of New England, he or she does not have to persuade a publisher that it will sell well enough to justify the cost of editing, designing, printing and shipping it. The author can just upload the book themselves.

For some writers, the economics of e-books are attractive. A traditional publisher typically pays the author a royalty of 10–20% on the sale of each book. The sale of international rights can bring more income — but only after an author's royalties rise above the advance. Although e-book distributors such as Amazon or Smashwords won't offer an advance, their royalty arrangements are usually much more favourable. Depending on the e-book publisher, royalties can range from 30–70%.

Of course, it is also true that 70% of zero is zero. A common illusion among writers is that as soon as they finish a book, the world at large suddenly becomes aware of it and millions of copies just sell themselves. In fact, it is easy for a book to vanish into oblivion, and it becomes all the more easy as the number of book titles published each year goes up. Traditional publishers may have their flaws, but they also know how to distribute and publicize books. If writers want to self-publish, they have to take on all the things that publishers do. And today, mastering the art of book publicity is tricky. Many newspapers are shutting down their book-review sections. Discussions about new books are migrating instead to blogs and social media such as Facebook and Twitter.

The format of the e-book itself should also be a cause for concern for authors. Even the most successful e-book campaign simply pushes data from one computer to another. No physical object ends up sitting on a shelf. The longevity of e-books remains uncertain, depending as it does on the technology for reading them. When I look at some of the most elaborate e-books, I hear a ghostly voice whispering, "CD-ROM". In the early 1990s, compact discs were all the rage — you could fit an entire encyclopedia on a single disc.

For a fleeting moment, CD-ROMs were the future of books. If I had decided to abandon print books and publish my books only on CD-ROMs, I would have imprisoned them in obscurity. Sneer at printed books if you will, but you can't deny that their operating system will never expire. ■

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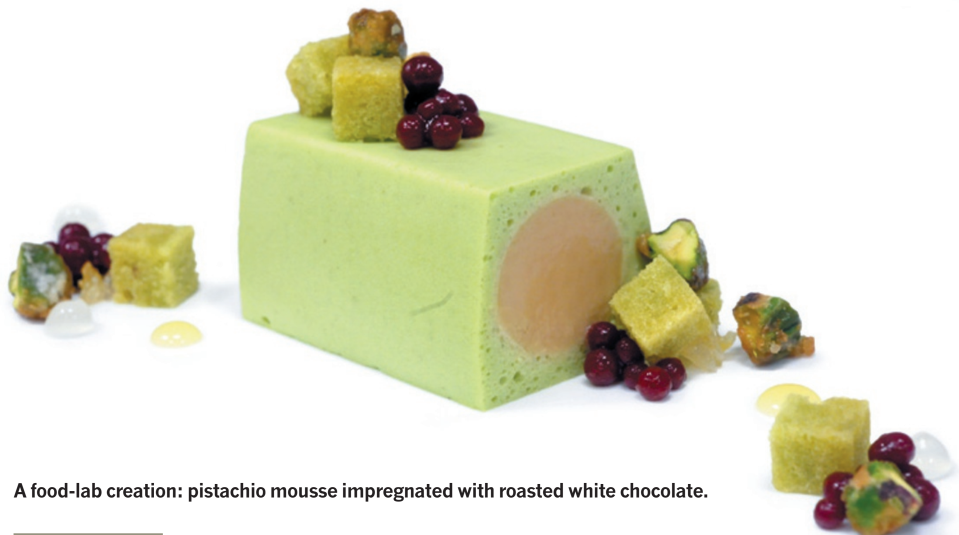


A food-lab creation: pistachio mousse impregnated with roasted white chocolate.

M. HARLAN TURKELL/HARLANTURK.COM

FOOD SCIENCE

With pipette and ladle

From stretchy ice cream to wire-brushed crackling, **Harold McGee** digests an eclectic modernist menu.

In 1988, the Oxford physicist Nicholas Kurti and his wife Giana published an anthology about food and drink by fellows of the UK Royal Society. When he sent me a copy of *But the Crackling is Superb*, he inscribed it: "An unashamed frivolity!"

