

# CAREERS

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BERT VOGELSTEIN



Postdoctoral researchers at the Ludwig Center at Johns Hopkins in Baltimore, Maryland, participate in an annual Halloween contest.

## TEAM BUILDING

# Morale boosters

*You can keep spirits up when the research doldrums hit.*

BY KENDALL POWELL

Every early-career scientist has been there: six months pass with no good news to report at a lab meeting. You can't move on to the next phase of your project because you still need to complete a particular experiment or analysis. Dread overtakes you at the thought of facing yet another week of try and try again.

Senior researchers know that this is the norm, not the exception. Making cutting-edge discoveries means that you may figuratively bash your head against a brick wall for many months before any true breakthroughs happen.

But even the most resilient junior researchers can get depressed and frustrated when weeks of experiments leave them empty-handed. The best group leaders know how to keep morale flying high in the face of the research doldrums

(see 'Let them eat cake'). They use one-on-one meetings and progress reports to keep the wheels rolling, and lab outings, group-bonding activities and silly contests to keep the 'fun' in functional labs. Many also have strategies to 'normalize' failure in their labs, so that researchers won't hide or grow listless when projects aren't working.

Principal investigators (PIs) and lab heads who want to maintain high spirits — and high productivity — in their labs need to keep in mind that morale flows from the top down, say veteran group leaders. It is crucial for PIs to foster community building in their lab to give team members a sense of belonging and to establish a support network that will see junior members through the roughest spots.

"The success of people in the lab at certain times can elevate the success of everyone," says

Jeff Karp, who leads a bioengineering group at Brigham and Women's Hospital in Cambridge, Massachusetts. He and other PIs make sure to acknowledge and celebrate successes publicly when they do arrive. "It's important to have in place a high morale because it helps bring out the best in everybody," he says.

## BREAKOUT TIME

Stephen Royle, group leader at the University of Warwick, UK, knows that he is not necessarily the first person to whom his team members will turn when things aren't going well on a project in his cell-biology lab. So he tries to create and nurture a high level of trust and camaraderie in his group to establish a safety net that won't let any one person's woes reach crisis level.

His group goes on regular lunch and laser-tag outings together, and he's also dreamt up ▶

► some friendly competitions to keep things light in the laboratory. Using the free pens, T-shirts and other trinkets gathered at scientific conferences for prizes, he runs a Lab Quiz event akin to pub quizzes. Lab members compete on trivia questions about the university and its host city of Coventry, and on little-known facts about clathrin, the lab's favourite molecule.

Royle's lab members chart lab records — who can get the maximum yield from a DNA preparation, say — on a whiteboard, and one wall hosts the 'Western blot Hall of Shame' with horribly smeared protein samples. Such a display is a great equalizer and morale-builder, Royle says — it shows students and junior lab members that even the most accomplished senior teammate with a stellar publication record can run experiments that deliver rubbish results. He also likes to tell his team about past blunders of big names — such as how Nobel laureate Roderick MacKinnon broke the electrode of a pH meter during his first days of undergraduate research.

It's important to "de-pathologize" the idea of failure in science, says astronomer Keivan Stassun, senior associate dean for graduate education and research at Vanderbilt University's College of Arts and Science in Nashville, Tennessee. Instead, you teach students that failures are more akin to having writers' block, a normal part of the process that everyone runs into. It is imperative, he adds, that no one feel isolated in their struggles.

With that in mind, many lab heads say that they try to flatten hierarchies and promote a connected, cooperative environment. One hierarchy-shattering activity that Karp uses is a three-minute presentation competition. Everyone in the lab gives a quick talk on any topic they choose — these have ranged from the best hamburger joints in the region to historical figures from India — and then gets feedback. The group votes on the best presentation and the best critique, and each winner receives a useful electronic gizmo, such as a slide pointer.

To promote collegiality, some PIs take their team-building ventures outdoors. When cell biologist Anne Straube was asked to organize a



Anne Straube runs Cake Club in her department.

## LET THEM EAT CAKE

### Good ways to wind down at the end of the week

At the end of a dispiriting week in the lab, it doesn't hurt to have something to look forward to as a morale lift. For PhD student Alice Bachmann, that is Cake Club — a weekly meeting of researchers in her building that is centred around the simple act of eating scrumptious cake. "Always on Fridays. It's a good way to finish the week with a high sugar level and high level of happiness," says Bachmann, who studies cell biology at the University of Warwick, UK.

