SARAH R. DAVIES

Jaking the Maker lovemer

'This is a well-written guide to hackerspaces and the rise of the maker movement. The book pleasingly embraces all kinds of making – a point made from the first page onwards, where sourdough-making is equated with more high-tech practices – and includes honest discussion of gender issues and exclusion. Excellent.' David Gauntlett, University of Westminster

'Sarah Davies provides deep insight into how hackerspace culture came to be, what makes it tick, and what questions we should be asking in this context.'

Austin Toombs, Indiana University

A new industrial revolution. The age of making. From bits to atoms. Many people are excited by the possibilities offered by new fabrication technologies like 3D printers, and the ways in which they are being used in hacker and makerspaces. But why is the power of hacking and making an idea whose time has come?

Hackerspaces: Making the Maker Movement takes the rise of the maker movement as its starting point. Hacker and makerspaces, Fab Labs, and DIY bio spaces are emerging all over the world. Based on a study of hacker and makerspaces across the US, this book explores cultures of hacking and making in the context of wider social changes, arguing that excitement about the maker movement is not just about the availability of new technologies, but the kinds of citizens we are expected to be.

Sarah R. Davies is Assistant Professor in the Department of Media, Cognition and Communication at the University of Copenhagen.

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Hackerspaces Making the Maker Movement

Sarah R. Davies

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Hackerspaces

Preface

When I first heard about hackerspaces, and became interested in them as a research topic, I knew that I had to get one of my colleagues involved. Dave Conz had written his PhD on the amateur technologies of biodiesel, and in the process had become an expert in the technique. If anyone was a hacker and maker – if anyone had a natural affinity with the art and craft of making stuff work – it was Dave. In 2012, funded by the research centre that employed us (the Center for Nanotechnology in Society at Arizona State University), Dave and I teamed up to carry out a research project on hackerspaces across the US.

Dave and I carried out the research and collected the data together, but I am writing this alone. Dave died in 2013, suddenly and very tragically. He was – well, so many things, but amongst them a passionate researcher, thoughtful analyst, and maker *par excellence*. His enthusiasm for all things making leave their trace on the work that we did together and the arguments in this book. I hope that it can serve as a celebration of him and some of the things he cared about.

Acknowledgements

This book is for Dave. It goes without saying that his thinking, practices and research work have immeasurably influenced my writing.

I am extremely grateful to all the hackers, makers, tinkers and community builders who talked to us about their hacker and makerspaces and what they did there. All of our interviewees were generous with their time and with their spaces, allowing us to ask all kinds of impertinent or ignorant questions and to poke around in dark cupboards and forgotten shelves. This work couldn't exist without that generosity. Similarly, the Center for Nanotechnology in Society at Arizona State University provided the funding for Dave and me to visit hackerspaces around the US. I'd like to thank the Center, and particularly Dave Guston and Cynthia Selin, for their support.

Since starting this project I have switched continents and jobs and lost a fantastic, knowledgeable collaborator. I therefore owe a debt of thanks that is even larger than usual to all those who have discussed hacking and making with me or who have commented on my writing, including the anonymous reviewers provided by Polity, whose comments were instrumental in improving the book at all its stages. David Gauntlett, Andrew Schrock and Aubrey Wigner were thorough readers whose opinions were extremely important to me. More generally, I have learned much from the growing body of scholarship on hacking and making, including work by Jeffrey Bardzell, Shaowen Bardzell, Carl DiSalvo, Silvia Lindtner, Daniela Rosner, Johan Söderberg and many others. Ana Delgado, Denisa Kera, Martin Malthe Borch, Morgan Meyer, Christo Sims, Karin Tybjerg and Louise Whiteley have all been important interlocutors as I have thought about hacking and making. Talks at the European Commission's Joint Research Centre, the Center

for Science, Technology, Medicine and Society at UC Berkeley, the Center for Nanotechnology in Society at Arizona State University, and the Centre for Science Studies at Aarhus University all provided me with opportunities to test out my arguments with audiences of scholars, hackers and makers. Another useful audience was comprised of members of my extended family, who read some early text and provided comments, grammatical corrections, and strong discouragement from overusing the word 'affordance'. Finally, I'd like to thank Raffael Himmelsbach for reminding me that, while the hacker spirit of Do! Plan! Make! is valuable, so at times are other, quieter, ways of being.

