

**Theanne N. Schiros**

Department of Science and Mathematics

*Sustainability at Scale- Inclusive Development Models through The Science and Art of Natural  
Dyes in Guinea, West Africa*

This work is a continuation of research and knowledge transfer on natural dye chemistry and practices with indigenous communities in the Kindia region of the Republic of Guinea. The project is a conduit to develop models for sustainability at scale and address the challenges of reintroducing local plant dyes to ultra-poor communities in West Africa, where traditional knowledge and practices have been threatened or decimated by colonial systems.

The textile industry is a leading source of water pollution globally. In China, 90% of groundwater and 70% of rivers are polluted, with 72 toxic chemicals in the water supply from textile dyeing. The waves of companies from the East and West setting up factories and seeking cheap labor in former colonized nations, particularly Africa, combined with the prevalent prejudice that textiles from developing nations should be cheaper, make it increasingly difficult for artisans to get a fair-trade value for their wares. This economic pressure in some of the most impoverished regions in the world is pushing many artisans to work with synthetic dyes. Without chemical training or pollution control, synthetic dyes contaminate limited water supplies in regions where water scarcity is already a pressing issue. Around the world, women and girls spend 200 million hours a day collecting water, at the expense of time available for education critical to reversing climate change and building sustainable economies.

I partnered with [There is No Limit Foundation](#) (TINL) and their Association of Women Tie-Dyers to promote education, entrepreneurship and empowerment of ultra-poor communities, particularly women, for inclusive sustainable development in alignment with the UN Sustainable Development Goals (SDGs). TINLF is a non-profit promoting entrepreneurship, health, sanitation, education and advocacy, and interest-free business loans to communities in need. Like much of Africa, Guinea has abundant natural resources and a rich tradition in tie dyeing and textile arts. Despite these resources, more than 55% of its people live in poverty line and 76% of girls are married by age eighteen in Guinea, limiting their access to education and prosperity critical to eradicating poverty, building peace and reversing climate change.

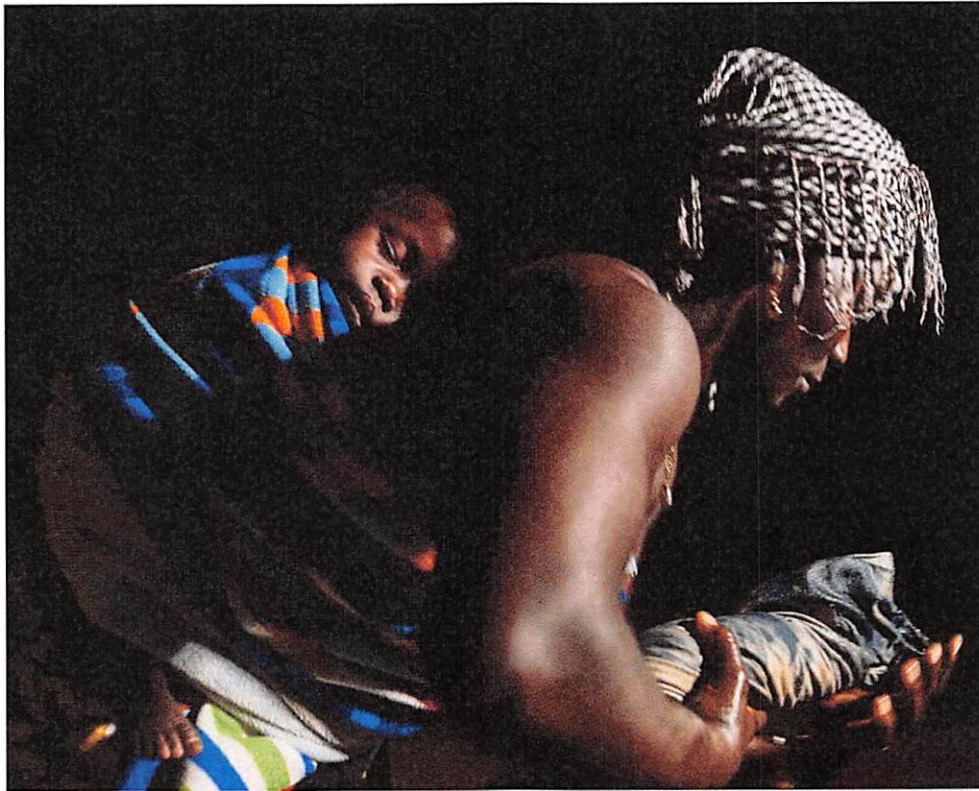
During my time in Kindia, I led trainings and participated in knowledge transfer with the local community of artisans on sharing best practices for creating natural dyes from local plants and food waste (onion skins, eggplant skins, avocado skins and seeds, carrot tops), and waste to energy (biogas) strategies. We created a large color palette through treatment of locally sourced fabric with non-toxic mordants and modifiers (e.g. soda ash from wood stoves, acids from vinegar and fruits). We made 14 dye baths from plants and food waste and over 80 different colors. On this last trip I gave workshops on non-toxic mordants such as kola nuts, abundant and traditionally used for textile arts in the region, and iron mordant from rusty nails soaked in water.