"I want to keep people sane," says Anne Straube, Bachmann's adviser. "After they've spent a week in the microscope room counting dots on the computer screen, they need to break out of this." Although she doesn't quite remember how Cake Club started, she thinks that excelling at recipes in the kitchen helps lab members to hone their experimental skills, too.

Creations have included cakes in the shape of a brain, a green fluorescent

cheesecake and a cake decorated like the page of a PhD thesis. Members are also encouraged to experiment and bring their failures (which are still edible, after all).

'Vino', a social hour with refreshments, ends the week at the Vanderbilt Initiative in Data-Intensive Astrophysics at Vanderbilt University in Nashville, Tennessee. The gathering often includes a toast to research successes — getting a paper accepted, a fellowship awarded or grants funded.

The VINO room contains no projector or whiteboard, so no one can inadvertently slip too far into shop talk, and the informal chatting makes advisers and other professors more approachable for trainees. "We've been collectively working hard all week. Hopefully, we've had some glimmers of success, but we mostly all experience a whole lot of slog and tribulation," says Vanderbilt astronomer Keivan Stassun. "And we all deserve a beer." **K.P.**

social activity for her department's retreat, she warned them that it could get muddy — she's a fan of orienteering, which can mean running through ditches or alongside creeks. She designed a course on her campus at the University of Warwick: teams of 3 had to find the locations of 45 picture clues. Once people have collective fun and get to know each other, it makes it easier to ask for advice or a reagent, she says. "It breaks down the hierarchies and lets them be less serious about things."

Running two lab groups — one in Uppsala, Sweden, and one in Milan, Italy — means that cancer researcher Elisabetta Dejana must work doubly hard to ensure cohesiveness. She holds lab meetings once a week over Skype, and in January, organized a retreat for everyone to meet and gather in Milan. She hosted both groups at her home for pizza, gelato and wine, and took them on hikes.

The informal gathering tightened group bonding and eased the tension over competition between the groups. "They are exchanging messages and mice and cells," she says. "Now, they understand that working together will help everyone." When peer reviewers send back a research paper with calls for new experiments, she divides the work up among the group, which makes the revisions go more quickly and adds energy to the team, she says.

#### CAREFUL SCREENING

Creating a strong sense of community often starts with the recruitment process. Cancer researcher Bert Vogelstein accepts only applicants whom he thinks will be able to hold up emotionally and psychologically through the

challenges of bench science. During interviews, he probes candidates' mindsets: asking them how long they expect to work on their project, for example, and whether they have failed at anything before. "If they say, 'No,' that's a conversation ender — they are not being honest with themselves," Vogelstein says. He also phones their previous mentors to glean detailed information about the candidates' lab experiences and how they handled setbacks.

Vogelstein and Kenneth Kinzler — who co-direct the Ludwig Center at Johns Hopkins in Baltimore, Maryland — run their group of about 15 trainees as subgroups of 2 or 3 people. The subgroups function as a risk-mitigation plan: all the members are co-authors on any papers. So even if one member has a particularly difficult project that takes three years to publish, she or he will have other papers come out in the interim.

And there are team rewards. Whenever work in the lab generates intellectual property, everyone in the lab benefits financially from any royalties. "Establishing a group that can cheer when someone else succeeds is not an accident," Vogelstein says. "It requires structure and planning of how people appreciate each other."

But even within a bonded community, trainees will get stuck at some point. Weekly check-ins or progress reports can prevent any hiding of problems. Lab heads can use software such as Trello or Slack, which allows everyone on a project to see progress — or lack thereof. Vogelstein has a pre-emptive approach. "Don't wait till they get stuck! The time to intervene is way before someone is despondent."

Switching a stuck lab member to a project

with better chances of success is a common strategy. But Stassun says that sometimes the best option is just to push through. “The single most important thing you can do is pull the bedcovers back and walk out the door,” he says. He uses ShareLaTeX, a shared online text-editing application, as a quick way to check for stalled project manuscripts. Stuck trainees should find one thing that they can write down, he says — maybe it’s one paragraph describing an experimental set-up or one paragraph of the introduction explaining a piece of background research.

