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OF GODS AND GANGS: INDIGO AS A NEW EDUCATIONAL MODEL

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Indigo, the world's only natural blue dye, is the most universally valued. Found on archaeological textiles of all the great civilisations, whether of Ancient Egypt, China or South America, or Iron Age Europe, its exotic history stretches back more than four thousand years. Indigo's story touches on most aspects of life: history and geography; botany and agriculture; chemistry and physics; politics and economics; trade and industry; ethnography; clothes and furnishings; applied arts; medicine and cosmetics; and folklore and music. It is woven into such legendary figures as the Hindu god Krishna and even 'Bluebeard' himself.

The story continues into the twenty-first century, not only because indigo dye is essential for the most universal of all fashion items, blue jeans, but also with the search for more ecologically sustainable dyes, paints and medicines. Indigo's global connections are also being recognised and pioneered as a model to engage students in inter-disciplinary education.

Personal background

A lifelong delight in ethnographic textiles and all aspects of natural dyes was ignited in me after traveling overland to India and Sri Lanka, and working and living in the Arab world in the 1970s. Back in UK in the early 1980s, while working as a textile artist and teacher of fabric printing and dyeing, I had the chance to visit Yemen, where I found its ancient indigo industry on the verge of dying out. (Fig.1) I was encouraged to return there to record its history and traditional uses and subsequently to extend this research to the rest of the Arab world. Indigo, featuring in Egyptian mummy wrappings by 2,000 BC, was widely used until the later twentieth century throughout the Middle East and North Africa in all kinds of textiles, as well as in cosmetics and medicines. This research became a PhD, later published, and led to a book on indigo worldwide for the British Museum Press, as well as an Honorary Research Fellowship in the Institute of Arab and Islamic Studies at Exeter University and Fellowships of London's Royal Geographical Society and New York's Explorers Club.



Figure 1, Dyeing with indigo, Bayt Muhammad 'Ali Abud, Zabid, Yemen, 1983.

When researching and carrying out much indigo fieldwork, often in little visited parts of the world, such as isolated villages in south-west China, Mali and Bangladesh, I became intrigued and fascinated by cross-cultural comparisons and social uses of indigo, and amazed by the variety and beauty of indigo-dyed textiles and the creativity of the makers. (Fig 2)



Figure 2, Indigo dye paste and the plant source, Strobililanthus flaccidifolius, Guizhou province, China, 1993.

Indigo

Before the invention of synthetic dyes in the later 19th century, all dyes came from the natural world. Innumerable plants yield yellowish dyes, and reds could be either vegetable (e.g. madder or morinda) or animal (cochineal, kermes and lac insects) - but the world's only source of colourfast natural blue dye is the indigo-bearing plants that supplied beautiful hues ranging from the palest sky blue to the deepest midnight blue. Combined with other dyes indigo also furnished greens (nature, so full of green, provides no green dyes), most purples, and non-corrosive blacks. Vast quantities of organic indigo were therefore produced and traded between nations well into the twentieth century.

Fortunately, indigo's precursor exists in certain species of several plant genera worldwide, though different cultures used differing production processes. The main tropical plant, *Indigofera tinctoria* and similar species, grew in India and was cultivated on colonial plantations east and west. 'Japanese indigo', a knotweed called *Polygonum tinctorium*, was widespread in China and Japan, while woad was Europe's source. Other plant sources were also used in West Africa and Southeast Asia. However, the blue dyestuff obtained from all these plant species is identical, whether the plant leaves are fermented slowly into leaf compost, as in medieval Europe and Japan, or the dyestuff is extracted from the green leaves by soaking them in water and adding oxygen by vigorous whisking. The latter method produces a clay-like blue paste ideal for drying into rock-hard blocks for storage and long-distance trading.

Dyeing with indigo seems like alchemy, since bacteria or modern chemicals convert the blue dyestuff to a yellowish green colour in the lukewarm, alkaline dye vat. Cloth or yarn dyed in an indigo vat emerges a yellowish color that turns blue on exposure to the air. This unique chemistry makes indigo-

dyed items a permanent blue, with desirable fading qualities due to multiple dips, and also makes indigo compatible with any type of fiber, unlike many natural dyes that are best suited to absorbent animal fibers such as wool and usually require an intermediate chemical substance, called a mordant, and high temperatures to bond to fibers. Indigo dyers passed their secrets down the generations and many superstitions and rituals arose because of the mysterious changes that take place during the dyeing process, bestowing a mystique that in turn gave rise to fascinating social and ceremonial uses. (Fig 3)



Figure 3, Ikat indigo cloth (detail) from Sumba Island, dyed in indigo and morinda red.

