSIC

Anecdotally, it has been long reported that music and psychedelics interact in a special way, which can be harnessed to optimise psychedelic-assisted psychotherapy. Mendel Kaelen, a Beckley/Imperial Research Fellow, has found that communication between the visual cortex and the parahippocampus – which is involved in autobiographical memory – increases under LSD, and even more so while listening to music. This means that psychedelic visions become more vivid and relevant to one’s own life experiences, enabling patients to better access and process latent personal memories during therapy.



PSYCHEDELICS HAVE UNPRECEDENTED THERAPEUTIC POTENTIAL

Much of the work of the Beckley Foundation is driven by a desire to clarify how psychedelics can ease psychological distress of all kinds. Our collaborations have been leading the way in this regard. We have shown that psilocybin can alleviate stubborn, treatment-resistant depression and that it is the most effective known medicine to help curb nicotine addiction. We have also shown that LSD-assisted psychotherapy can quell anxiety and depression in those who have been diagnosed with a terminal illness, and that regular use of ayahuasca leads to personality changes that are linked to improved mental health. In vitro, we have demonstrated that components of ayahuasca stimulate the birth of new neurons, which could lead to the development of novel treatments for psychological and neurodegenerative disorders. With the continued expansion of our research, we hope that psychedelics will soon become accepted tools with which to better understand and alleviate human suffering.

Connectivity	Within Network	Between Networks	Effects on Cognition
Normal functioning	<p>High integrity</p> <p>High Integrity</p>	<p>Segregation</p> <p>● Nodes or regions — Connectivity</p>	<p>‘Organised’ brain</p>
Psychedelics	<p>Disintegration = low integrity</p> <p>Low Integrity</p>	<p>Desegregation</p>	<p>‘Disorganised’ or ‘entropic’ brain</p>

POLICY PROGRAMME

The 'War on Drugs' continues to cause worldwide devastation. Prohibition costs taxpayers billions each year, yet policies have failed to eliminate drugs, instead increasing the risks and harms associated with their use. Unregulated and mired in criminality, the illicit drugs trade is now worth over \$350 billion a year, and is associated with escalating violence, corruption, incarceration and suffering.

For nearly 20 years, the Beckley Foundation has been at the forefront of global drug policy reform, pioneering a scientific evidence-base on which to build balanced alternatives to the prohibitionist approach. We bring together international scientists, politicians and other experts to produce seminal books, reports and conferences, with the aim of minimising the harms incurred by current policies, proposing rational alternatives, and opening doors to further research into the potential medical benefits of certain psychoactive substances.

A SELECTION OF KEY ACHIEVEMENTS

Society & Drugs: A Rational Perspective (2002 - 2011). This series of 11 highly influential seminars held at the Houses of Lords, brought together for the first time eminent politicians, scientists, policy-makers, and other experts to discuss key policy issues at the national and global levels. Out of these discussions came a series of policy reports and books, that laid the foundations for the global drug policy reforms which are currently taking place.

The seminars also paved the way for our ongoing policy programme which has included the following initiatives:

The founding of two leading organisations: the *International Drug Policy Consortium (IDPC)* and the *International Society for the Study of Drug Policy (ISSDP)*. These were both founded by Mike Trace and Amanda Feilding as part of the *Beckley Foundation Policy Programme* and launched at the Beckley Foundation Seminar of 2004. Since then they have become independent and flourished.

The BF Global Cannabis Commission was initiated by Amanda in 2006, and launched in 2008 with the report *Cannabis Policy: Moving Beyond Stalemate*. This report was the first of its kind and extremely influential in the regulation of cannabis. It was later co-published with Oxford University Press.

The Global Initiative for Drug Policy Reform was launched in 2011 at a Beckley Foundation seminar at the House of Lords. The *All Party Parliamentary Group for Drug Policy Reform* was set up to support this initiative. The seminar was attended by high level governmental representatives of 14 countries interested in reform. Former President Fernando Cardoso of Brazil attended leading the representation of the Global Commission on Drug Policy.

The Beckley Foundation's Public Letter (2011) was signed by 9 Presidents, 13 Nobel Laureates, and a host of other international luminaries. It is considered a key milestone in the history of drug policy reform.

The Beckley Foundation's International Advisory Work. Amanda was invited by both the Guatemalan and Jamaican governments to advise them on drug policy reform. This included writing two reports for Guatemala, one entitled the Paths to Reform, which the President used at UN and other international meetings. In Jamaica, Amanda worked closely with the Minister of Justice and the Government in the implementation of a regulated cannabis industry.

The foundation has also been involved in advisory work in Mexico and Colombia among other countries.



