DIGITAL SECRETS OF SUCCESSFUL LAB MANAGEMENT

Group leaders say these tools keep their research groups running smoothly. **By Kendall Powell**

Christie Bahlai felt as if she was buried under a pile of virtual sticky notes. Like many group leaders, the computational ecologist appreciates that her team uses the messaging app Slack for virtual 'water-cooler talk'. But she finds the app lacking when it comes to managing the various projects her laboratory is working on – threads, ideas and long-term goals get lost as conversations and memes rush on.

"Slack is a not a great way to record anything for posterity," says Bahlai, who runs a seven-member group at Kent State University in Ohio. So in May, she decided to "lay down the hammer and invite everyone to a Trello board". The project-management software acts like a shareable, virtual bulletin board, and Bahlai hopes it will give team members a tangible way to keep their research moving towards common goals.

"It's the digitization of my yellow legal-sized notepad," she says of her analog approach to tracking projects. And, importantly, she can't misplace it, unlike her notepad.

When it comes to streamlining communications, organizing inventory and general project and lab management, group leaders often seek digital tools that go beyond the usual suspects of Google Docs, Zoom, Slack and GitHub. These tools especially help investigators who lead groups in the range of 5–15 people, that do not have a full-time lab manager or administrative help and who need inexpensive software solutions (see 'Six tools group leaders love'). (Unless otherwise noted, the software applications highlighted here have a free option for academic and non-profit researchers.)

"Ironically, a lot of these tools are about not having people sit in front of a screen all the time," says computational biologist Mark Gerstein at Yale University in New Haven, Connecticut. "I don't think that helps people think." Instead, he says, researchers spawn creativity when talking and scribbling down ideas together, be that on a phone, tablet, laptop or in person.

Big-picture project management

Bahlai's group investigates insect communities, including using sound to estimate population size. The team navigated the pandemic using a combination of Zoom and Google Docs to talk about the tasks that were 'on fire', but longer-term goals were continually falling through the cracks. Trello, she hopes, can help seal those gaps.

Using Trello, Bahlai can break tasks into steps and assign each one to a lab member. For example, for a fieldwork project to record songs of grasshoppers and katydids, her team needs to deploy audio recording devices. The units have rechargeable batteries, so one task on the board is to assign someone to find, test and charge the batteries.

Trello also lets Bahlai get a '30,000-foot view' of her group's research. It provides a place to store lab 'stream-of-consciousness' Google Doc links. And it keeps her accountable, she says. Team members "will be able to say to me, 'You haven't reviewed Katie's paper yet'".

Similarly, Mary-Anne Lea, a marine-predator ecologist at the University of Tasmania in Hobart, Australia, is test-driving Miro, an online 'whiteboard' app, both for her own group and to integrate interdisciplinary work across several groups and institutions.

Many of Lea's group's projects funnel into the South Eastern Australia Sentinels project, a collaboration of eight teams drawn from academic, government and non-profit organizations, which tracks the health, behaviour and human interactions of seabirds and marine mammals, as well as how marine heatwaves

affect the animals.

With so many moving parts, it's hard for everyone to "see how their bit of the puzzle fits into the whole", says Lea. She wants a tool that handles project management, idea generation and planning consolidation. "I think Miro can do these things for us."

Lea expects Miro will be especially helpful for students who have a 1–2-year project to have a place where they can outline their tasks, and she is beta-testing the idea with one of her undergraduate honours students, who studies penguins. They have each set up their own Miro boards and share them with each other. "She can see my big-picture thinking and where her project fits into that, and I can see what she is planning," Lea says.

Digital aids for communication

For C. Titus Brown, a bioinformatician who spends most of his days at the University of California, Davis, in front of a screen, there's value in good old-fashioned conversations with his lab members.

But Brown hates meetings — particularly recurring events. "I'm philosophically against having weekly meetings where people who are stuck on things have to talk about them," he says. Still, he wants the members of his 15-strong Laboratory for Data-Intensive Biology to be able to reach him easily for one-to-one catch-ups.

When Brown had weeks on the "rollercoaster of faculty time commitments", he found that he spent more time on e-mail and Doodle polls trying to schedule a meeting than the meeting would actually take. Now, he's turned to the scheduling app Calendly to ensure he's available when team members need him.

Calendly has free and low-cost subscriptions (US$8–15 per month), and integrates with Google, iCloud and Outlook calendars and with meeting programs such as Zoom, Google Meet and Microsoft Teams, without sacrificing privacy. "It integrates with my calendar in a way that no one can see why I'm busy at a particular time," says Brown.

