Introduction: Weaving Codes, Coding Weaves

Alex McLean, Ellen Harlizius-Klück & Janis Jefferies

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Alex McLean is a live coding musician, digital artist and interdisciplinary researcher based in Sheffield, UK. He completed his PhD thesis "Artist-Programmers and Programming Languages for the Arts" in 2011 in Goldsmiths, University of London, leading into a research fellowship at the School of Music, University of Leeds, during which time he worked on a number of research projects including leading the Weaving Codes, Coding Weaves project with Ellen-Harlizius Klück. He is now beginning work on the ERC PENELOPE project as a Post-Doctoral researcher at the Deutsches Museum Research Institute.

Alex is active across the digital arts, including co-founding the TOPLAP and Algorave live coding and algorithmic music movements, the international conferences on Live Interfaces (ICLI) and Live Coding (ICLC), the Sonic Pattern symposia, the Festival of Algorithmic and Mechanical Movement (with FoAM Kernow), and the Dorkbot electronic art meetings in Sheffield and London. He is a director of the Access Space charity, working in the area of education and the arts in Sheffield. Alex also created the TidalCycles live coding environment, now a popular free/open source project used by people across the world to make strange music.
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Ellen Harlizius-Klück is Principal Investigator in the project PENELOPE. A Study of Weaving as Technical Mode of Existence, which has been awarded an ERC Consolidator Grant in 2015 (Grant Agreement no. 682711). From 2014 to 2016, she was international Co-Investigator in the Weaving Codes – Coding Weaves Project, funded by the Arts & Humanities Research Council (AH/M002403/1). She also investigated the philosophy of ancient textile production in the Collaborative Project Ancient Textiles (Centre for Textile Research, Copenhagen, Department of Ancient History, Hanover). In 2012 and 2013, she spent a Marie-Curie Senior Research Fellowship funded by the Gerda Henkel Foundation (COFUND) at the Centre for Textile Research, Copenhagen.
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Janis Jefferies is an artist, writer and curator, and Professor of Visual Arts and Research at Goldsmiths, University of London, UK. Since 1978 she pioneered the field of contemporary textiles within visual and material culture and has exhibited and published, widely and internationally. She was one of the founding editors for Bloomsbury publishers of *Textile: The Journal of Cloth and Culture*, was co-curator of the first Hangzhou Triennial, "Fiber Visions" in China in 2013 and an exhibitor in 2016. She is co-editor of *The Handbook of Textile Culture*, the first international Handbook to provide the most comprehensive survey of the global production of textiles. It was published in 2015. http://research.gold.ac.uk/view/goldsmiths/Jefferies=3AJanis_K=2E=3A=3A.html.

With Barbara Layne, Concordia University as P1, Jefferies is the international collaborator on The Enchantment of Cloth, a research project involving the dynamic of smart technology within expressive art fabrics. The SSHRC Canadian funded interdisciplinary project investigates embroidered metalwork from the historic textile collections at the V&A, BM, Museum of Textile, Toronto to provide the research underpinning technical methods, aesthetic value and cultural meaning.

She is consultant to MILL6, a new textile Foundation in Hong Kong as a consultant for research and publications throughout 2016.
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Abstract

This article introduces the TEXTILE special issue on Weaving Codes, Coding Weaves, and the project of the same name, which was funded by the Arts and Humanities Research Council for 18 months from September 2014. We introduce the collaborators of this interdisciplinary project, spanning textiles, music, arts technology, computer science, mathematics, anthropology, media theory, and philosophy. We tell the multifaceted story of how we met and began to collaborate, following prescient activities in textiles, music performance, live art, and computer programming that have met confluence in our project. This forms an introduction to the articles produced by these collaborators, either as part of the Weaving Codes project, or in parallel with it. We conclude by looking to the future, in particular the five year ERC PENELOPE project now beginning in the Deutsches Museum in Munich.

