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BY SARAH WEBB

John Long never expected to write a book. His weeks were crammed with biology research, writing papers and teaching at Vassar College in Poughkeepsie, New York. But in 2009, after multiple newspapers picked up an Associated Press story about his work using robots to study evolution, he got a call from a literary agent in New York City.

The agent encouraged him to write a popular, mainstream book for general sale. Long was sceptical that such a project was worth his time or would advance his career, but the agent persisted. “You’re a teacher, right?” she asked. She convinced him that a book would allow him to reach “fun-loving nerds who want to learn something cool about science”, he recalls. Basic Books published *Darwin’s Devices* in 2012; the book offered Long a little extra money and the chance to interact with non-researchers interested in science. He is now considering another book idea.

Writing a book for a popular audience offers intellectual rewards and perhaps the opportunity for fame. But it also involves a lot of time, dedication and the willingness to re-examine one’s work with an eye towards popular consumption. Advance payments depend on market factors determined by publishers. There is no guarantee that the book will be profitable. And an author risks spending plenty of toil on work that might not make money or even be well received.

The process is taxing. “Nobody has ever finished a book and said to me in all my years in this business, ‘That was easier than I thought,’” says agent Alice Martell of the Martell Agency in New York City. To give the project its best chance at success, researchers who want to tell their stories to a broad audience need to find an appealing idea, and work with a team to craft the book.

SEEDS OF AN IDEA

Most popular books by scientists either link directly to their research or explore big topics in their field. An idea might come from noticing a gap in the market. As an avid reader, Daniel Davis recognized that there were many popular-science books on fundamental physics or evolutionary biology. But Davis, an immunologist at the University of Manchester, UK, had not seen one about his own research area. That void led to him to come up with the topic for his 2013 book, *The Compatibility Gene* (Penguin), which explores the diversity of ►

POPULAR SCIENCE

Get the word out

Writing science books for the public is rewarding, but can take a lot of time — and financial gain is uncertain.

► human immunity and its implications. To make it accessible to the public, he focused on the idea that the biggest genetic differences between humans are not in the genes that code for hair, eye or skin colour, but rather in the genes of our immune systems.

Scientists considering a book should seek advice from a literary agent early in the process, to avoid investing a lot of time in an idea that will not work. Because they know the business and what editors are looking for, agents can reshape an idea to be more attractive to a publisher, says Long. That is crucial, says Martell, because a prospective author needs to persuade a publisher that the idea has merit and that he or she is the best person to write it (see “The narrative arc of authorship”). It also helps to establish a following online — a social-media presence and a popular blog, for example, can show an agent or publisher that a researcher has a potentially promising readership.

SUBSTANCE WITH STYLE

Writers must cater to their audiences. Most readers of popular-science books are well educated, but are not in the field. If they are to spend US\$25 on a hardback book and invest the time to read 300 pages, they also want to

be entertained. “You really have to take the readers someplace that they couldn’t go otherwise, and it has to be a compelling read,” says Martell. Most non-fiction books, even those about science, rely on narrative storytelling — very different from the dry, expository style of journal articles or the chatty, informative writing suited to a blog or opinion piece.

The style should also be more literary than a researcher is probably used to, using a more conversational tone and perhaps including personal stories or jokes about the science, says Davis. Retelling how the science is done is as important as explaining the results, says Steven Pinker, a cognitive scientist at Harvard University in Cambridge, Massachusetts, whose best-selling books include *The Language Instinct* (Harper Perennial, 1994). To make stories come alive, Pinker spends a lot of time digging into the nitty-gritty of methods sections in papers.

It can be tricky to get away from jargon and still avoid talking down to intelligent readers. When Irene Pepperberg, a psychologist and research associate at Harvard, was working on her book *The Alex Studies* (Harvard University Press, 2002), which focused on her cognitive research on parrots, she tested her writing by



DAVID CARTER

Irene Pepperberg’s book about cognitive research in parrots caught the public’s imagination.

sending drafts of chapters to friends who had been to university but worked outside her field. “If they could follow it, then I was home free,” she says. Pepperberg says that parrot owners liked having a book that explained their pets’ behaviour, whereas scientists liked having a round-up of all the relevant literature.