POLICY PUBLICATIONS

The **Foundation has produced over 40 books, reports, and briefing papers on global drug policy issues**, which have had a strong role in influencing the UN and various governments and States in their moves towards reform. Our publications present a thorough review of the impact of current prohibitionist policies and shed light on many previously obscured areas of this complex issue, while opening up the avenues for alternative policies.

We present alternatives to prohibition that :

- **Promote human rights and public health**
- **Reduce drug-related crime, violence and corruption**
- **Enable governments to gain control of, and profit from ,one of the world's largest economies**
- **Dismantle the barriers to scientific and medical research**

KEY PUBLICATIONS

Cannabis Policy: Moving Beyond Stalemate (2008) was based on a pioneering report by the **Beckley Foundation's Global Cannabis Commission** that demonstrated how draconian drug policies do not curb use. The book laid out for the first time the alternative routes towards minimising the harms associated with cannabis: by decriminalisation and the establishment of a legally regulated market.

Roadmaps to Reforming the UN Drug Conventions (2012) explains in detail how the UN Drug Conventions could be amended to give countries the freedom to tailor their drug policies to their individual needs i.e. full decriminalisation and regulation where appropriate.

Licensing and Regulation of the Cannabis Market in England and Wales: Towards a Cost-Benefit Analysis (2013) was the first report to quantify the fiscal and social benefits of a regulated and taxed cannabis market.

ONGOING AND UPCOMING POLICY WORK

2017 WILL SEE THE RELEASE OF TWO NEW SEMINAL REPORTS:

Evidence is mounting for the failure of prohibition to curb or eliminate drug use, despite the billions spent on enforcement. Leaders from countries most affected by the drug war, such as Guatemala and Colombia, are demanding a review of ineffective policies and an enquiry into possible alternatives. Countries such as Uruguay, Portugal and the Czech republic, and certain States in the US, have taken the lead by either legalising cannabis use or decriminalising all drug consumption.

In response to the call for alternative drug policies, we are launching two new policy reports assessing the harms and benefits associated with the use of specific drugs, the collateral damage brought about by punitive policies, and the way forward in terms of alternative policies focused on public health, community safety, cost effectiveness, economic development and human rights.

Change will occur on a drug-by-drug basis, responding to specific issues in specific contexts. Our reports are the first to focus on individual drugs, the ways in which they are produced, distributed and consumed, and the potential routes forward to reduce harms and maximise benefits associated with their use.

Roadmaps to Regulation: Cannabis, Psychedelics, MDMA, and New Psychoactive Substances (2017) presents four stand-alone sections that explore regulatory models for the medical, therapeutic and recreational use of each of these substances. We demonstrate that most of the risks associated with the use of these drugs are direct consequences of prohibition, and that legal regulation at both the production and supply levels will help resolve many of the harms caused by both the drugs themselves and the unintended consequences of prohibition. The report also highlights the need for reform in order to remove the obstructions currently inhibiting research into their therapeutic potential.



Image: Thomas Grisaffi

The Cocaine Papers (2017). The illicit cocaine trade is a major destabilising force in many parts of the world, particularly Latin America, the Caribbean, and West Africa. The cocaine trade and the drug war waged to suppress it are responsible for deaths, violence and corruption, economic damage, and environmental destruction, among many other harms to individuals and society. It is difficult, if not impossible, to envisage an end to these problems without addressing the complex issues surrounding both the illicit cocaine market and the prohibitionist approach to controlling it.

Following a series of meetings with the Guatemalan president, Otto Perez-Molina, the first courageous world leader to advocate drug policy reform, Amanda Feilding proposed the idea for a report on regulating coca, cocaine and its derivatives. Molina endorsed the project and the Cocaine Papers was conceived. This report brings together over 25 international experts from multiple disciplines to make the case for the legal regulation of coca and cocaine, in order to tackle the illicit market and reduce the devastating violence, corruption and political instability it has caused around the world.



Brain Stem fractal by Rick Chapman

WHAT IS THE AIM OF THE BECKLEY FOUNDATION?

