

<b>Institution:</b> UNIVERSITY OF THE ARTS LONDON
<b>Unit of Assessment:</b> 34
<b>Title of case study:</b> Professor Rob Kessler's collaboration with the Royal Botanic Gardens, Kew.
<p><b>1. Summary of the impact</b></p> <p>Kessler's research collaboration with scientists at The Royal Botanic Gardens, Kew during his NESTA Fellowship (2002–2005) has allowed insights previously only accessible to a small number within the scientific community to reach a wide audience and impact on public understanding of fruit and seed biology. Unlike other works on the subject that are solely aimed at a scientific audience, the books <i>Pollen: The Hidden Sexuality of Flowers</i> (2004), <i>Seeds: Time Capsules of Life</i> (2006) and <i>Fruit: Edible, Inedible, Incredible</i> (2008) produced in collaboration with Kew scientists Dr. Madeline Harley (<i>Pollen</i>) and Dr. Wolfgang Stuppy (<i>Seeds</i> and <i>Fruit</i>) target a wider audience by revealing beautiful complex forms and structures, via scanning electron micrographs of fruits, seeds and pollen. The publications have found a worldwide audience and the work has had an influence on education in schools.</p> <p><b>2. Underpinning research</b></p> <p>The underpinning research was produced by Kessler whilst employed by University of the Arts London (UAL) as Senior Lecturer in Ceramic Design (now UAL Chair of Arts, Design and Science). Throughout his career, Kessler's work has focused on the appropriation of the natural within contemporary culture, examining its impact on daily life through a wide range of familiar materials and objects from ceramics to furniture, drawing to photography. Over the past decade he has worked extensively with botanical scientists at Kew exploring the creative potential of microscopic plant material, producing the publications <i>Pollen</i> (2004), <i>Seeds</i> (2006) and <i>Fruit</i> (2008). A defining feature of the collaboration was that the work should be of the highest order, meeting with peer approval from audiences within the fields of both plant biology and art and design.</p> <p>After training in microscopy techniques, Kessler controlled the whole process of creating the images. He identified and collected samples from a range of UK and European flora, preparing them for the microscope by mounting the samples and sputter coating them in platinum for examination in the vacuum chamber. Selection of optimal focus for magnification and orientation of the samples was critical in ensuring a stable result in which the images convey a strong sense of three dimensionality. Extending the existing canon of botanical representation, Kessler examined contrasting modes for depicting plants distinguishing the individual approach of artists, scientists and illustrators, and challenged the orthodoxies of conventional representation. He developed a collection of images coloured to reveal specimens as powerful phytomorphic motifs, producing 359 micrographs and 191 photograph images. The images are painstaking, meticulous constructions that extend the potential of the microscope beyond conventional boundaries, and in conjunction with imaging software, reveal the structure and form of the specimens with great clarity.</p> <p>Intrinsic to the research is the development and use of colour as both an informative and emotive tool. This approach goes beyond the limitations of the 'false colouration' characteristic of most science imaging, which normally relies on colour enhancement software and requires limited user intervention. Through colouration of the black and white images, Kessler highlights functional characteristics of the specimen via a process of multiple layering, addition and erasure, introducing an artistic sensibility intended to create a sense of awe, capture the imagination, and extend user engagement. This revelation of the intricate structure, forms and functions of botanical subjects, in conjunction with the texts by Harley and Stuppy, creates new perspectives for both scientific and art and design communities.</p> <p>The key findings that underpin the impact outlined in this case study are as follows:</p> <ul style="list-style-type: none"> <li>• Revelation of new perspectives on the structure, characteristics, functions and form of</li> </ul>

## Impact case study (REF3b)

botanical specimens.

- Extension of the canon of botanical representation challenging the orthodoxies of conventional representation.
- Contribution to the understanding and appreciation of organisms vital to the preservation of bio-diversity.

### 3. References to the research

- 1) Kessler, R. and Harley, M. (2004) *Pollen: The Hidden Sexuality of Flowers*. Papadakis Publishers [Artefact]. UAL on request.
- 2) Kessler, R. and Stuppy, W. (2006) *Seeds: Time Capsules of Life*, with Foreword by HRH Prince of Wales. Papadakis Publishers [Artefact]. UAL on request.
- 3) Kessler, R. and Stuppy, W. (2008) *Fruit: Edible, Inedible and Incredible*. Papadakis Publishers. [Artefact]. Listed in REF2.

Kessler received support from the Nesta Fellowship programme to undertake research in collaboration with the Royal Botanic Gardens, Kew.

In 2007, *Pollen: The Hidden Sexuality of Flowers* and *Seeds: Time Capsules of Life* won a Gold Medal at the Independent Publisher Book Awards in New York, category Outstanding Books of the Year.

### 4. Details of the impact

The images created by Kessler during his work with Kew are visually stunning and bring about engagement with the subject, resulting in impact on public understanding of plant biology. The books *Pollen*, *Seeds* and *Fruit*, are specifically designed to appeal to the wider public with the further aim of increasing public understanding and support for the conservation work of the Royal Botanic Gardens, Kew and the Millennium Seed Bank Partnership (the largest ex-situ plant conservation project in the world). The reach of Kessler's impact is evidenced by sales figures and media coverage of his work, and its significance by the importance of the research to scientific, publishing, educational and creative communities.