Some senior scientists like to remind more-junior researchers that everyone gets mired at some point — it’s how they handle it that determines their success. When third-year PhD candidate Alice Bachmann, a member of Straube’s lab, got stuck for nearly 18 months on how best to prove that she had depleted a protein from her rat cells, she recalled the mantra of a friend: “If Plan A is not working, there are 26 letters in the alphabet.” Plan D ended up working, after she repeated it many times. Astrophysicist Rodolfo Montez Jr, a support scientist for the Chandra mission at the Smithsonian Astrophysical Observatory in Cambridge, Massachusetts, notes that he spends most of his research time running up against ‘bugs’ when computing an equation for an astronomical observation. “Solving the bug is now what your job is. It’s not a nuisance, it’s part of the path, and it’s cool,” he says.

That psychology of ‘flipping’ failure on its head is a recurring theme among lab leaders: embrace the failures, embrace the spinning wheels, embrace the bad weather at the field station. These things force researchers to get more creative and to approach problems in fresh ways. That, the leaders add, is when true discovery often happens.

Ultimately, the research enterprise works best when energy and enthusiasm remain high, even in the face of rejection, failure and defeat. “Keeping morale up in the lab is one of the most important aspects of trying to succeed,” says Vogelstein, whose group has identified more than a dozen major cancer genes, including the most common culprits in colon cancer.

“Succeeding in science is difficult,” he says. “We are always competing: for publications, for grants, for experiments. We are fighting battles all the time. The best thing to hear in the lab are the words, ‘It worked!’ You might think after 35 years it gets old, but it doesn’t.” ■

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## TURNING POINT

# Nanotech bridge

*Hossam Haick, a nanotechnology researcher at the Technion-Israel Institute of Technology in Haifa, has developed devices to detect cancer using exhaled breath rather than through biopsies. But, he explains, life in Israel can be difficult for Arab scientists. He is therefore trying to use his science to bridge cultural boundaries.*

### How many Arab professors are at the Technion?

Out of 600 faculty members, there are 9 Arab professors. The Arab community in Israel is 20% of the population, but in academia, it is roughly 1%. There is a pervasive belief in Israel that the Arab community is not educated. I try to dispel that notion.

### How did you get the idea to use breath to diagnose disease?

I read a lot of the history. From the ancient Greeks 2,400 years ago to Alexander Graham Bell in the early 1900s, there were long-standing hypotheses of the smell of chronic disease in breath. I also heard hypotheses that dogs could smell cancer. I decided to see if I could prove scientifically whether there is something about exhaled breath that can reveal signs of disease.

### At what stage is the research?

We have shown that exhaled breath contains unique fingerprints of specific diseases. We have lab results, as well as animal experiments. We have run clinical studies with 5,000 patients across 19 departments and 9 institutions, where we collected breath with a small device called NaNose, which is able to detect more than 1,000 different compounds in the breath from all of these people. We started with lung cancer, and have extended studies to gastric, colorectal and breast cancers, as well as to degenerative disease such as Parkinson’s, Alzheimer’s and multiple sclerosis. In the case of lung cancer, we are able to discriminate between benign and malignant tumours with 88% accuracy. By using breath to discriminate between benign and malignant tumours, we could save people from having to undergo unnecessary biopsies and surgeries.

### Will this be in use soon?

We have built technology in a portable device that can detect disease in an easy and inexpensive way — only a few thousand dollars. Three companies have obtained the licence from Technion.

### How else are you building on this technology?

We are also working on Sniffphone. The idea



is to bring breath analysers into smartphones. If a risk is found, the smartphone could send the results to a physician.

### How do you try to improve relations between Arabs and Jews in Israel?

In a research institute, you are judged on excellence and achievements. That’s not the reality outside an academic institute, however. And in the Arab sector, there is a belief that whatever you do, you will not excel in Israel, unfortunately. As scientists, our role in the community is not only to produce papers. We have to disseminate the results and provide a message for the community. I volunteer to go to many community schools, both Jewish and Arab, to talk about science. These efforts consume a lot of my personal time. Every year, I give 200 lectures in schools. This is huge, considering I lead three research consortia. But it’s important.

### How else do you pursue outreach?

A professor at the Technion had the idea that we should disseminate the fundamental principles behind nanotechnology and nanosensor research. We decided to present the course in a digital way, to talk to people beyond the boundaries of Israel. I said I would only do it if courses were offered in English and Hebrew, as well as in Arabic, so as not to discriminate. We have many people from Arab countries that have taken the course. One of the nicest data points is that 900 of those people who took my course were from Iran, which has huge political sensitivities with Israel. My students come from 127 countries worldwide, an indication that education, science and technology can serve for peace. ■

### INTERVIEW BY VIRGINIA GEWIN

This interview has been edited for length and clarity.