1. The aim of the Beckley Foundation's Science Programme is to explore and discover how changing states of consciousness can help heal sickness, improve well-being, and increase openness and creativity. Certain psychoactive substances such as cannabis and psychedelics are tools by which these altered states can be achieved. The complementary aim of our Policy Programme is to bring about change in drug laws, so that these compounds are recognised as valuable healing agents, and thereby become licensed medicines.
2. Now there is a groundswell of interest in the possible benefits that careful use of these extraordinary compounds can bring. Scientific research is gradually building a network of studies which demonstrate the efficacy of the use of psychedelics in controlled circumstances. As the network of experiments and clinical trials grows, professional and public awareness of the possible uses of these substances is intensifying. As medicines, these substances are *unusually non-specific*. The limited research so far completed has shown that they can help bring about remarkable results in a wide spectrum of illnesses, such as depression, anxiety and addiction. Furthermore, anecdotal evidence suggests that their healing abilities may spread much wider, to anorexia, obsessive compulsive disorder, post-traumatic stress disorder, autism, cluster headaches, etc.
3. Many of these conditions have been shown to be based upon hyperactivity of, and between, two hub-centres of the *Default Mode Network* (DMN) - the medial prefrontal cortex and the posterior cingulate cortex. Our research has demonstrated that psilocybin and LSD reduces the activity of these centres, thereby diminishing their "censoring" effect, and allowing the whole brain to communicate more actively. This freer, more flexible and primal state of consciousness allows for psychological change at a deeper level than normal consciousness, where the DMN is in full control. This state can also enhance creative thinking, assist healing and trigger constructive transformation. Many people claim that an insight they had under the influence of a psychedelic changed their lives for the better, touching a deeper level of the psyche.
4. We need more clinical trials to clarify the powerful possibilities of these substances for public health. Only then will policy-makers become aware of their advantages. This should lead to the reassignment of psychedelics and cannabis from Schedule I—which defines them as having no medicinal value and a high potential for abuse—to a lower schedule, so that research can be conducted without expensive and time-consuming obstructions, and so that doctors can prescribe them. This will result in a win-win outcome for both patients and society.

Amanda Feilding

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DR JORDI RIBA, PhD

Associate Professor of Pharmacology at the Universitat Autònoma de Barcelona (UAB), Associate Researcher at the Drug Research Center of the Sant Pau Hospital in Barcelona.

IN MEMORIAM

DR ALBERT HOFMANN, PhD

Discoverer of LSD and founding member of the Beckley Foundation's Scientific Advisory Board until he passed away in April 2008 at the age of 102.

DR ALEXANDER SHULGIN, PhD

Pharmacologist, chemist, and psychoactive drug researcher. Author of PiHKAL, TiHKAL, and The Shulgin Index.

DR RONALD SANDISON, MD

British psychiatrist, psychotherapist and pioneer for the clinical use of LSD in psychiatry.

THE GLOBAL WAR ON DRUGS HAS FAILED IT IS TIME FOR A NEW APPROACH

WE THE UNDERSIGNED call on Governments and Parliaments to recognise that:

Fifty years after the 1961 UN Single Convention on Narcotic Drugs was launched, the global war on drugs has failed, and has had many unintended and devastating consequences worldwide.

Use of the major controlled drugs has risen, and supply is cheaper, purer and more available than ever before. The UN conservatively estimates that there are now 250 million drug users worldwide.

Illicit drugs are now the third most valuable industry in the world, after food and oil, estimated to be worth over \$350 billion a year, all in the control of criminals.

Fighting the war on drugs costs the world's taxpayers incalculable billions each year. Millions of people are in prison worldwide for drug-related offences, mostly personal users and small-time dealers.

Corruption amongst law-enforcers and politicians, especially in producer and transit countries, has spread as never before, endangering democracy and civil society. Stability, security and development are threatened by the fallout from the war on drugs, as are human rights. Tens of thousands of people die in the drug war each year.

The drug-free world so confidently predicted by supporters of the war on drugs is further than ever from attainment.

Yours faithfully,

President Juan Manuel Santos
President of the Republic of Colombia

President Otto Pérez Molina
President of the Republic of Guatemala

President Jimmy Carter
*Former President of the United States,
Nobel Prize winner*

President Fernando H. Cardoso
Former President of Brazil

President César Gaviria
Former President of Colombia

President Vicente Fox
Former President of Mexico

President Ruth Dreifuss
Former President of Switzerland

President Lech Wałęsa
*Former President of Poland, Nobel Prize
winner*

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Physicist, Nobel Prize winner

Professor Sir Anthony Leggett
Physicist, Nobel Prize winner

Professor Martin L. Perl
Physicist, Nobel Prize winner

Wisława Szymborska
Poet, Nobel Prize winner

The policies of prohibition create more harms than they prevent. We must seriously consider shifting resources away from criminalising tens of millions of otherwise law abiding citizens, and move towards an approach based on health, harm-reduction, cost-effectiveness and respect for human rights. Evidence consistently shows that these health-based approaches deliver better results than criminalisation.

Improving our drug policies is one of the key policy challenges of our time. It is time for world leaders to fundamentally review their strategies in response to the drug phenomenon.

At the root of current policies lies the 1961 UN Single Convention on Narcotic Drugs. It is time to re-examine this treaty which imposes a 'one-size-fits-all' solution, in order to allow individual countries the freedom to explore drug policies that better suit their domestic needs.

As the production, demand and use of drugs cannot be eradicated, new ways must be found to minimise harms, and new policies, based on scientific evidence, must be explored.