Kessler's images enable what was only previously accessible to a small number within the scientific community to reach a global audience. On Kew's website, Stuppy describes the images produced as a 'key attraction of the books'. In 2012, images from *Seeds* were used as part of a Kew produced documentary *Beyond the Gardens: The Millennium Seedbank Partnership* which has been viewed by c. 9,500 people on YouTube. In 2011 Jonathan Drori (Trustee of the Royal Botanic Gardens Kew) utilised Kessler's images in two TED Talks; *Every Pollen Grain has a Story* and *The Beautiful Tricks of Flowers*. On the TED platform these talks have been viewed over 660,000 times. TED states that the number of total views across all platforms (YouTube, downloads etc.) is typically double this figure. The Head of Seed Conservation Department & Millennium Seed Bank writes 'His [Kessler's] colourful, crafted images have become compelling icons that reassert the beauty and diversity of the plant world and capture the imagination of wide audiences, including people who do not have a particular interest in plants. The beautifully illustrated books [...] have brought new audiences to the important work we do and have become recognised by our partners internationally.'

Kessler's work has been the subject of exhibitions at Kew intended to inspire new audiences and raise awareness of the important work being undertaken. Kew's Galleries and Exhibitions Leader commented on the 'remarkable use of imagery' saying it has 'captivated visitors and was a powerful vehicle to highlight some of the significant "behind the scenes" science that is not widely known.' *Canopy – a new Micrographia* took place in The Nash Conservatory (05/2008–09/2008). During this period 598,000 people visited Kew and it is estimated that 15% to 20% would have

## Impact case study (REF3b)

seen the exhibition (Source: Kew), which was reviewed in *New Scientist*. This exhibition was subsequently modified and displayed at the Millennium Seed Bank (MSB), Wakehurst Place, Kew (05/2009–01/2011). Wakehurst Place has nearly 400,000 visitors per year and Kew estimate that between 10% and 20% visit the Seed Bank. Designer Thomas Heatherwick became aware of Kessler's work when visiting MSB and has said '*Whilst researching ideas for what became known as the Seed Cathedral, the British Pavilion at the Shanghai Expo, 2010, I visited the Millennium Seed Bank at Kew where I became aware of the work the artist Rob Kessler had been doing with seed morphologist Wolfgang Stuppy. His stunning colourful images of microscopic seeds and pollen were truly inspirational and revealed how their complexity and diversity exists even on the most minute scale.*' Eight images of seeds by Kessler have been on permanent display at the MSB since 2009.

The publications *Pollen*, *Seeds* and *Fruit* have found a worldwide audience. The reach of Kessler's research impact is evidenced by sales figures for the publications, averaging c. 25–30,000 per title (source: Papadakis). In 2009 *The Bizarre and Incredible World of Plants* was published, bringing together elements of all three previous publications in one volume. The books have been translated into seven languages and foreign co-editions have been published in USA/Canada, Germany, Spain and Japan. French and Chinese editions of *The Bizarre and Incredible World of Plants* have been published in France, Taiwan and mainland China, respectively. *Pollen* is currently in its third edition and second editions of *Seeds* and *Fruit* have been published. In May 2011 *Seeds* featured in the list of top 10 botany books in *The Times*' special science supplement *Eureka* magazine, and in 2009 the German edition of *Pollen* was awarded the prize for the most beautiful book of the year by Wissenschafts BDW, Germany. In 2010 *Up Close* was published by Papadakis, an extensive survey of Kessler's work from the past twenty-five years. It is '[...] undoubtedly Professor Kessler's striking and groundbreaking work that has led to the popularity of this series of books [...] which is recognisable and much admired throughout the publishing world' the series '[...] has led our publishing house to pursue new lines in publications and we have since developed a very strong line in nature and natural history.' (Publishing Director, Papadakis). An image from *Fruit* features on the cover of the Papadakis Autumn 2011 Catalogue, a further indicator of the continuing importance of Kessler's body of work to his publishers.

The publications have received much attention in the press, both in the UK and abroad. During 2008 the work was the subject of a BBC News Website feature, had a centre page spread photo feature in *The Guardian*, received an illustrated feature in *The Telegraph*, was the subject of an article in *Kew Magazine*, and featured in *Time Magazine*, who described *Fruit* as '*a spectacular new book of botanical architecture.*' In 2008 *Fruit* was the subject of a cover feature and lead article for *Infocus* magazine (the proceedings of the Royal Microscopical Society). In addition Nesta's celebration of 10 years of Fellowships in 2011, featured an interview with Kessler and utilised images from the publications. In November 2012 an article *Amazing Close-ups of Seeds* was published on the Smithsonian blog giving an overview of the work of Kessler and Stuppy against the background of the MSB at Kew. '*The Millennium Seed Bank is a global seed garden of epic proportions. By 2010, the project had amassed about 10 percent of the world's 400,000 plant species, and the trajectory is to reach 25 percent by 2020. Wouldn't you like to see it? The vault itself, of course, is hidden from the public eye. But, MSB's seed morphologist Wolfgang Stuppy and visual artist Rob Kessler have come up with a clever workaround.*' In May 2013 an article on Kessler's work was published in *Design Bureau Magazine* (US).