Users can create public Calendly pages that allow anyone with the link to request an appointment in prespecified time blocks. When someone books a time slot, the program sends the user a notification and updates their calendar.

Users can also opt for 'secret' events that are not available for everyone, such as early-morning or late-night slots for international collaborators. Brown reserves one of these for doctoral students who need to schedule three-hour thesis meetings.

"I'd rather be meeting with my lab members than other people," says Brown, and Calendly gives them a nice window into his calendar and availability.

Like Brown, Gerstein prizes face-to-face conversation and collaboration in his group,

which works on large-scale analyses of biosensor and wearable data. As such, it attracts "hard-core computer geeks", he says, so he's thought deeply about how to entice them out from behind their screens.

"Computers now let us dictate, write and draw with our hands in much more relaxing and natural ways," he says. Gerstein sets his phone on a nearby table, then uses Google Recorder to capture discussions, and the app (which is available only on Pixel phones) transcribes it in real time. The transcript is coupled to the audio and can be searched by keyword. Another dictation app, known as Rev, offers quick-turnaround manual transcriptions for $1.25 per minute of recording. Gerstein also uses the app Grammarly to "take the yucky voice-to-text transcript and fix the language up quickly".

Gerstein describes his group's use of these tools together as a "stack" to go from conversation to a rough draft of a manuscript in just a few clicks, he says. He estimates that the tools cut the time they spent on that task in half.

Gerstein has also investigated tools that digitally recreate the experience of scientists gathered around a whiteboard. Zoom's Annotate feature is one option, which he has deployed during remote meetings both before and during the pandemic. Another is Rocketbook, a reusable physical notebook ($16–45) that has whiteboard-like paper paired with a mobile-phone app that converts photos of notebook scribbles, cartoons and diagrams into digital files. Both Rocketbook and Google Lens use optical character recognition to interpret handwriting and translate it into searchable text. "I've saved thousands of sheets of paper this way," says Gerstein.

Taking stock

At the University of New Mexico in Albuquerque, immunologist Irene Salinas' lab-management challenge was all about inventory. Members of her group had grown frustrated

by the disorganized lab supplies and chaotic lab supply chain, made worse by pandemic disruptions. "We would have one million e-mails about who ordered it, did it arrive, who received it, was it aliquoted and where was it stored?" Salinas recalls.

What she needed was a way to track the entire chain from when a reagent needed ordering to its final storage on the lab's shelves or in refrigerators or freezers. Luckily, one of her postdoctoral researchers was married to a freelance software engineer, and he agreed to develop an app for them and customize it to their needs.

Lab Inventory automates the workflow so that the team members can access and check on orders at any point. It embeds photos of the items and PDFs of order forms to make reordering easier. Developer Christian Bullo says that such customized web applications cost $3,000–5,000 to build, and require about a month to develop. The app works for labs of up to 30 people, but could be scaled up for larger groups, he says.

For labs whose hardware is in high demand, Bookkit (now known as Clustermarket) streamlines equipment booking and management. "Bookkit is like AirBnB for research facilities," says Raif Yuecel, head of the Centre for Cytomics at the University of Exeter, UK.

With more than 40 people trying to access 10 pieces of equipment, Yuecel needed a way to manage use in an efficient and controlled way. Through Bookkit, he can advertise the instruments and services that his flow-cytometry core facility provides. Potential clients, both internal and external, can book immediately if there is availability and they have permission, or they can send a request to Yuecel's team. On the Bookkit dashboard, Yuecel can see the daily, weekly or monthly calendars for all of the instruments and can control access on a per-user basis.

Yuecel accesses Clustermarket through his university's subscription, but a free option is available for individual academic groups. Group leaders can generate a report each month to see who used each piece of equipment, how often and for which projects, as well as the associated costs. "We can do optimum resource management by tracking the usage of our instrumentation," says Yuecel.

Group leaders must find the digital tools that make their labs more streamlined, effective and creative. Apps that can do those things, leaders say, are worth their learning curves. Between in-house software, social media for outreach and other tools, researchers can become overwhelmed by platform fatigue, Lea says. "However, there's joy and excitement for learning new software if it makes your life easier."

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SIX TOOLS GROUP LEADERS LOVE

- AnyDesk is free software for accessing and controlling computers remotely.
- Google's Apps Script automates actions across the Google application suite.
- Benchling is a suite of life-sciences apps, with tools for DNA design.
- Google Keep is a great way to share short, shareable lists of reagents or lab to-do's, and can be accessed on a mobile phone.
- Quartzy centralizes lab orders and maps inventories.
- Voice Dream converts text into voice, and can be used to listen to PDFs of papers in the same way as an audiobook.