Let us break the taboo on debate and reform. The time for action is now.

Sir Richard Branson
Entrepreneur, founder of Virgin Group

Sting
Musician and actor

Yoko Ono
Musician and artist

Carlos Fuentes
Novelist and essayist

Gilberto Gil
Former Minister of Culture, Brazil

Sean Parker
Founding President of Facebook, Spotify

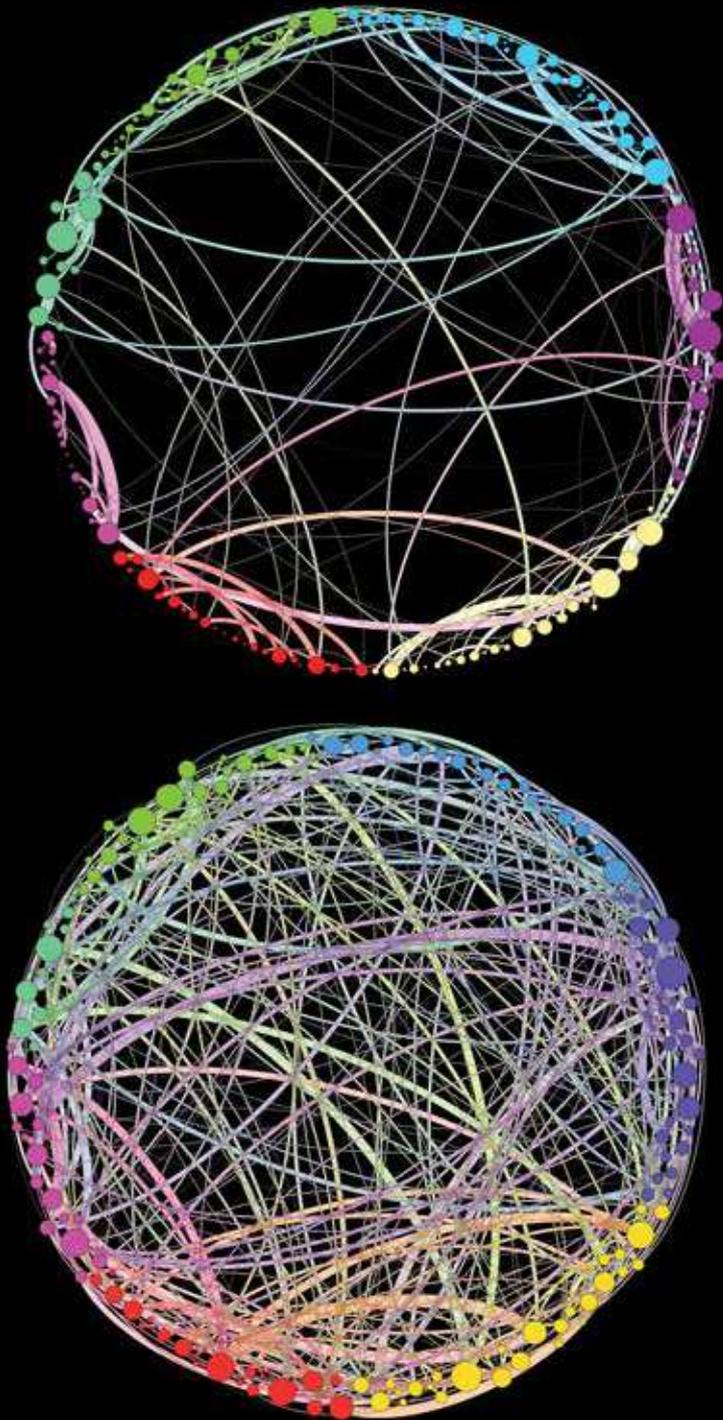
Thorvald Stoltenberg
Former UN High Commissioner, Refugees

Louise Arbour, CC, GOQ
*Former UN High Commissioner, Human
Rights*

Javier Solana, KOGF, KCMG
Former Secretary General, EU Council

Professor Noam Chomsky
Professor of Linguistics & Philosophy, MIT

Amanda Feilding
Director, the Beckley Foundation



BECKLEY FOUNDATION

✉: Beckley Park, Oxford, OX3 9SY, United Kingdom

📧: office@beckleyfoundation.org

☎: +44 (0) 1865 351209 | 🌐: www.beckleyfoundation.org

📌: /TheBeckleyFoundation | 🐦: @BeckleyResearch

The Beckley Foundation is registered as a charity in the UK N° SC033546

Image on front cover: Microscopic crystal cross polarisation; DMT, MDMA, Amphetamine, LSD, 2CB, GHB - Photo by Maurice Mikkers
Image on the back cover: Brain communication patterns on placebo (top) and psilocybin (bottom) - Image from Petri *et al.* (2014)