



# Being Bob Langer

Running one of the biggest academic labs in America gives Robert Langer almost 100 people to help and advise; his BlackBerry gives him the rest of the world. **Helen Pearson** joins the throng.

At 16.26 in the afternoon on an icy Tuesday in January, Robert Langer is in his office at the Massachusetts Institute of Technology (MIT) with a Harvard University freshman called Lulu Rebecca Tsao. Langer met Tsao last year in Finland when he and her stepfather were collecting awards from the Millennium Prize Foundation. Now she is in Cambridge, she has come to ask his advice on which projects to do, and Langer offers to show her around the lab. A quick tour would be great, she says.

It will have to be quick. In my hand there is a three-page printout of the day's schedule provided by Bethany Day, the assistant who keeps Langer's diary. He has four minutes until what would be the fourteenth meeting since breakfast — if he had had breakfast. And his research lab is not a thing to tour in four minutes: try four hours. It is the biggest in the chemical-engineering department, and probably the biggest in MIT. It may well be one of the biggest academic labs in the world under a single principal investigator. Its 1,300 square metres take up most of this floor of MIT's building E25 and some of a floor above. But Langer doesn't mention any of that. He leads us from room to room pointing out postdocs and pausing at embryonic stem-cell cultures.

At the doors, he peers over the top of his glasses at a list of key codes that Day has helpfully printed out while he carefully punches numbers into the locks.

Langer has a lab of more than 80 people, has authored in excess of 1,000 papers and holds more than 300 patents with almost as many pending. Those patents have been licensed or sublicensed by more than 200 companies, about two dozen of which Langer took a key role in founding. His 73-page CV (in small font, single spaced) starts with a 1970 chemical engineering degree at Cornell University in Ithaca, New York, and ends with patents pending in biodegradable shape-memory polymers. I have come to spend the day with him to get a sense of how it is possible for such a monster of productivity to do what he does — and why he does it.

In answer to the latter question, he says that he has only ever wanted to help people, make them happy and do good in the world. "If people feel good about themselves, they will solve problems." When I first heard this, the previous evening, I thought it sounded trite. By the time he, Tsao and I are touring the lab, I've come to think it pretty unvarnished truth.

**"If people feel good about themselves, they will solve problems."**

— Robert Langer



Langer is up and pulling on his shorts. When his father died from heart disease aged 61, Langer, then 28, gave up eating meat and started exercising, something he now does for two hours or more each day. Now 60, he uses the time in his home gym to work and read, sometimes scrawling notes on the gym-machine console. This morning, he reads *The Boston Globe*, starts skimming through the nearly 200 grant proposals he is reviewing for the Bill & Melinda Gates Foundation's Grand Challenges in Global Health and listens to country music — his favourite. He skips breakfast but for a few sips of Diet Coke.

These first hours, I must admit, are hearsay. I had suggested that our day together run from waking to sleeping but Langer — in consultation with his wife — understandably declined.



Langer picks me up at the hotel near his office in his beige Mercedes-Benz E350. It's only a few blocks to his office, but the trip is long enough

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to pass two or three of the biotechnology companies he has started. Langer traded up from a clapped-out Ford Pinto to a Mercedes Baby Benz when he received his first consulting fee in the 1980s. He gets a new one every five years.



I am not the only media person around today. A film crew is setting up in Langer's office; he puts on a jacket (his black jeans and brown shoes are out of shot) and starts answering questions about his achievements. It's an educational video for the website of the Charles Stark Draper Prize, a US\$500,000 award sometimes called a Nobel prize for engineering. Langer won it in 2002. The woman organizing the shoot told me that some of the other winners were impossible to pin down, but Langer was happy to oblige.

Langer recently read *Outliers*, a book in which Malcolm Gladwell makes the case that exceptional people get where they are partly because of the exceptional circumstances in which they find themselves, rather than through exceptional ability or sheer hard work. Langer concurs. There is a personal aspect, he says, "a combination of stubbornness, risk taking, perhaps being reasonably smart and wanting to do good". But there is also just the chance of what turns up. As a young chemical engineer keen not to work in an oil company he tried to find a position in teaching or at a medical school instead. He had no success until Harvard University's Judah Folkman gave him a job isolating molecules that inhibit blood-vessel growth. It was the right place: Langer says he was like a kid in a candy store, overcome by the sheer number of interesting medical problems that might yield to his engineering know-how and imagination. He isolated the angiogenesis inhibitor Folkman wanted (R. Langer *et al. Science* 193, 70–72; 1976) and went on to make a porous polymer that controlled the rate at which such large molecules were released (R. Langer and J. Folkman *Nature* 263, 797–800; 1976). The ideas took some time to catch on: both biologists and polymer chemists found them absurd. Now he is widely credited with founding the fields of controlled-release drug delivery and tissue engineering.



