

worldwide. In the marine records, this thin, iridium-enriched clay bed always occurs exactly at the level at which the microscopic foraminifera typical of Cretaceous oceans disappear almost completely.

Foraminifera are single-celled creatures with a calcite shell. Hundreds can be found fossilized within just one cubic centimetre of marine sedimentary rock. It would have required a cataclysmic catastrophe to obliterate billions of them across the world's ocean. And we know for sure, on the basis of many mineralogical and chemical studies, that the iridium layer originates from a major meteorite impact. The precise coincidence of these two events is so compelling that it is difficult to understand how anyone can doubt a direct relationship between them. Nevertheless, on the whole, Nield gives a credible account of this major scientific discovery.

“For 2 million years, shards of a shattered asteroid bombarded Earth.”

The rest of the book deals with the recent finding of more than 90 fossil meteorites — all of which are a stony form called L-chondrites, measuring 1–20 cm in diameter — buried in a quarry of Ordovician marine limestone in Sweden. The meteorites that fell on that ancient sea floor can be linked by isotopic and geochemical analyses to the largest known break-up in the asteroid belt in the past few billion years. The L-chondrite parent body, measuring more than 100 km across, was hit 470 million years ago, possibly by a comet from outer space that shattered it into billions of pieces.

For 2 million years afterwards, shards of it bombarded Earth. One or two of the meteorites may have been almost as large as the body that took out the dinosaurs. Yet strangely, this bombardment coincides with the Great Ordovician Biodiversification Event, when biodiversity on Earth rapidly increased from an all-time low to modern levels. Although researchers are still uncertain as to how this happened, Nield gives an insightful account of the ways these events can be related.

On my night table there is a pile of books in which the bookmark never made it beyond page 60. From these, I've derived a personal definition of a good book: one where I can't stop reading until the end. *Incoming!* is just such a book. ■

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GASTRONOMY

A visual feast

Felice Frankel grapples with a 20-kilogram cookbook.

It took me 40 minutes to unpack *Modernist Cuisine*. The 6-volume, 2,400-page set of books by culinary experimenters Nathan Myhrvold, Chris Young and Maxime Bilet weighs more than 20 kilograms and arrives wrapped in clean white paper and encased in a clear plastic box, from which each of the five main volumes can be retrieved: History and Fundamentals; Techniques and Equipment; Animals and Plants; Ingredients and Preparations; and Plated-Dish Recipes. The sixth volume, Kitchen Manual, is a simpler spiral-bound handbook intended for use in the kitchen, containing some 1,500 recipes referred to in the larger volumes.

The care given to the packaging of this collection foreshadows the precision that went into its production. It is a masterpiece filled with historical references and scientific explanations of why, for example, thickening liquids is important for taste, or why food browns during cooking. Nothing is left out, it seems. The pages are designed to form a monumental narrative and visual story, written and illustrated with passion and an obsession with getting it right. The authors' expertise blends science and cuisine: Myhrvold is a former physicist, Microsoft scientist and now entrepreneur with a lifelong interest in cooking (see page 575); Bilet and Young trained under innovative British chef Heston Blumenthal;

and Young also holds degrees in mathematics and biochemistry.

Photography is used to powerful effect. Myhrvold is a serious photographer, and he and Ryan Matthew Smith have created technically remarkable, often breathtaking and informative photographs. Some are purely decorative, such as their high-speed camera image of a bullet passing through six eggs. But the most innovative technique they have developed is the cutaway. To show what was happening inside food as it cooked, the team literally cut pots, woks and pans in half and cooked recipes in them. The cross-sectional images are laid out and annotated with scientific information, such as labels for zones of conduction, condensation and convection. Each image is a marvel.

I haven't yet tested the recipes. And I am not sure I will ever feel the urge to try the Edible Soap Bar with Honey Bubbles, for instance, or to replace my own fabulous pulled pork recipe (in which I cook an inexpensive cut for three hours



Modernist Cuisine: The Art and Science of Cooking
NATHAN MYHRVOLD,
CHRIS YOUNG AND
MAXIME BILET
The Cooking Lab:
2011. 2,438 pp.
\$625, £395



A cutaway image from the *Modernist Cuisine* cookbook.

R. M. SMITH/THE COOKING LAB

with leeks, Worcestershire sauce, garlic, sugar, wine and vinegar, among other ingredients) with the *sous vide* version in *Modernist Cuisine*. This technique — in which ingredients are vacuum-sealed in a plastic bag before being cooked at low temperature in a water bath or combi oven — plays a major part in the set, and the authors go to great lengths to argue its value. I have tasted meats cooked this way, and am unconvinced that it is essential to home cooking. But I am willing to give the pasta marinara a shot. It calls for tomato water, which I was happy to discover could be produced with a simple wine filter (to separate the flavourful water from the pulp after first processing the tomatoes in a juicer) rather than with the preferred piece of kitchen equipment in *Modernist Cuisine*, the centrifuge.