The demand for indigo was insatiable because it was needed to dye every blue garment and textile in the world, both everyday and prestigious. Its versatile qualities made it as suitable for practical clothing, including western work-wear and military and service uniforms - hence the expressions 'blue collar worker' and 'navy blue' - as for the 'royal blue' of luxury silks or the calendared turban of a 'blue man' of the Sahara desert. Its special chemistry also made it ideal for decorative techniques such as batik, *shibori*, and ikat.

The name 'indigo' comes from the Greek 'indikón', describing a 'substance from India' that intrigued Classical Europe. Much in demand in the Middle Ages, it was carried from East to West overland by camel caravan on the Silk Roads, changing hands in such great markets as those of Damascus and Baghdad, and by sea from India and beyond. From the end of the sixteenth century it was transported on the East India Companies' 'East Indiamen' galleys across the Indian Ocean and around the Cape of Good Hope.

From the seventeenth century European colonial powers produced their own indigo on plantations relying on slave labour in the West Indies, Central America and southern states of America e.g. Florida, Georgia and South Carolina. Tangible evidence of this trade includes recovered indigo cargoes from the Caribbean.

In the nineteenth century indigo production and trade was dominated by the British in Bengal – another story of forced labour that led to a mutinous uprising. Despite its tainted history in Bangladesh and West Bengal, there are exciting revivals there today of natural indigo, supported by the latest research into the intriguing biotechnology of the indigo vat.

A vital strand of indigo's story is linked with the arrival in America in 1853 of an immigrant called Levi Strauss. His invention of 'waist overalls' for cowboys and miners during the Californian gold rush ultimately led to blue jeans, the most long-lasting and global fashion item of all time. Originally an icon of glamour and rebellion for the youth of the post-war West, they have been so wholeheartedly embraced by mainstream fashion that the annual global output is more than a billion pairs and shows no signs of abating. Most jeans are dyed with synthetic indigo.

Indigo was such a valuable commercial product that much research was undertaken to try and synthesize it, but it took many years and a fortune of 18 million German marks before renowned German chemist Adolf von Baeyer (1835-1917) uncovered indigo's chemical structure in 1883. It earned him a Nobel Prize. In 1897 the Badische Anilin und Soda Fabrik (BASF) Company launched synthetic 'Indigo pure' onto the market, half a century after synthetic alizarin began to replace natural madder red, and within seven years Germany was exporting 8,730,000kg of synthetic indigo, dramatically undermining the manufacture of organic indigo.

In its un-dissolved state, indigo was also used for ink and paint pigment and for medicine and cosmetics, including tattoos.

All these different aspects of indigo, and the universality and beauty of indigo-dyed textiles, make it an enlightening subject for lectures, exhibitions and education. In 2007 UK's Whitworth Art Gallery staged a major touring exhibition called 'Indigo: A Blue to Dye For', curated by Dr Jennifer Harris, with myself as consultant curator. Modern indigo artwork from this exhibition toured to the Textile Museum in Washington DC in 2008 for their exhibition called 'Blue'. While the exhibition toured UK each venue ran popular educational and arts events for school and college students. Indigo was also being used as a successful model for education programs at Cornwall's popular 'Eden Project' in UK, a tourist attraction and educational charity visited by over a million people a year. It uses imaginative exhibits, events, workshops and educational programmes - in an engaging, entertaining and inspiring way - to remind a wide audience of our dependence on, and connection to, the natural world.

Indigo must have been in the global educational air somewhere; while the indigo show was touring Britain the eminent 'cellist Yo Yo Ma was exploring the subject of indigo for an educational experiment in interdisciplinary learning in New York City. In February 2009, on the day of President Obama's inauguration, the artistic director of the Silk Road Project, Andy Russ, e-mailed me about these ideas.

Indigo and Silk Road Connect

Yo Yo Ma is generally concerned about peace, global connection and education, beyond his well-known musical activities in Classical and cross-cultural music (notably with his Silk Road Ensemble). 'I have always been more curious about what joins people together than what separates them' he has said. In 1998 he founded The Silk Road Project, 'a not-for-profit artistic, cultural and educational organization with a vision of connecting the world's neighbourhoods by bringing together artists and audiences around the globe'. Ma took his inspiration from the historic Silk Road trading routes, 'the internet of antiquity' being a metaphor for the first global exchange of scientific and cultural traditions. (Fig. 4)



Figure 4, *Yo Yo Ma, with members of Silk Road Connect (including Jenny Balfour-Paul) discussing the indigo project with teachers at P45 school in Harlem.*