After the workshop, the woman self-directed in peer-to-peer learning and 30 of us worked together to create naturally dyed textiles shown in the photos.

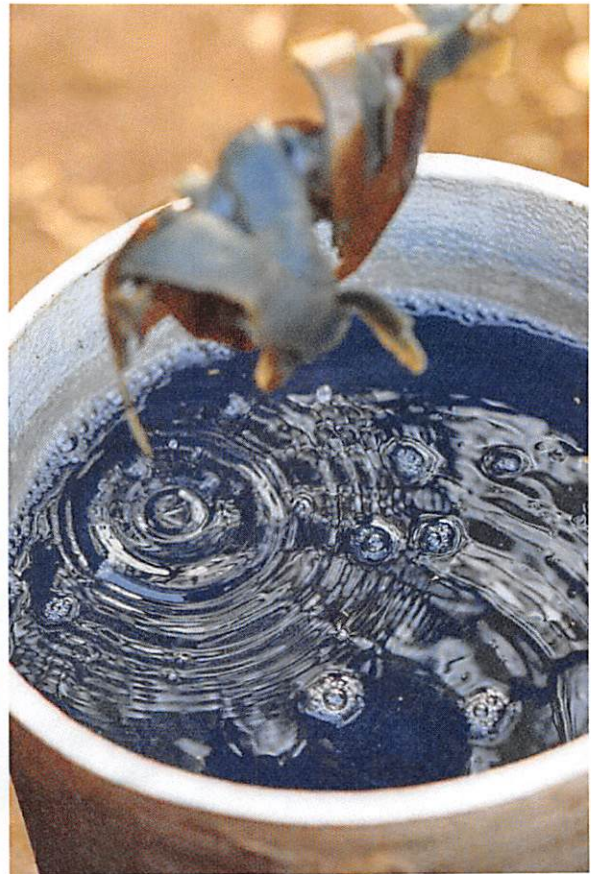
The results of this work will be presented in an exhibit in the Art and Design Gallery in the Pomerantz Lobby of FIT during the Sustainability Conference on April 14 and 15, 2020. The exhibit, supported by an NEA Learning and Leadership grant, will include documentary photos by Jon Brown, interviews with the artisans, and ethically sourced and botanically dyed textiles produced by Guinean artisans and garments created by FIT students from the sustainably dyed fabrics. The photo series will celebrate West African indigenous artisans and the FIT student innovators who design with their textiles, as well as transparency and circularity in the textile economy.

The Fashion Revolution question, “Who made my clothes?” will be transparent at every stage, in a model that connects a community of 300 women in Guinea and the FIT community, particularly emerging student designers. This type of connectivity has invaluable impact in communicating the importance of considering the full cycle of a product, as well as a framework for operating in a safe inclusive space bounded by both environmental and social justice considerations. Knowledge gained in Guinea on textile processing and coloration and advancing my research on the chemistry of plant color will support my teaching program in chemistry, sustainability, circularity in a supply chain and will be incorporated into classroom investigations and campus wide natural dye workshops as part of, *e.g.* Sustainability Awareness Week and other college-wide initiatives.

More globally, this work aims to build an accessible model for inclusive development in a framework defined by environmental boundaries and a basic social justice foundation--including access to education, water, health, and a global voice--that can be replicated across the entire African continent, and around the world. The project directly addresses multiple facets of sustainability, including environmental issues, social justice as well as economic in the enhanced opportunity for successful entrepreneurship education and connection to fair trade opportunities textile arts with food waste and native plants offers. The outcomes of the field work will comprise an impactful education module about the connections between environmental, ethical and economic aspects of sustainable development. My experience is that FIT students have a profoundly positive reaction to these demonstrations, which provide a framework for addressing complicated aspects of development into a simple cohesive example and demonstrate that individual actions can have broad global impact.



Bimbe, at rest for a portrait (top) and rinsing textiles just removed from the indigo vat with her son asleep on her back (bottom).



Dye baths in the village made from discarded onion skins (left) and eggplant skins (right).





Onion skin tie-dyed fabric held by artisans from TINL's Association of Women Tie-Dyers.