Phil Hilts, who heads MIT's Knight Science Journalism Fellowships programme, wants some advice on good people in nanotechnology to invite to a 'boot camp' for journalists. He is possibly the 15th person to ask Langer for some advice so far today. Everyone wants

access to his network and his experience, and he obliges. In *The Audacity of Hope*, Barack Obama recounts asking Langer's advice on stem-cell research in 2006. Langer replied that more stem-cell lines would be useful, but "the real problem we're seeing is significant cutbacks in federal grants".



On the way to and from the bathroom, Langer deals with seven or eight e-mails, including editorial advice on a paper being considered for *Proceedings of the National Academy of Sciences*. A passion for his BlackBerry is another link to Obama. At every moment he is not talking to someone directly, he slumps into a characteristic stoop over the device. His computer, by contrast, has not even been switched on so far today. All its processing power would make little difference to the speed at which Langer — a one-finger typist — sends messages. Not that much difference could be made. There is rarely more than a few minutes between sending Langer an e-mail and receiving a BlackBerry reply.



We walk across the snowy MIT campus to the room where he will be lecturing. On the way he points out the brown scaffold skeleton of the new David H. Koch Institute for Integrative Cancer Research; his lab will move there in 2010. He will increase his lab space to almost 1,900 square metres, although he says he plans to give his existing lab members more space rather than recruit more staff.



Langer wolfs down some (vegetarian) lasagna and a chocolate cookie, then starts his lecture. (Another of his five full-time administrators, Ilda Thompson, spends much of her time putting together his talks from six or seven templates.) This one is for undergraduates, part of a programme to teach them about 'real life' skills such as starting companies. "We have the Tiger Woods, the Michael Jordan of engineering," says programme director Susann Luperfoy as she introduces him.



Everyone who is even remotely thinking about starting a biotechnology company should listen to this lecture; it would probably save millions in wasted venture capital. Langer has boiled

down the requirements for starting a biotech company to a set of clear bullet points. (Do you have a platform technology, a seminal paper and a blocking patent? If not you may be in trouble). Then he recounts six of his own success stories. "Dazzling," says my neighbour at the table as Langer rounds up his talk.

As we walk back to his office, a small Mars rover appears to be making its way through the snow. "These kinds of things happen at MIT," he says.



Langer is embracing Smadar Cohen, once his postdoc and now a professor at Ben Gurion University in Tel Aviv, Israel. He says that nothing makes him prouder than his 180–200 former students and postdocs now heading academic labs of their own. Cohen is involved in a new biotech 'incubator' for promising academic research projects called Pharmedica, based in Haifa, Israel.

She and Yoram Rubin, the chief executive, have flown here largely for 30 minutes of Langer's time; their questions are how to raise money and which field to specialize in.

Langer tells them that their incubator needs to be closer to having a product if they want to persuade venture capitalists to invest the sums that they are thinking about (\$10 million). "I always think to put money in they need to be scared enough that if they don't, they're going to lose something big," says Langer. In terms of specializing, he says, "you have to look at what the cutting areas are and who has the intellectual property (IP) rights". Neuroscience is a huge area, they agree. But, he adds, "I don't like to set boundary conditions before you need to".



A no-show. Natalia Rodriguez, an undergraduate student who has been working in Langer's lab for the past two and a half years, has never had a one-on-one meeting with Langer. Today she had scheduled 15 minutes. Where is she?



Langer has essentially built his own interdisciplinary research institute in E25 — chemical engineers, cell biologists, chemists, physicists, material scientists, geneticists, medical doctors, mechanical engineers and mathematicians. "I don't think you could do a lot of the things we are doing without a lot of people," he says. To run the group, he has three right-hand people, senior researchers at MIT who have elected to



stay in his lab. One is Dan Anderson, who has come to the office to talk about further expansion. "We need to hire more people and figure out how to get them," he says. The reason they need to expand is that the Juvenile Diabetes Research Foundation, which has awarded the lab a large grant to develop biocompatible polymers for encasing pancreatic islet cells, has recommended they get an immunologist on board. They talk about hiring a joint-postdoc with another lab, but then Langer says, "it's probably easier to have our own". He picks his book of National Academy Fellows off the shelf and turns to immunology. "I knew quite a few of these people. Frank Austen. Fred Alt. Irv Weissman, he's really interested in tissue engineering."



