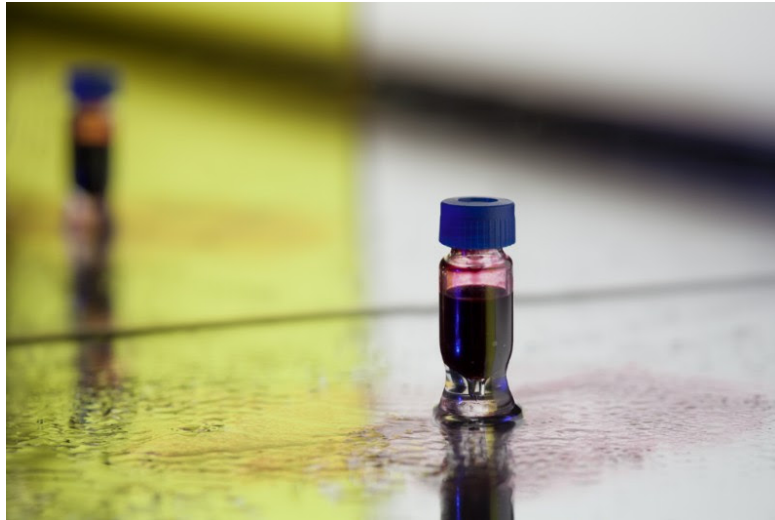


COLOUR CODED

Faber Futures' bacterial dye becomes first DNA-coded colour in the Forbes Pigment Collection



A sample of *Streptomyces coelicolor* with encoded DNA, Faber Futures in collaboration with Gingko bioworks for the Forbes Pigment Collection 2018. Photography by IMMATTERS.

On the fifth floor of **Harvard Art Museums' Straus Center for Conservation and Technical Studies**, the human history of colour is mapped out on shelves stacked from floor to ceiling. Thousands of vials line the walls, containing powders in every conceivable hue, like the shelves of an apothecary or a vast rainbow spice rack. This is the **Forbes Pigment Collection** – a repository of almost every pigment and dye employed by artists across the world since **1,000 BC**.

Now there's a new addition to the library, and it isn't a dye or a pigment, but a set of instructions for creating colour from bacteria – written in DNA.

For the last seven years, the biodesign pioneer and founder of biotech consultancy **Faber Futures, Natsai Audrey Chieza**, has been exploring the ability of the soil microbe ***Streptomyces coelicolor*** to generate a pigment that could be used to **dye textiles**. When it interacts with natural fibres, *S. coelicolor* can create a colourfast sky-blue to red finish without the use of chemicals, and with minimal water consumption compared to industrial dyeing methods. This opens up exciting new possibilities for the textiles industry, and introduces other, potentially game-changing, prospects for **biotech-driven design and production systems**.

Meeting with **Senior Conservation Scientist Naryanan Khandekar** – director of the Straus Center and custodian of the Forbes Collection – Chieza quickly realised that as a representative of a new technological shift in sourcing colour and growing material systems, Faber Futures' work with *S. coelicolor* more than merited inclusion in the collection. Khandekar agreed.



(Left) *Streptomyces coelicolor* (Right) Natsai Audrey Chieza, founder of Faber Futures. Photography by Toby Coulson.

Storage techniques have greatly progressed since **Edward Forbes** first gathered his pigments in the early 20th century. Instead of preserving only the isolated *S. coelicolor* pigment molecule (actinorhodin), Faber Futures and **Ginkgo Bioworks** – the Boston-based organism-design company – have also embedded the metadata of the organism’s use case and the context of their collaboration into strings of DNA. More enduring than existing big-data storage architecture, DNA has the potential to store information for 700,000 years or more – and at a greater magnitude of density. All the data in the world could be packed into a space no bigger than a small wardrobe.

Working in collaboration with **Michael Napolitano**, a design engineer at Ginkgo Bioworks, Faber Futures has explored emerging DNA-based data storage techniques to encode a contextual explanation of the coelicolor project, the organism’s complete genome, and information about its potential applications, including textile dyeing. Through this intervention, Faber Futures speculates that, in the coming decades and far into our unknown futures, users of this and similar archives would be able to retrieve the relevant DNA sequence, and interpret the data enclosed according to their needs, technologies and cultural context

Companies including **Microsoft**, **Intel**, **Twist Bioscience** and **Catalog** are already leading the scale-up of these capabilities. For Faber Futures, this project demonstrates the possibilities that lie ahead and opens up a conversation into this fast-developing space in biotechnology. The Forbes Collection contains more than **2,500 pigments** in bottles of all shapes and size, and spans a staggeringly nuanced array of colours – each with their own origin story. Now, unique among all these, in a tiny vial you’d probably miss if you weren’t looking for it, are the instructions for creating colour from living organisms, written in the universal language of life.

'At Faber Futures, we are interested in the implications of emerging biotechnologies and how they interact with society now and into the future. What happens when we can store the internet using DNA, and then take it to Mars? Perhaps we export some of humanity's best and worst ideas? More immediate and tangible at present is trying to understand how information storage interfaces with current requirements for the preservation of material artefacts. How do we document, distribute, preserve and recover the colossal amounts of data we are generating, and maybe one day access revelatory time capsules in the form of DNA that teach us something new in a place or context we cannot yet imagine?'

– **Natsai Audrey Chieza**, founder, Faber Futures

Notes to Editors

About Natsai Audrey Chieza

Operating at the intersection of design and biotechnology, Natsai Audrey Chieza is an internationally recognised authority in the rapidly emerging field of biodesign. Her work incorporates the co-creation of new materials, products and services with living systems; the development of novel biofabrication processes; and the implementation of innovative design strategies for an emerging bioeconomy. For Chieza, designing with biology presents unique opportunities to address significant ecological challenges, squaring the circle of sustainable production and finite resources.

Driven by a whole-systems approach to innovation, her interdisciplinary practice engages industry, institutions and society at large. In her TED Talk, Chieza sets out an agenda for a pollution-free future of fashion, pioneering work in the development of bacterially derived biopigments for use in dyeing textiles. She has exhibited these works at Bauhaus Dessau Foundation, TRESOR Contemporary Craft with the Crafts Council, the V&A, the Science Gallery Dublin, and Fondation EDF, among others. Listed as one of OkayAfrica's 100 Women for her work in STEM, Chieza has spoken widely about her vision of a biodesigned tomorrow, appearing at SXSW Interactive, Biofabricate Synbiobeta and more, and has taught on biodesign programmes at Bartlett School of Architecture and Central Saint Martins. In 2018, she launched the Ginkgo Creative Residency with Ginkgo Bioworks in Boston, MA, as a curator and mentor on the programme – and founded Faber Futures.

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For more information about **Faber Futures**, the **Colour Coded** project, or project **S. Coelicolor**, as well as interviews with **Natsai Audrey Chieza**, please contact **Dorothy Bourne** at dorothy@zetteler.co.uk or on +44 (0)7939 200519.