After The Silk Road Project ran a successful creative, collaborative, project in Chicago in 2006 and developed a curriculum for middle school and secondary students called ‘Along the Silk Road’ with the Stanford Program on International and Cross-Cultural Education (SPICE), Ma sought was an educational ‘spark’ to inspire ‘passionate learning’ in students and educators in ‘under-served’ schools in New York City. He heard Ben Haggerty, British storyteller of the Silk Road Ensemble, recount an African tale of how indigo came down to earth from the sky so people could capture its colour in their clothes, and this tale ignited the ‘spark’. Ma began to explore the subject of indigo, which included reading *Indigo* and encouraging members of his Silk Road Project team to visit ‘Blue’ at the Textile Museum. The more he discovered the more he saw the potential of using indigo as ‘a gateway by which students can connect the personal experiences of their everyday lives (for example, blue jeans) with the history, geography and culture of the rest of the planet’.

I first heard of these ideas in that e-mail from Andy Russ, followed by a phone conversation with Ma himself, from Istanbul where he was on a concert tour. They invited me to Cambridge Massachusetts to join members of the Silk Road Project and a number of invited artists and educators at a ‘brainstorming’ session. (In 2005 the Faculty of Arts and Sciences at Harvard had become, with Rhode Island School of Design, a partner with the Silk Road Project. In 2010 the Project moved its offices from Providence to the Harvard campus).

Of all the unexpected situations indigo has placed me in, sitting between a Nobel prize-winning chemist and an eminent palaeontologist from the American Museum of Natural History at dinner in the Harvard Club takes some beating. As does sharing a stage at a New York teachers’ training college with Yo Yo Ma and Ben Haggerty to present Ma’s indigo idea to eight hundred schoolteachers and New York Chancellor Joel Klein, using music, indigo stories and a riddle: ‘what connects Egyptian mummies, pirates, Mahatma Gandhi and blue jeans?’

Since then the project became known as ‘Silk Road Connect’ because its wider aims include non-indigo connecting elements, not least music and other performing arts, and work with the National Geographic’s Genographic Project, using personal DNA samples to show students how they are linked to one another through more than 60,000 years of human migration.

I returned to New York twice in 2009, firstly to meet the Silk Road Ensemble musicians and curriculum developers in the New York City Department of Education, and secondly to teach at the first teacher training course at the start of the Fall. (Fig. 5) By then, I'd found a dedicated indigo dyer in New York, Linda Labelle of the Yarn Tree, who made a dye vat on the course so that teachers could experience indigo dyeing and related textile techniques for themselves. During the teacher training course in late August it was fascinating to see the wide range of interests and questions sparked off by the subject of indigo, when teachers understood the potential of indigo, the dye of ubiquitous blue jeans, to provide a connecting link to engage students across the disciplines, whether using its long inter-continental history for social studies or its unique chemical properties in both art and science studies. Unexpected topics arising during the training even included colours worn by street gangs, and thus the wider question of ownership of colour, and the nature of 'indigo dye gods', not least the use of the word 'gods' in that context.



Figure 5, Teachers dyeing with indigo at the training workshop in Harlem in 2009.

Following the training Silk Road Connect was piloted in five middle schools in 'underserved' neighbourhoods in New York City such as Harlem, Washington Heights and the southern Bronx, involving almost 500 sixth-grade students (aged around twelve) and their teachers as part of the new New York City Department of Education's Campaign for Middle School Success. During the year professional development sessions supported and engaged teachers as 'active learners' and offered opportunities to connect with educators from other pilot program schools. Teachers also had access to a private online learning network, where they could share successes, ask questions and recommend resources.

The first pilot year was deliberately experimental, allowing ideas to be explored. For example, my suggestions for the creation of an 'Indigo trail' around the Metropolitan Museum were later built on by the museum educators and 'indigo fellows' in 2010. All schools experienced hands-on indigo dyeing with Linda Labelle and produced such indigo items as individual denim covered notebooks and a communal 'Indigo river timeline' that students and teachers could develop over the school year. Two young 'indigo fellows' and a co-ordinator liaised with schools and the Silk Road Project team.

The pilot program culminated in June 2010 in a collaborative performance at the American Museum of Natural History, where students shared their year of learning. This was created by students, teachers, partners and the Silk Road Ensemble with Yo-Yo Ma. It was quite an experience seeing 500 students from 5 schools performing for several hours in the museum's famous 'big whale' hall. The schools chose different inspirations from the Silk Road Connect year - one school used music and mime to represent the production and dyeing of indigo, ending their performance with a student fashion show of clothing dyed in indigo at school.