Charles Jennings wants to consult Langer about an IP issue. As head of the neurotechnology programme at MIT's McGovern Institute for Brain Research, it has fallen to Jennings to hammer out an IP agreement for discoveries made by researchers at the institute — somewhat like a prenuptial agreement for future income. In general, MIT policy is that income from IP is split three ways between the inventors, their department and MIT. Jennings has drafted an agreement to sort out how this would work at the McGovern Institute, which often involves collaboration across several departments. Langer is concerned that MIT's Department of Brain and Cognitive Sciences (BCS) might not like it. They agree it would be bad, as Langer says, if three years from now "the head of BCS says how did you guys pull this off? We got nothing and you get 100%."



A smell of perfume fills the air. Rob Robillard and three well-made-up young women (Jamie, Amber and Michelle) file into the office. As well as starting a bevy of companies that make biomedical devices, drugs or delivery systems, Langer also helped found Andora, which is now called Living Proof. The company, also based in Cambridge, uses chemical engineering to design hair and beauty products. Robillard is the chief executive.

Its first product, No Frizz, seals the gaps in the hair shaft so that water cannot enter, thus attempting to live up to its name. The three young women will be training beauty consultants across the United States when it is officially



Robert Langer's papers make covers — as does he.

launched there in February (and on the QVC shopping channel). "It's spreading through the MIT campus," says Robillard. Through starting this company, Langer now has his (frizzy) hair cut for free by a top hair stylist.



Langer parcels out wisdom and contacts in 15- and 30-minute slots. To the undergraduate student wanting advice on courses: "The most important thing you can learn is fundamentals." If you want a placement in a company, "we can arrange that", he says. He gives Tsao the lab tour. A button has come undone, unnoticed, on his shirt. Langer told me earlier

that he does wonder whether he needs to be better at saying no to things. But "I don't like to hurt people's feelings", he says.



We are slightly late to meet Rodriguez, whose appointment was rescheduled. She missed her original slot because she was trapped in an elevator for 45 minutes. She looks close to tears, but not because of the elevator; she's having difficulty deciding whether to accept a job offer from Merck, or whether to go to graduate school. Langer tells her there is no wrong choice. "What do you feel in your heart you want to do?" he says. "I think I'm gonna work," she says eventually, looking unconvinced.



Langer walks upstairs to a conference room filled with a throng that, in most other labs, would be an all-hands meeting. But this is just the undergraduates who work here; he has organized a pizza and soda session in an attempt to make himself accessible. As they

introduce themselves (he doesn't know all their names), their varied projects outline the sheer scope of the lab's activities: stem-cell regeneration; contact lenses that release drugs; lipid parcels that deliver small RNAs; biomaterials for insulin delivery; DNA vaccines.

What is your favourite discovery, they ask. (His 1976 *Nature* paper.) Where do you like to travel best? (Paris. Maui. Where the food is good.) Are you still intimidated by talks? (No.) Where do you find your inspiration? (TV shows, music, reading, no single mechanism.) How do you balance everything? (Exercise a lot.) If you did it all over again, what would you do differently? (He wouldn't change anything.) Will America still be a power in future research? (Yes.) What was your worst mistake? (Even mistakes teach you to be better.) He answers them all, between three pieces of pizza.



Langer's computer is still sitting unused as we leave the office. He drops me back at the hotel — I'm exhausted. On his way home he stops for an ice cream — coffee chip frozen yoghurt with hot fudge sauce. He spends an hour on the exercise bike. Sometimes he reads *People* magazine or watches the Boston teams play. Tonight he reads CVs, revises a paper for *Angewandte Chemie* and prepares his talk for the World Economic Forum in Davos, Switzerland, later in the month. He listens to his daughter — one of three teenagers — practise the presentation for her Friday chemistry class on smart polymers. "She did it all herself," he says. "She has four citations and an interview with me. I don't do her homework. I explained some of the chemistry." Then he does another hour on the cross-trainer and treadmill. No dinner speech today, and his own bed to look forward to: comparatively relaxed.



While packing for tomorrow's trip to Tampa, Florida, for the Armed Forces Institute of Regenerative Medicine, Langer panics: where are his passport and phone? They're in his coat.



Langer's BlackBerry is charging in the bathroom. He is in bed. I can't tell you what he dreams of. But if I had to guess it would be about happy, helped people.

**Helen Pearson is Nature's biology features editor.**