The format of the recipes will also challenge most cooks. Because the authors consider that “volume measurements are not sufficiently accurate”, all ingredients, even liquids, are measured by weight in grams. One recipe, for example, calls for 100 g of wine — good luck with that. The amounts of ingredients are also presented in the baker’s percentage system, in which the weight ratios of each are scaled to a reference ingredient. Having to weigh liquids and work with percentages will mystify most non-professional cooks, and will probably vex scientists who want to relax at the end of a long day in the lab.

So who is the audience for *Modernist Cuisine*? In its present form, the volumes will be bought by those who can afford their three-figure price tag and have time for slow, precise cooking — people who are already familiar with the chefs and cognoscenti mentioned in volume I: Blumenthal, Ferran Adrià and Harold McGee, among others. Purchasers will also need space to store the bulky set, and a table on which to rest the book to delve into its pages. The volumes are so heavy and large that they are difficult to hold open.

Modernist Cuisine is too important to be offered only to an elite audience. The stunning visual impact of the printed volumes supports the publisher’s choice to produce the initial work on paper. Still, I hope the authors bring out the book in an electronic form, so that a larger audience can explore its many layers of information. Like a good meal, this remarkable effort needs to be shared. ■

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Q&A Nathan Myhrvold

Steakhouse science

Nathan Myhrvold trained as a quantum cosmologist with Stephen Hawking and was chief technology officer of Microsoft before founding Intellectual Ventures, a US company that funds inventors and acquires patents. As he publishes a six-volume work on the science of cooking, Myhrvold explains why chemistry techniques could soon be seen in every restaurant.

Why did you write a six-volume scientific cookbook?

When I was two years old, I told my mother that I would be a scientist; when I was nine I insisted on cooking Thanksgiving dinner. In the mid-1990s, I took a leave of absence from Microsoft and went to culinary school in France, and got back into cooking with a vengeance. The only way to learn about modern cooking techniques now is to work at a cutting-edge restaurant. I saw an opportunity to write a book that would cover modern techniques and the science behind them [see page 574]. I hired a team and we kept getting more ambitious. I think ours is the only cookbook in the world to cover prion science and quorum sensing in cells. We could have gone further. We decided not to include pastry and desserts.

Can you see science-driven cooking catching on?

Yes. Chocolate cake with a liquid centre was once a novelty, but is now in every shopping mall in the United States. Some of these techniques are incredibly convenient and tasty. We have a chapter on emulsions, with an indestructible vinaigrette, and a rapid soufflé recipe. I think most steakhouses should use *sous vide* cooking [slow cooking in an airtight plastic bag immersed in a low-temperature water bath]. You can get the steak done perfectly without worrying about timing, and cheaper cuts are just as tender as a prime filet mignon. I think science-based cooking will be in every US steakhouse within a few years. Once you explain the science, people will find uses for the techniques.

You have many interests, including palaeontology and wildlife photography. How do your pursuits fit together?

Each makes a good diversion from the other, and occasionally they filter back into my work at Intellectual Ventures. Wildlife photography is about travelling to a beautiful place and taking pictures. Palaeontology is about going into the desert and walking around until you find a bone sticking out of the ground. Our chapter on meat opens with



R. M. SMITH/THE COOKING LAB

a picture that I took of a lion cub eating a wildebeest. Some of the technical solutions that we cover in the cookbook have led us to consider inventions to improve food safety in developing countries, where adequate sanitation is often lacking.

In 2000, you pledged US\$1 million to help Microsoft co-founder Paul Allen fund the Allen Telescope Array in California. Why do you believe in the private funding of science?

Venture capital has grown faster than government science funding. If you can show that you can make money rather than begging for a grant, people will compete to fund you. I’m not suggesting this is a panacea. Outside the life sciences, people don’t tend to fund things with a level of technical risk. We’ve created Intellectual Ventures to do just this. We invest in existing patents, help institutions to develop new technologies, and fund inventors and scientists to come up with new ideas. If we could find a way to fund more science and innovation at venture-capital growth rates, that would be a wonderful thing.

What makes an invention successful?

The best way to stimulate invention is to get the right set of smart people in a room talking to each other. What separates successful from unsuccessful inventions is not the quality of the idea. To be successful, an invention needs to have a passionate advocate. It requires the initial flash of genius — then believing and investing in it. ■

INTERVIEW BY JASCHA HOFFMAN

➔ **NATURE.COM**
For a Q&A with molecular chef and chemist Hervé This: go.nature.com/wdrmrcc