Written resources

Throughout 2010 I collaborated, as consultant editor and contributor, on a special Indigo edition of the American educational magazine *Calliope*. (Fig. 6) Other contributors include East Asian art historian Elizabeth ten Grotenhuis, Nobel Prize-winning chemist Dudley Herschbach and award-winning science writer Phillip Ball. Created in partnership with the Silk Road Project, 'Indigo, A Color that Links the World' was published in September 2010 to coincide with the start of the new school year and accompanied by a 'Teacher's Guide for Indigo' developed by SPICE - the Stanford Program on International and Cross-Cultural Education at Stanford University. Fourteen illustrated articles and various word games and puzzles, explore many aspects of indigo in a readable style. They delve into: the origin of blue jeans; the science of indigo and of the colour blue; historical accounts of trade such as along the Silk Road; the exploitation of slave labour and rebellions on indigo plantations; the potency of indigo blue; Nigeria's dyeing pits; an African creation myth involving the indigo plant; the unique chemistry of the indigo molecule and the development of synthetic dyes; indigo-dyed textiles of various cultures; and revivals of indigo production in the twenty first century. The varied aspects provide a springboard for much wider cross-disciplinary teaching because looking deeply into indigo reveals more general connections to science, arts, history, social studies and mathematics. But it starts with the immediate connection students have to indigo through their everyday blue jeans.

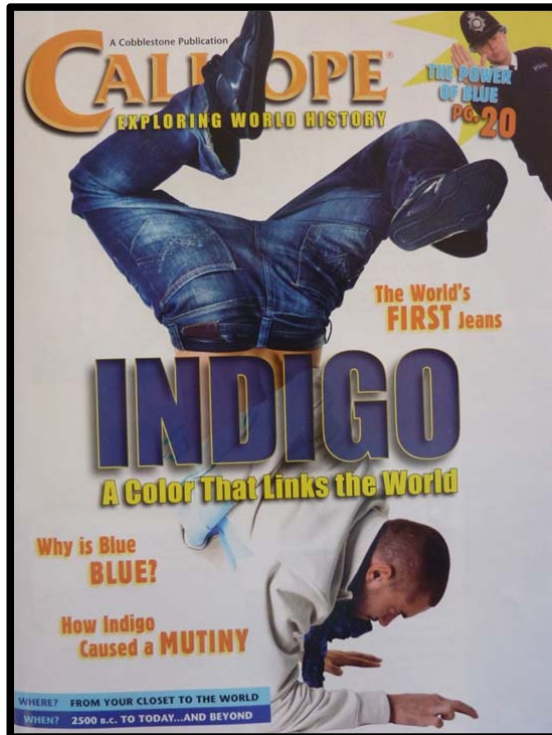


Figure 6, Front cover of 'Indigo: A Color that links the World', *Calliope* educational magazine, September 2010.

I also wrote an article, 'Found! A lost shipwreck', for the archaeological educational magazine *Dig*. This focussed on the recovered cargo of a famous Spanish galleon wrecked in the Caribbean in 1640 with a large cargo of indigo, some of which was discovered coating sand, coral and silver 'pieces-of-eight' when the site was discovered in 1980. Again, such a story can attract the attention of students and be a tool to teach a wide variety of topics ranging from global economics, trade and colonial history to ship-building, maritime warfare and piracy on the high seas.

The future of indigo in education

Silk Road Connect began its second pilot year in September 2010, in sixth-grade classrooms in four New York City public schools, still in partnership with the New York City Department of Education and cultural institutions across the city, with one indigo fellow, Johnny Quinn Alston, continuing from the first pilot year, and an education co-ordinator from Harvard, Allison Trombley. It will be interesting to see where this project leads and how it will be possible to gauge how much the program has fulfilled Yo Yo Ma's aim 'to spark a lifelong passion for learning in students'. Silk Road Connect may open to a wider group of participants in New York City and expand to other cities such as Chicago and Boston, 'with the goal of fostering similar approaches by interested educators'.

Ma's enthusiasm and contacts have helped to raise the general profile of using indigo for education that began long before the specific 'Silk Road Connect' project. Using indigo as an exciting cross-disciplinary subject for schoolchildren resonates with my other passion to encourage greater use and understanding of sustainable natural dyes for the future. Educating younger generations to question the origins of the colour of their blue jeans from all angles can therefore be an eye-opener in the widest sense.

Silk Road Connect Partnerships

The American Museum of Natural History
CALLIOPE Magazine
The Harvard Graduate School of Education
Jenny Balfour-Paul, indigo expert
Long Bow Group
Manhattan School of Music
The Metropolitan Museum of Art
National Geographic's Genographic Project
New York City Department of Education
The Silk Road Ensemble
The Stanford Program on International and Cross-Cultural Education (SPICE)
Teachers College at Columbia University
The Yarn Tree

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Indigo: A World of Blue. Vancouver: Maiwa Productions. www.maiwa.com

See also the website www.spindigo.net