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Introduction

There Are a Number of Places This Book Could Begin

There are a number of places this book could begin.

It might start with me, in my kitchen, stirring a jar of sourdough starter. Sourdough is a thick batter-like home for wild yeasts that, when at room temperature and in its active growth phase, foams happily and releases a rich, hoppy smell. For millennia it's been used to bake bread that has a slightly sour tang – hence, sourdough – and which generally requires longer to rise, but which is delicious and, by some accounts, better for you than breads made with instant yeast. I hadn't heard any of this stuff before a year or so ago, but today I am stirring my own culture, feeding it with flour and water and setting it on the kitchen counter to let the microbes grow and develop. Tomorrow I'll mix some of the starter with more flour and water to begin making bread dough, kneading it for 15 minutes or so before leaving it overnight to rise.

Or it could start in a hackerspace – any hackerspace, it doesn't much matter which one. It might be tiny, like one student-run hackerspace in Boston I visited, which was squeezed into a few square metres in a basement of a university building. The walls are filled to bursting with whiteboards, piles of humming servers, books, notices and posters, and shelves of wires and plugs and tools and spare computer parts. There's also what appears to be a small flying machine, labelled 'McFly'. In the centre of the room, student hackers sit around tables or on a battered sofa, talking in groups, focusing intensely on laptop screens, or plugging, welding and building. The air, in the manner of air in densely populated basement rooms the world over, has a thick, moist fug to it.

Or we might be in a much larger space – a TechShop, or the 40,000 square foot ex-factory makerspace that is just down the road from the students in Boston. These kinds of spaces might feel emptier: they're probably less crowded, and tools and materials are balanced less precariously. But they're still full of stuff, from laser cutters to 3D printers and CNC routers and, importantly, the finished or half-finished projects these tools are being used to build. You can see anything from beer brewing systems to exquisitely fine jewellery and hacked bikes with glitterballs attached to them. There's more space, so there are more comfy chairs, plus a library of sofas, armchairs and bookshelves in the centre.

But we might also begin in the media, with the UK's Guardian newspaper launching its 'Do Something' campaign in early 2014. This was, as the paper wrote in its 'Do Something Manifesto', an invitation to 'try something new'. Through a monthly magazine, journalists present stories and discussion about easily accessible and low-cost opportunities for readers to try something different. Articles give advice on everything from places to learn how to upholster your furniture to unusual ideas for a date or whether it's possible to learn Russian in a day; the tone is chatty and friendly, with reader feedback and sections like 'The Do Something Challenge' and Beginner's Guides. The campaign, the Manifesto explains, is motivated by the belief that the experience of novelty adds value to people's lives. Whether it's trying out new things, meeting new people or learning something different, living life such that you accrue new memories and new experiences means that you will live more intensely. If you 'broaden your horizons, learn new skills, or implement more beneficial habits', they suggest, your life will be more satisfying (though also perhaps harder work: the first magazine contains a list of tips on how to meet your goals and stay motivated).

This book is about the connections between these things. More specifically, it's about hackerspaces, and the hacking and making activities that go on within them, and their connection to broader developments in society. Culturing sourdough; hacking together software or bikeglitterball hybrids; embarking on a lifestyle of active and engaged leisure: these things look quite different on the surface. I want to argue, however, that they share some central commonalities. Something similar is going on when one chooses to join a hackerspace, gets involved in crafting, or dabbles in traditional skills like sourdough baking. Taken together, these kinds of activities can tell us something about the kinds of societies we live in, and the kinds of people we are asked to be.

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The rise of hacking and making

Hackerspaces and the maker movement are a growing trend. Though many people haven't heard of them, as of the start of 2016, there were 1,233 active hackerspaces around the world, and more than 500 spaces in development. This is a global movement: these spaces are anywhere from Surprise, Arizona to Yangon, Myanmar. They can be anything from tiny rented garages to vast former factories or shopfront locations, situated anywhere from inner cities to residential suburban tracts. They may be private members' clubs or open to anyone, anytime. They may be literally filled to the ceiling with stuff – electronics supplies, wood, books, defunct tools, test tubes and fume hoods – or almost empty apart from a couple of tables and chairs.