Word choice and sentence rhythm are important, too. Writers need, for example, to vary sentence length and provide smooth transitions, says David Haskell, a biologist at Sewanee: the University of the South in Tennessee and author of *The Forest Unseen* (Viking Penguin, 2012). He compares writing to making music or cooking: the words need to sound and taste right. The richness of the writing also needs to transport readers to a place where they are not necessarily conscious of learning something, says Martell, who is Haskell’s agent. “It’s being able to pull other people in and making them want to read it”

“It’s not about little literary flourishes. It’s about the squirrels or the bacteria,” Haskell says. “They need to be honoured with good words.”

SHAPE AND TIME

The book must have a structure with a clear beginning, middle and end. The big-picture narrative and pacing can be challenging for any author, especially one navigating a sea of research. That is where help from an editor is invaluable, says Haskell: for him, input about narrative structure “really took the book up several notches in quality”. Kevin Doughten, who was Haskell’s main editor and now works at Crown in New York City, says that the overall quality of Haskell’s writing was superb. So Doughten’s role was to find places where the pace of the book moved a little too quickly or where he felt that a reader’s brain might get tangled up. “Here are the parts where I need you to slow down a little bit or I need you to explain,” he advised.

INTO PRINT

The narrative arc of authorship

Writing a book involves more than putting pen to paper. Here are the six main steps in crafting a popular-science book.

- Find a big idea. You will need to convince an agent (and eventually a publisher) that your concept is a great idea for a book and that you are the best person to write it.
- Find an agent to serve as a liaison between you and the publisher, and to help you to navigate the publishing process. He or she can also help you to refine your idea, polish your book proposal and negotiate your publishing contract, and will be an advocate on your behalf. If you have a public profile, an agent might approach you; otherwise, you can talk to colleagues about their agents, or check the acknowledgements sections of books that you admire. Advances — upfront payments an author receives from the publisher that may be recouped with book sales — range widely. Writers might expect anything from US\$10,000 to \$80,000 for a niche topic, but a great idea with obvious appeal to the public could get much more. Your agent typically receives around 15% of total earnings, including both the advance and royalties. Other money may come from international rights and rights to different media; agents also get a portion of these earnings.
- Write a proposal. Editors want an idea

of what you are planning to write before you write it, so authors typically work with an agent to prepare a proposal with a compelling overview of the book, sometimes with one or more sample chapters and a chapter-by-chapter outline. It should include information about books on similar topics. Your agent will send your proposal to publishers and editors to gauge interest, which can take weeks or months.

- Write the book. After signing a contract, you can expect to have a year to write your book. During that period, you will probably want to send a few chapters to your editor early on to ensure that your expectations match.
- Revise the book. Once you hand it in, you might work with your editor to expand, prune and refine the book and ensure that the whole manuscript works. Accuracy is important: you will need to fact-check and index the book (or hire someone to help you). Then, over several months, copy editors and proofreaders will work through the accepted manuscript as you review changes.
- Market the book. Once it goes on sale, you will need to take part in publicity. You might do television and radio appearances, or give talks about your topic. Your publisher may expect you to blog or participate in social media, and you should let your contacts know about your book to help with sales. **S.W.**



Daniel Davis wrote about differences in genes of the human immune system, a topic that had received little attention in the popular-science market.

As a big project with multiple moving parts, writing a book can be all-consuming. Davis says that it is almost impossible to be a brilliant teacher, researcher and author all at the same time. While writing, he kept up his lab but did not teach. Most scientist-authors write books during a sabbatical or on leave while teaching is not in session. Pepperberg wrote *The Alex Studies* in three-hour blocks from 9 a.m. to noon each day, and spent the rest of her 13-hour workdays in her laboratory. The writing, she says, took the place of teaching and committee work during that time.