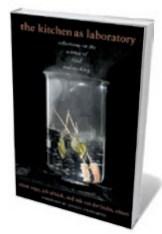
The title was a self-deprecating joke, a prominent French chef's polite reaction to an experimental pork roast of Kurti's. Cooking and eating were not respectable academic subjects in those days, so the whole enterprise had the fresh, recreational air of scientists on holiday. The book is still great fun to browse.

Times have changed. Last year, Harvard University in Massachusetts had to turn away hundreds of students from a course on the soft-matter science of cooking. This spring saw the publication of the six-volume treatise on food science and technology in the professional kitchen, *Modernist Cuisine* (The Cooking Lab, 2011). And now we have the serious and substantive anthology *The Kitchen as Laboratory*, edited by food scientists César Vega, Job Ubbink and Erik van der Linden.

Most of the book's 33 chapters are by scientists at universities and food companies, and there is much of interest to cooks and food lovers. The most engaging chapters — the ones that made me feel like getting into the kitchen to experiment — illuminate the making of particular foods and go on to suggest improvements and new twists on them.

In a playful nod to Kurti's anthology (cited by the editors as an inspiration) and to his work in low-temperature physics, *Modernist Cuisine* co-authors Christopher Young and Nathan Myhrvold describe how to achieve the ultimate crackle in duck skin. The keys: a wire pet brush, a water bath and a block of dry ice.

➲ NATURE.COM
For a review of *Modernist Cuisine*:
go.nature.com/jjxa2t



The Kitchen as Laboratory: Reflections on the Science of Food and Cooking
EDITED BY CÉSAR VEGA, JOB UBBINK AND ERIK VAN DER LINDEN
Columbia University Press: 2012. 400 pp./320 pp. $29.95/£19.95

Vega's chapter on soft-cooked egg yolk is a model of clarity and consideration. He demonstrates that yolk viscosity increases with holding time at around 60 °C, gives a chart to help obtain the texture desired, and a table for translating Pascal-seconds of viscosity into the consistency of mayonnaise, honey or Marmite.

Chemist Martin Lersch surveys the flavour- and colour-forming Maillard reactions, and reports that chopped onions brown faster and get sweeter when fried if you raise their pH with sodium bicarbonate. Alas, he resorts to the most old-fashioned cook's measure, specifying a "pinch" of soda per onion and, confusingly, per half an onion. My evidently oversized pinch browned my onions faster, but gave them a distinctly unpleasant flavour.

Physicist Thomas Vilgis explains how xanthan gum, a readily available bacterial polysaccharide, thickens ketchup and other foods without cooking. He gives a simple recipe that uses it to hold diced vegetables together in a tart. John R. Mitchell, a food technologist, follows with an analysis of why starch and gelatin remain better at releasing flavours than xanthan and other thickeners.

There is a substantial report on the Turkish delicacy *salep dondurma* — sometimes known as fox testicle ice cream. It contains the ground roots of an endangered orchid, which are said to resemble fox testicles and give a stretchy, chewy consistency to the ice cream. A group at New York University shows that these properties come from the carbohydrate glucomannan, also found in Japanese konjac flour, which, unlike the orchids, is plentiful. Food-structure expert Tim J. Foster reveals that the stretchiness comes from phase separation of the glucomannan and milk proteins during freezing, a physical effect that can also be achieved by cooking. Expect to see stretchy savouries in modernist restaurants soon.

Other chapters propose making meringue-like solid foams from milk powder and tomatoes, flavouring ice cream with coffee extracted into butter to exclude its bitterness and acidity, and trapping aromas in mixtures of molten sugars. Intriguing but all too sparse are essays from chefs who explain how science contributes to their creativity.

However, I found the book somewhat parochial and not always an enjoyable read. The writing is often less than fluent, and frequent pronouncements about the value of food science become mind-numbing. Some chapters reinforce the image of the food scientist as a technician out of touch with cooks.

In rebutting writer Michael Pollan's denigrations of food science and technology, for instance, one chapter makes the astonishing claim that cheap processed foods are responsible for increased lifespans during the twentieth century. In another example, an encapsulation specialist searches for a quick way to make pizza dough because his mother's recipe takes 2–3 hours and he does not "have the luxury of time". He replaces the yeast with encapsulated baking powders, which most cooks can't buy, and notes that the mixed dough must be rested to hydrate — for 2–3 hours. An essay on the acoustic nature of crispness gives a recipe for a frying batter, then suggests that, to experiment with the recipe, the reader can "place the battered fish on the texture analyzer platen and record the force displacement and acoustic output as the probe pierces the batter".