Keywords: weaving; coding; weaving codes; interdisciplinary; collaboration

Introduction: Weaving Codes, Coding Weaves

This special issue on weaving codes, and coding weaves, is the culmination of a research project of the same name, bringing together weaving and computer science. This project was funded for 18 months as part of the Digital Transformations theme launched by the Arts and Humanities Research Council (AHRC) in the UK. Alex McLean (then at the School of Music, University of Leeds) and Ellen Harlizius-Klück (then at the Center for Textile Research, Copenhagen) led the project as principal and international co-investigators, with research collaborators including David Griffiths of FoAM Kernow, Emma Cocker of Nottingham Trent University, Kia Ng of the University of Leeds, and an esteemed steering committee including the present co-editor Janis Jefferies (Goldsmiths, University of London), and author Julian Rohrhuber (Robert Schumann School of Music and Media) among many others. See http://kairotic. org/ for full information on the project and the research team.

Weaving Codes, Coding Weaves was an 'amplification' project, as such bringing together separate strands of research in coding and in weaving, in order to create an interdisciplinary team. Inter- and cross-disciplinary work is often quite rightly discussed in terms of barriers to collaboration, such as the different languages, conceptions of academic rigor, and methodologies at play. This was, however, not a problem for our project; we were drawn together by a number of prescient activities, with the aim of discarding barriers between computer science and weaving by looking for common structures and histories. We recount some of the activities that led to our project and the articles in the present special issue in the following.

The making of textiles still has a great binding role in families, touching both Dave and Alex; Dave has recounted during our project memories of programming graphics on a Sinclair ZX Spectrum, while his Mother warped her loom next to him, and feeling the correspondences in the relationship between structure and outcome in both activities. Alex similarly remembers being taught knitting by his mother, and later in life knitting socks for her, which fed into his interest in loops and patterns in programming languages for music (McLean 2013). Dave and Alex were later closely involved in the founding of the contemporary *live coding* movement in the performing arts, developing programming language environments and using them for making music, video, and computer games (Ward et al. 2004; McLean et al. 2010; McLean 2014), often in front of a live audience. The relation between pattern and code has therefore been a core interest to both of them over the past 15+ years. In their present article "Textility of code: a catalogue of errors," they recount some of the codes and weaves they have made through the weaving codes project in order to get to grips with the complexities of weaves.

The phrase "Textility of code" in the chapter mentioned above is designed to invoke Tim Ingold's notion of the "Textility of making" (Ingold 2010); Tim's work has inspired us in many ways. He once pointed out that, despite a common origin,

> the technical and the textilic were set on radically different paths. While the former was elevated into a system of operational principles, a *technology*, the latter was debased as mere craft, revealing the almost residual or interstitial 'feel' of a world engineered in the light of reason. (Ingold 2010, 93)

This idea underpins our work on making, during the project and indeed prior to it, and we had fruitful discussions with Tim as *advocatus diaboli*, as speaker, and steering committee member.

Ellen Harlizius-Klück has always done textile work, and presented her textile art in an exhibition in Munich during the course of the project. In her dissertation (Harlizius-Klück 2004), she explored an ancient arithmetic called *dyadic* that distinguishes numbers as either odd or even, and fed into the earliest forms of logic and mathematical proofs handed down to us in Euclid's famous book *Elements*. Her thesis was that this idea came from weaving, where every construction of fitting patterns needs a consideration of the number properties of the included amount of warp or weft threads. Later, Ellen was looking for a simulation of pattern weaving that includes changes on the spot and the complex combinations of weaves that are typical for ancient weaving. This desideratum brought her to the Dagstuhl seminar on Live

Coding (Blackwell et al. 2014) to which she was invited by another author in the present volume Julian Rohrhuber (because of her article on the mathematical gender of the *Meerschaum*-pipe, Harlizius-Klück 2007). It was at this seminar where Ellen met Alex and Dave.

In a world where one is surrounded by computers, and they also can be carried along as laptops, coding can be done at almost any place. We did it in the woods of Sheffield, in between plaster casts in a museum in Munich or waiting for the next flight in airport lounges in Germany and the UK. Weaving is not so easy to do, and the 'weaving codes' part of our project was threatening to fall short. Luckily Ellen had the opportunity to work on several looms while doing a weaving diploma of the Art University Linz: the shuttle course. There she was able to directly use the code of bitmap images to control a Jacquard loom (and a TC-1). The images were generated by Peano Curves that Alex used to transform music into pictures, which is connected to the work of Janis Jefferies and Tim Blackwell, described later in this introduction.

