brief contents

preface	xvii
part 1 adventures in manufacturing	1
chapter 1. made in china	7
chapter 2. inside three very different factories	43
chapter 3. the factory floor	73
part 2 thinking differently: intellectual property in china	
chapter 4. gongkai innovation	119
chapter 5. fake goods	143
part 3 what open hardware means to me	175
chapter 6. the story of chumby	181
chapter 7. novena: building my own laptop	215
chapter 8 chibitronics: creating circuit stickers	251

${\it viii} \ \ \textit{brief contents}$

part 4 a hacker's perspective	275
chapter 9. hardware hacking	279
chapter 10. biology and bioinformatics	325
chapter 11. selected interviews	357
epilogue	388
afterword	385
index	391

contents in detail

preface	xvii
part 1 adventures in manufacturing	1
1. made in china	7
The Ultimate Electronic Component Flea Market	8
The Next Technological Revolution	14
Touring Factories with Chumby	16
Scale in Shenzhen	17
Feeding the Factory	18
Dedication to Quality	20
Building Technology Without Using It	23
Skilled Workers	24
The Need for Craftspeople	26
Automation for Electronics Assembly	29
Precision, Injection Molding, and Patience	31
The Challenge of Quality	34
Closing Thoughts	42
2. inside three very different factories	43
Where Arduinos Are Born	44
Starting with a Sheet of Copper	46
Applying the PCB Pattern to the Copper	49
Etching the PCBs	51
Applying Soldermask and Silkscreen	53
Testing and Finishing the Boards	54

Where USB Memory Sticks Are Born	57
The Beginning of a USB Stick	57
Hand-Placing Chips on a PCB	59
Bonding the Chips to the PCB	61
A Close Look at the USB Stick Boards	61
A Tale of Two Zippers	64
A Fully Automated Process	67
A Semiautomated Process	68
The Irony of Scarcity and Demand	70
3. the factory floor	73
How to Make a Bill of Materials	74
A Simple BOM for a Bicycle Safety Light	74
Approved Manufacturers	76
Tolerance, Composition, and Voltage Specification	76
Electronic Component Form Factor	77
Extended Part Numbers	78
The Bicycle Safety Light BOM Revisited	79
Planning for and Coping with Change	82
Process Optimization: Design for Manufacturing	84
Why DFM?	85
Tolerances to Consider	86
Following DFM Helps Your Bottom Line	88
The Product Behind Your Product	91
Testing vs. Validation	97
Finding Balance in Industrial Design	100
The chumby One's Trim and Finish	
The Arduino Uno's Silkscreen Art	104
My Design Process	105
Picking (and Maintaining) a Partner	
Tips for Forming a Relationship with a Factory	
Tips on Quotations	
Miscellaneous Advice	
Closing Thoughts	

part 2 thinking differently: intellectual property in china 115		
4.	gongkai innovation	119
	roke My Phone's Screen, and It Was Awesome	120
	anzhai as Entrepreneurs	
~11	Who Are the Shanzhai?	
	More Than Copycats	
	Community-Enforced IP Rules	
Th	e \$12 Phone	
	Inside the \$12 Phone	
	Introducing Gongkai	
	From Gongkai to Open Source	
	Engineers Have Rights, Too	
Clo	sing Thoughts	
5.	fake goods	143
We	ll-Executed Counterfeit Chips	143
	unterfeit Chips in US Military Hardware	
	Types of Counterfeit Parts	
	Fakes and US Military Designs	
	Anticounterfeit Measures	
Fal	ke MicroSD Cards	156
	Visible Differences	157
	Investigating the Cards	158
	Were the MicroSD Cards Authentic?	159
	Further Forensic Investigation	160
	Gathering Data	162
	Summarizing My Findings	166
Fal	ke FPGAs	168
	The White Screen Issue	168
	Incorrect ID Codes	170
	The Solution	172
Clo	sing Thoughts	174