Food scientists have much to contribute to today's dynamic food scene. I hope that those who write sequels to *The Kitchen as Laboratory* will shake the chips from their shoulders, work more closely with cooks and convey more of the joys of understanding and discovery — and eating. Tip: they should start with another big pinch of Kurti. ■

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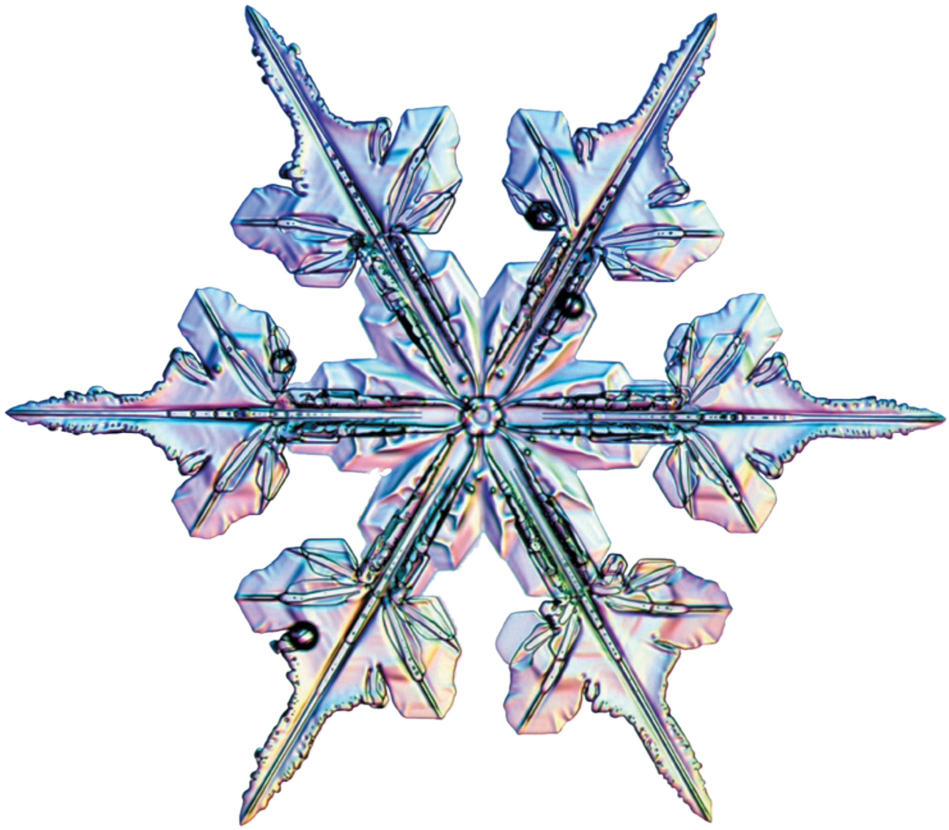
K. LIBBRECHT

Q&A Kenneth Libbrecht

The snowflake designer

For the past decade, physicist Kenneth Libbrecht has been studying how ice crystals form, taking thousands of photographs of their intricate structures. He describes how he grows snowflakes in his lab at the California Institute of Technology in Pasadena, and never tires of tracking the real thing in the far north.


NICK HIGGINS

Why study snowflakes?

We see these beautiful structures falling from the sky, and we still cannot explain how they came to be. When you ask how snowflakes form, you are really asking about how molecules go from a disordered gaseous state to an ordered crystalline lattice. Unexpected phenomena can emerge — snowflakes are one fascinating example. The complex morphologies arise in part because different ice surfaces grow at different rates. What we learn could eventually find application in materials science or nanoscale self-assembly. But I am also motivated to simply understand how this natural phenomenon works. I use ice as a case study of crystal growth.

What sorts of shapes do you see?

The diversity of snow-crystal shapes is amazing, and you can learn a lot even with an inexpensive magnifier. You can find hollow columns, needles, bullet rosettes, stellar dendrites, sectored plates, ▶