Ellen studied mathematics in the late 1970s, when punched cards were still in use at the university computing centers. She knew about the close connection of these cards to weaving, stemming from the binary choice of either picking up each warp thread or not, before inserting a weft. In the article presented in this issue, this idea is developed further into an exploration of the binary algebra of pattern weaving. The argument is that the codification of loom setups and its standardization in the first printed

books on pattern weaving enabled the French inventors to explore digital control devices for drawlooms, thus leading to the Jacquard mechanism that is said to be Babbage's inspiration for the first computer.

A metaphorical connection between the performance practice of live coding and weaving was first substantially made by Emma Cocker during the Live Notation project led by Hester Reeve and Alex McLean, and also funded through the AHRC Digital Transformations theme. This project brought together practitioners of the fine art discipline Live Art together with Live Coders to explore the use of notation in both disciplines. Emma wrote about Live Notation as the project 'interlocutor,' with special focus on the connection between live coding and the mythological figure of Penelope, who wove by day and unwove by night as a form of resistance. Through this writing, Emma drew on this notion of unraveling of technology, and the Kairotic notion of creating and responding to opportunity present in both weaving and live coding (Cocker 2014). Emma has again taken the role of interlocutor on the weaving codes project, the results of which begin the present special issue as an in-depth, and in some sense independent, introduction to the project and its activities. We consider this article, titled *Weaving Codes/Coding Weaves: Penelopean Mêtis and the Weaver-Coder's Kairos,* to itself be a core outcome from the project.

Earlier still came the work of Janis Jefferies with computer scientist and musician Tim Blackwell on exploring the weaving of sound. Janis has a long and esteemed career in research and practice

across many disciplines in arts and technology, including in textiles and performance, and indeed convened the PhD Arts and Computational Technology program at Goldsmiths, from which Alex McLean graduated in 2011. She will be well known to readers of TEXTILE journal as founding editor, and for her recent work editing the Handbook on Textile Culture (Jefferies, Clark, and Conroy 2015). Her work with Tim inspired Alex to explore the "weaving" of sounds into images by following a space-filling Peano curve (see, for example, Flake (2000) for an explanation of these curves). Interestingly, Ellen has previously explored this same fractal curve in her own work, through her piece "Nine-patch with Kolam", and later took Alex's Peano "woven" sound to realize as woven fabric while on the shuttle course at Haslach. For the present volume, Janis contributes "Material Codes: Ethereal Traces", as a conversation with Kelly Thompson about her work in weaves, codes and data.

As mentioned, it was Julian Rohrhuber who introduced Ellen to the live coding field. Indeed, Julian is himself a founder of the field of live coding, contributing key ideas, texts, and software to the field, and convening the first live coding seminar, "Changing Grammars," with Renate Weiser in 2004. Following their meeting at Dagstuhl, Julian hosted Ellen, Dave and Alex for an *Experimentallabor* residency at the Robert Schumann School of Music and Media in Düsseldorf, where the ideas for "Weaving Codes, Coding Weaves" were first brought together

and formed into a project, with the involvement of Julian and his colleagues and students. For the present collection, Julian joins with Dave Griffiths to contribute "Coding with Knots," an investigation into the knot-based recording system of pre-Columbian Quipus, through visualization, sonification, and cryptanalysis.

We will continue the collaboration and research approach initiated with the Weaving Codes, Coding Weaves project in a new five-year undertaking "PENELOPE: A Study of Weaving as Technical Mode of Existence," awarded an ERC Consolidator Grant, and led by Ellen Harlizius-Klück. Our hope is to integrate the practices of weaving and coding in a way that brings new ideas of the use of digital tools to the digital humanities and that results in a better way to understand the textility of processes of making and also thinking.

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