What they share is that they are physical spaces, operated collectively, where members can use equipment they might not be able to afford, or have space for, by themselves.2 This equipment can be anything from 3D printers to industrial sewing machines or server systems. It is, essentially, anything that hackers and makers need to help them hack and make. Hacker and makerspaces therefore bring together people who are interested in hacking and making, and offer them support in doing so. The result, the stuff that is hacked and made, is pretty diverse. Hacker and makerspaces can help you learn to code, give you access to the tools you need to make your own furniture, provide lessons in electronics, or give you space to do some tabletop genetic engineering. British freedom of information campaigner Heather Brookes has called hackerspaces the 'digital-age equivalent of English Enlightenment coffee houses', which suggests something rather intellectual and discursive: a place where ideas might be shared. Hacker and makerspaces house communities of people who, together, learn and share and make anything from apps to oscilloscopes.

For a long time hacking had strictly negative connotations. Even now, the term can make us think of the activities of Anonymous, the loosely organized collective which has taken down the websites of PayPal and Visa and agitated for social justice,⁴ or of solitary, bearded geeks with poor social skills.⁵ President Barack Obama at one stage dismissed ex-NSA contractor and whistleblower Edward Snowden as a '29 year old hacker'.⁶ Hacking as a criminal activity – as breaking and entering on computers, networks and servers – remains the top entry in the Urban Dictionary's definition of the term.⁷ This understanding of hacking is as something that is strictly digital. It's generally illicit, referring to practices known as cracking, or black-hat hacking, rather

than white-hat hacking, which is 'ethical' hacking that harmlessly tests the resilience of particular networks.⁸

But the idea of hacking, and, relatedly, that of making, is currently being rediscovered as something positive, exciting and useful. As far back as 2005, the American Dialect Society announced that 'lifehack' was one of its words of the year (definition: 'to make one's day-to-day behaviors or activities more efficient'9). Today the website Lifehacker continues to offer tips and tricks to help deal with everyday life, from how to effectively de-seed a pomegranate to a guide to making your own keyboard. IKEA hacking involves the re-purposing of IKEA products into anything from vibrators to personalized kitchen cabinets. 10 A 2014 book frames urban exploration as 'place hacking'. 11 Computing also remains an important context for hacking. Take, for instance, the growth of hackathons, software hacking marathons which focus on contributing to a particular technology, or on a social issue or problem.¹² In the UK, a 'National Health Service Hack Day' is held several times a year, to help develop better healthcare technologies. 13 The trend to use technology to hack social problems¹⁴ has reached such a pitch that there's now an annual 'Stupid Hackathon' satirizing it, at which participants attempt to develop projects with 'no value whatsoever'. 15

Hacking has even entered the heart of the establishment. The Royal Institution of Great Britain's Christmas Lectures have been running since 1825 and were started by Michael Faraday. Presented in the Institution's lecture theatre, with its high-banked round of seats, wooden panelling, and stage from which Faraday himself once spoke, the annual lecture series aims to provide engaging science education to young people. Among others, Nobel Prize winners have given past lectures. It's a sign of the reinvention of hacking, then, that in 2014 the lectures took as their focus 'how to hack your home'. Over the course of three lectures, Professor Danielle George (an engineer, and the sixth woman in the history of the Christmas Lectures to present them) showed viewers how to unpick and reconfigure everyday household devices, from light bulbs to motors. As the Royal Institution's press release proclaimed, Professor George would:

take three great British inventions – a light bulb, a telephone and a motor – and demonstrate how viewers can adapt, transform and 'hack' them to do extraordinary things. This is tinkering for [the] 21st century. Danielle, who grew up in Newcastle, said: '[...] I want young people to realise that they have the power to change the world from their bedroom, kitchen table or garden shed. If we all take control of the technology around us and think creatively, then solving some of the world's greatest challenges is only a small step away'.¹⁶