part 3 what open hardware means to me	
6. the story of chumby	181
A Hacker-Friendly Platform	182
Evolving chumby	184
A More Hackable Device	186
Hardware with No Secrets	187
The End of Chumby, New Adventures	189
Why the Best Days of Open Hardware Are Yet to Come	205
Where We Came From: Open to Closed	206
Where We Are: "Sit and Wait" vs. "Innovate"	208
Where We're Going: Heirloom Laptops	210
An Opportunity for Open Hardware	211
Closing Thoughts	214
7. novena: building my own laptop	215
Not a Laptop for the Faint of Heart	217
Designing the Early Novena	219
Under the Hood	219
The Enclosure	224
The Heirloom Laptop's Custom Wood Composite	227
Growing Novenas	228
The Mechanical Engineering Details	229
Changes to the Finished Product	232
Case Construction and Injection-Molding Problems	233
Changes to the Front Bezel	237
DIY Speakers	238
The PVT2 Mainboard	238
A Breakout Board for Beginners	241
The Desktop Novena's Power Pass-Through Board	242
Custom Battery Pack Problems	243
Choosing a Hard Drive	244
Finalizing Firmware	246
Building a Community	247
Closing Thoughts	249

8.	chibitronics: creating circuit stickers	251
Cr	afting with Circuits	257
	Developing a New Process	259
	Visiting the Factory	260
	Performing a Process Capability Test	261
De	livering on a Promise	264
W	hy On-Time Delivery Is Important	266
Le	ssons Learned	266
	Not All Simple Requests Are Simple for Everyone	267
	Never Skip a Check Plot	268
	If a Component Can Be Placed Incorrectly, It Will Be	268
	Some Concepts Don't Translate into Chinese Well	270
	Eliminate Single Points of Failure	271
	Some Last-Minute Changes Are Worth It	271
	Chinese New Year Impacts the Supply Chain	272
	Shipping Is Expensive and Difficult	273
	You're Not Out of the Woods Until You Ship	274
Cle	osing Thoughts	274
กล	art 4	
-	hacker's perspective	275
9.	hardware hacking	279
На	cking the PIC18F1320	281
	Decapping the IC	282
	Taking a Closer Look	283
	Erasing the Flash Memory	284
	Erasing the Security Bits	285
	Protecting the Other Data	287
На	cking SD Cards	289
	How SD Cards Work	290
	Reverse Engineering the Card's Microcontroller	293
	Potential Security Issues	298
	A Resource for Hobbyists	298
На	acking HDCP-Secured Links to Allow Custom Overlays	298
	Background and Context	300
	How NeTV Worked	302

Hacking a Shanzhai Phone	306
The System Architecture	306
Reverse Engineering the Boot Structure	311
Building a Beachhead	315
Attaching a Debugger	317
Booting an OS	321
Building a New Toolchain	321
Fernvale Results	323
Closing Thoughts	324
10. biology and bioinformatics	325
Comparing H1N1 to a Computer Virus	327
DNA and RNA as Bits	328
Organisms Have Unique Access Ports	330
Hacking Swine Flu	331
Adaptable Influenza	333
A Silver Lining	335
Reverse Engineering Superbugs	335
The O104:H4 DNA Sequence	336
Reversing Tools for Biology	338
Answering Biological Questions with UNIX Shell Scripts	340
More Questions Than Answers	342
Mythbusting Personalized Genomics	344
Myth: Having Your Genome Read Is Like Hex-Dumping	
the ROM of Your Computer	344
Myth: We Know Which Mutations Predict Disease	345
Myth: The Reference Genome Is an Accurate Reference	345
Patching a Genome	346
CRISPRs in Bacteria	347
Determining Where to Cut a Gene	350
Implications for Engineering Humans	351
Hacking Evolution with Gene Drive	352
Closing Thoughts.	354

11. selected interviews	357
Andrew "bunnie" Huang: Hardware Hacker (CSDN)	357
About Open Hardware and the Maker Movement	358
About Hardware Hackers	367
The Blueprint Talks to Andrew Huang	372
epilogue	383
afterword	385
index	391