Once a book is published, authors have to get involved in marketing. They need to be able to talk about it to an average reader, and might be asked to do interviews on radio or television and give talks. Marketing can be gruelling. "There's just not enough hours in the day and not enough ATP in the body," says Haskell, who is currently taking a year of unpaid leave from teaching to promote his current book and to prepare his next one. For this year, his income comes from his book earnings and from fees for book-related speaking engagements.

Because of these demands, most scientist-authors advise other academic researchers not to start writing a book before they earn tenure. "I think it's a mistake until you're comfortable establishing a lab and getting grants," says Pinker. But Davis says that people with an enduring passion for book writing should just go ahead and dive in when offered the opportunity — or they might miss the chance.

MEASURING SUCCESS

Predicting which books will succeed and which will fail is never easy. Even if a book gets critical acclaim, there is no guarantee that the public will embrace it. Haskell recognizes that he is one of the lucky ones: his *The Forest Unseen* was a finalist for the 2013

Pulitzer Prize for General Non-Fiction, and won this year's US National Academy of Sciences book award. It has also sold well, says Haskell, both through mainstream booksellers and as a result of being adopted for use in academic courses.

But regardless of commercial success, the mental energy that goes into book writing can enrich a scientific career. Pinker sees writing as an extension of his academic research; it is like doing theoretical science with an audience. Davis has taken advantage of the time he spent thinking about 60 years of research and interviewing other scientists: since writing his book, he has used the ideas he came across to pull out new themes for his group's research. Seeing the big picture revealed new ways to focus on important questions in the field. For example, his laboratory is now looking at how different individuals' immune systems respond to various types of diseased cells.

Long's book has raised his public profile and led him to two unexpected opportunities. He is developing an 'Introduction to Robotics' course for the Great Courses, a company in Chantilly, Virginia, that sells DVD-based teaching materials. Long has also formed a research collaboration with Josh Bongard, a cognitive researcher at the University of Vermont in Burlington whom he met after Bongard reviewed his book for the magazine *New Scientist*.

Book publishing has always been a risky business. "The amount of work isn't proportional to the pay-off," says Laura Wood of Fine Print Literary Management in New York City. It is not about the money, Haskell emphasizes. "Irrepressible love of language and science," he says, "is the only good reason I can think of to set pen to paper." ■

Sarah Webb is a freelance writer based in Chattanooga, Tennessee.

RELOCATION

International impact

Scientists who move countries tend to publish in higher-impact journals than those who remain at home, a study finds (C. Franzoni *et al. Econ. Lett.* <http://doi.org/p68>; 2013). The authors asked about the relocation history of 14,299 researchers of all career stages in biology, chemistry, Earth and environmental sciences and materials science in 16 nations. Looking at papers published in 2009, the team found that scientists who were living in countries other than the ones they had been living in at age 18 published in journals with impact factors an average of 1.07 points higher than scientists who stayed put. Moving may help scientists to find work settings where they can maximize their potential, says co-author Chiara Franzoni, an economist at the Polytechnic University of Milan in Italy.

DIVERSITY

Inequalities at work

Women of colour comprised 5.7% of US science, technology, engineering and maths (STEM) academic faculty members with doctorates in 2010, a report says; white men made up 58%. *Accelerating Change for Women Faculty of Color in STEM* adds that the low numbers and restricted advancement of minority women on STEM faculties limit innovation and role models. It notes that university leadership should value diversity, but women of colour must cut time spent on committee service and mentoring, learn how job duties count towards tenure and pay rises, and welcome help, says Barbara Gault, co-author of the report and vice-president of the non-profit Institute for Women's Policy Research in Washington DC.

RECRUITMENT

Florida hiring push

The University of Florida in Gainesville is recruiting 100 researchers in 16 fields including neurology, global health, plant genomics, metabolomics and drug discovery. The move is part of a strategy to become a leading research university, says spokesman Chris Moran. The institution has received US\$15 million in state funds, which it will match with privately raised money to create 107 endowed seats that could be occupied by new recruits or existing faculty members. The money will also support the construction of research facilities and other initiatives.