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Fabricated: The New World of 3D Printing

Summary: *This book explores how 3D printing will revolutionise the worlds of design, materials science and manufacturing.*



By Wendy M Grossman for [ZDNet UK Book Reviews](#) | April 4, 2013 -- 12:21 GMT (05:21 PDT)

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"Food printers have tremendous social appeal," Hod Lipson and Melba Kurman write in [Fabricated](#), based on Lipson's experience with demonstrations. It's true. I'd rather bake than print, but nonetheless it's fun to watch a cookie build up layer by layer. Today, the process is fairly crude in terms of resolution, but tomorrow, or maybe a few years from now, the authors imagine a system that collects metabolic and health data from its owner, and then prints out a meal exactly tailored to the individual's nutritional needs. Ah, the smell of freshly printed broccoli...



Lipson is the [Cornell associate professor](#) who's into all the cool stuff: programmable materials, robots, 3D printing in chocolate. A visitor to his lab finds little bread men and fabricated robot parts jostling for space with a gripper made of coffee grounds that can throw a ping-pong ball across the room. What makes *Fabricated* different is that it seeks to explore the implications of this work, not just cheerlead for it. And not just Lipson's own work: Lipson and Kurman survey the field, travelling to England to interview the creator of the open-source [RepRap](#) and to Utah to investigate work on CAD for the human body. The latter, they argue, is a technology required to enable bioprinting — designing and editing living tissue and body parts. The former is a warning shot in the 3D intellectual property battles to come. Lipson's is the world of the 'voxel' — or volumetric pixel.

In general, the human imagination is incremental, even in science fiction. The *Star Trek* replicator produced more or less familiar foodstuffs and machine parts. [Neal Stephenson's](#) nano-assembling matter compiler could only make items that already existed. Douglas Adams' running joke in *The Hitchhiker's Guide to the Galaxy* was that an Englishman lost in space and given a robotic drinks dispenser would beg it to make a perfect cup of tea. Lipson's students, assigned the task of imagining a pencil holder to be 3D-printed, disappoint him because they fail to think radically enough.

Lipson and Kurman imagine all manner of radical departures from the limitations the manufacturing methods of the past have imposed upon us: intricate blends of multiple materials, like different colours of ink, that will create new materials with properties that have never existed before. The blockage is design software, which is both too hard to use and too limited in scope. For a counter-example, the authors turn to the virtual world [Minecraft](#). Now add some intelligence, so that you tell the computer the functional specifications and it suggests a design. An early attempt at a tool based on this approach is at [Endless Forms](#), created by Lipson's former student Jeff Clune. Why should a mug only have one handle?

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The key point is this: the manufacturing methods we've had until now rely on taking a block of material and subtracting everything we didn't want. It's wasteful and physically limited by our tools. In 3D printing you start with a blank and add only what you need. If we can learn to print with biodegradable waste materials and not produce endless failed plastic prototypes, 3D printing can give us a much greener world. We are facing a suddenly unlimited world of new shapes made out of composites with characteristics we've never seen before. I suspect some things won't change too much: our spaces and furniture are designed around our bodies, and people seem pretty committed to the way we currently make those.

Fabricated: The New World of 3D Printing

By Hod Lipson and Melba Kurman

[Wiley](#)

302 pages

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£18.99 / €22.40 / \$27.95

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