In Nov/Dec 2011 *Primary Science* recommended Kessler's work as a starting point for teachers in the classroom in the article *Drawn Together: Linking Science and Art and The Millennium Seedbank* saying '*the work of artist Rob Kessler [...] is inspirational in revealing the detail of natural forms.*' He contributed to the *Skills in the Making Workshops (2009-2012)* organised by *The Making*, and his work is cited as a resource for inspiration in their publication *Working with Craft across the Curriculum* (supported by the Paul Hamlyn Foundation). *AD* magazine (the magazine for National Society for Education in Art and Design) ran an illustrated article showing how Kessler's work has been used as part of a project within the School of Education at the University of Brighton, developing new curriculum approaches to art and science in schools. Here students

## Impact case study (REF3b)

were introduced to Kessler's work as an illustration of the potential of making connections between science and art (Spring 2012, Issue 4). In 2013 AD magazine (Spring 2013, Issue 7) published an article by Kessler Awe – *A personal approach to looking*. The cover of this edition featured an image from *Fruit* and the article was accompanied by a specially designed pull-out poster. In 2012 Kessler's images were reproduced in a US textbook *What is Life? A Guide to Biology* by Jay Phelan (W.H Freeman Publishers) where they were used to accompany chapters on growth and reproduction in plants and the common structural features of plants.

As a direct result of the underpinning research outlined above Kessler was awarded a Fellowship with the Instituto Gulbenkian Ciencia, Oeiras, Portugal, instigated by the Calouste Gulbenkian Foundation London as part of the Year of Bio-Diversity 2010. Here he was invited to work with the molecular biologists at the Gulbenkian Science Institute and produced *Jardim Porcelânico*, a body of work focusing on the cellular structures of Portuguese wild flora and continuing exploration of the themes of accessible presentation of the process of science developed at Kew. *Jardim Porcelânico* was selected for inclusion in the AWARD at the Potteries Museum and Art Gallery, Stoke-on-Trent as part of the British Ceramics Biennial in 2011. Kessler was invited to contribute to Ceramic Review Magazine, where he authored a feature on *Jardim Porcelânico*, and the work was the subject of an interview in Nature magazine. Work undertaken during the fellowship was showcased at *Petals, Pixels and Plates – an artist in the laboratory*, a one day solo exhibition at Sala Verde da Estação Agronómica Nacional, Oeiras, Portugal in celebration of International Plant Fascination Day — a worldwide initiative adopted by 39 countries, with events taking place at 580 institutions ranging from botanical gardens to plant research centres.

## 5. Sources to corroborate the impact

### Impact on public understanding of plant biology and dissemination of the work of Kew:

1. *Amazing Close-ups of Seeds* (Nov 2012) on Collage of Arts and Science, Smithsonian.com can be found at <http://blogs.smithsonianmag.com/artscience/2012/11/amazing-close-ups-of-seeds>
2. Bizarre and incredible world of fruit and nuts (Sept 2008) *The Telegraph* can be found at <http://www.telegraph.co.uk/earth/earthnews/3350676/Bizarre-and-incredible-world-of-fruit-and-nuts.html> 'The pictures were taken using an electron microscope which uses focused beams of electrons to create hugely magnified images. It produces bizarre and incredible shapes and textures offering a rare insight into a fascinating and mysterious world.' Includes 11 images from *Fruit*.
3. TED Talk by Jonathan Drori  
[http://www.ted.com/talks/jonathan\\_drori\\_every\\_pollen\\_grain\\_has\\_a\\_story.html](http://www.ted.com/talks/jonathan_drori_every_pollen_grain_has_a_story.html)
4. BBC News Website slideshow can be viewed at:  
<http://news.bbc.co.uk/1/hi/sci/tech/7591649.stm>
5. Statement from Head of Seed Conservation Department & Millennium Seed Bank, Royal Botanic Garden's Kew. UAL on request.
6. Statement from Galleries and Exhibitions leader, Royal Botanic Gardens, Kew. UAL on request.

### Impact on publishing and audience reach:

7. Statement from Publishing Director, Papadakis Publishers. UAL on request.
8. Seeds in Top 10 Botany Books in *The Times'* magazine *Eureka* (May 2011)  
<http://news.papadakis.net/titles/seeds-in-eureka/>

### Impact on education:

9. Statement from Editor of AD magazine (the magazine for the National Society for Education in Art and Design). UAL on request.
10. Kessler in The Making's *Working with across the Curriculum*  
[http://www.themaking.org.uk/Content/our\\_programme/Skills/teaching%20resources/Working-with-Craft-across-the-Curriculum.pdf](http://www.themaking.org.uk/Content/our_programme/Skills/teaching%20resources/Working-with-Craft-across-the-Curriculum.pdf) and at <http://www.nsead.org/craft/curriculum.aspx>