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The Lincoln Park campus of DePaul University in Chicago, Illinois, is empty after being closed to faculty members over COVID-19 concerns.

SCIENCE-ING FROM HOME IN THE CORONAVIRUS ERA

Scientists affected by the COVID-19 shutdowns outline the tools they are using to run their research groups remotely.

As universities close, heads of life-science laboratories are having to quickly shutter labs, wind down experiments and make contingency plans for maintaining research organisms and cell lines. *Nature* surveyed five group leaders who closed their labs in early to mid-March, and asked which tools are helping to keep research moving and lab members motivated and mentally healthy. See 'Building a virtual lab community' for ideas.

This article is meant to provide general

advice. Always consult your local and/or institutional officials for legal, regulatory and public-health guidance.

ANNA MONDINO
LIVE BY EXAMPLE
AND STAY FOCUSED

When two small towns outside Milan shut down, the institute advised us to prepare to work from home and to finish only necessary

experiments. That was on 1 March. We had a virtual lab meeting on 13 March to review our data, and planned how we would finish experiments in the following week.

Everyone felt an ethical responsibility to try to complete the experiments that we were already running in mice. One person per lab is going in once or twice each week to take care of the animals, and we have labelled all the cages with clear instructions so that a minimal number of staff members can care for them.

On our first Monday working from home,

Building a virtual lab community

Provide assurance. Students, postdoctoral fellows and technicians need to hear that you are, first, unambiguously putting their health and community health first; and, second, working hard to mitigate any impact of the pandemic on their careers.

Adjust expectations. Change how you gauge productivity, and give yourself and your team a break. Set reasonable daily goals or to-do lists to check off; mix up tasks of reading, writing and data analysis; and take breaks for lunch, socializing and exercise, just as you normally would.

Check in. Check in by video call or phone with your colleagues, and especially those who live alone, are new to an area or from another country, or live far from their family. Provide a virtual sign-up sheet or group list on which people can indicate when they need assistance from the group, such as with groceries or pet-sitting, or in the event that they become ill.

Cover costs. Offer to cover any reasonable expenses for new laptops, trackpads, hard drives, software or other equipment that laboratory members need to work efficiently from home. Check whether grants and fellowships can cover such expenses.

Provide structure. Don't micromanage, but provide your team with milestones so that they can feel productive each week.

Keep it light. For early-morning video meetings, encourage members to wear their pyjamas and sport their 'bed head'. Or host a 'bring a pet to the lab meeting' day.

Socialize, virtually. Set up virtual lunch-break 'rooms' in small groups of two to four, to chat about science (or not) while eating together. Arrange virtual happy hours using programs such as Zoom or Webex so that large numbers of people can join during a two- to three-hour window.

Exercise. If allowed in your area, have team members pair up (while still social-distancing!) for exercise and outings such as running, cycling, hiking or pet walking.

Contact IT. See if your institute offers professional accounts for Zoom, Webex, Skype Business or other virtual meeting platforms.

Learn. People can use free, online tutorials to pick up new skills of coding in R or Python, master Adobe Illustrator or brush up on bioinformatics.

Collaborate. Now is a good time to call busy experts and ask them about your data or observations.

I sent everyone a 'homework assignment' related to their project. That helped to keep everyone focused on their scientific work in spite of all the guilt about our own privilege and safety, as well as the other emotions we felt. I wrote deadlines for myself and shared those, too.

My lab uses the messaging tool WhatsApp for group chats, and the members have another chat that doesn't include me, which allows them to troubleshoot among themselves. There's also a floor chat, which includes seven lab groups that share common rooms; we use this to set floor rules for when scientists have to be in the lab, and to arrange to get deliveries for each other.

In terms of working at home, I'm encouraging people to work on different things depending on the stage of their career or project. My student pursuing a master's degree was only six weeks into her project, so we decided she should write her thesis introduction. She had run into some experimental bottlenecks already, so she's also looking into the literature to find solutions. A postdoc, who has just joined my lab, will read background literature, outline future experiments and plan controls. Another postdoc will put together final figures and revise a manuscript. I'm looking for courses that my lab members can attend online for free to improve their research and presentation skills. Learning something new can act like a motivational anchor.

But researchers must also save time for themselves: if you never stop working, you will burn out.

Anna Mondino is an immunologist, at the San Raffaele Scientific Institute in Milan, Italy.

JENNIFER NEMHAUSER KEEP DISTANCE, BUT KEEP SOCIALIZING

The campus is still open, but from 6 March the strong message from the university has been: if you are in a supervisory role, you should be supporting people in working from home. Have a Google Group, or similar group platform, so you can blast e-mails and share resources with your team quickly and effectively. We also have a Google Sheet with each person's contact information and their emergency contact person, and our contingency plans, all in one place. Lab members use the Google Sheet to ask each other to do minor tasks in the lab, such as collecting plant seeds or moving culture plates from an incubator to a fridge. We also use that spreadsheet to prioritize tasks as the lab shuts down. We have three categories: essential (months of work could be lost if not done), priority (weeks of work would be lost) and needed (would help

keep things on track). For each task, people can volunteer, and others can leave notes on how to complete the task.

The Google Sheet also has a tab for emergency supply orders we should make now, such as Petri plates, culture media, antibiotics and molecular-biology reagents, so that our research won't be delayed when we return.

To maintain group morale, I try to provide some structure. Figure out what data you have that can be analysed, and make them accessible to as many people as possible. Have a system for people to back up their data and analyses from their home computers, such as Dropbox or Google Drive. Back up, back up, back up.

For our online journal club, which meets using the videoconferencing platform Zoom, we have one shared paper we're reading, and each person will also share something cool they've learnt from other reading. It's a chance to get together and talk science. It also gives people an excuse to take a shower and get dressed, and for us to see them. We cannot ignore emotion. In my group meetings, I ask everyone to check in using a scale of 1–10, 1 being 'I'm feeling normal' and 10 is 'I'm paralysed with anxiety and fear'. I offer my number first: 'I'm at about a 6 right now.'

Jennifer Nemhauser is a developmental and synthetic biologist at the University of Washington in Seattle.

RAFAEL CARAZO SALAS STAY AHEAD OF THE CURVE

Eugenia and I saw that working from home was coming and decided to take control. Safeguarding our people comes first – we are responsible for them – but we also want to safeguard the science. So, on 12 March we put four measures in place.

First, we applied social distancing immediately through a Google Sheet sign-up, so that only six people, three each from our two groups, could be in the shared lab space at a time. We broke down the entire week into hourly shifts to give people maximum flexibility. People can indicate which spaces they'll be in – such as to change cell-culture media or do polymerase chain reactions – so that people can stay distanced from each other.

Second, we shifted the way we operate to accumulate as much raw data as we could in the time left, so that they could be processed and analysed remotely. Luckily, we were able to do some large-scale imaging of cells using our automated microscopes, which feed the culture plates through over several days. That gave us a backlog of data that will keep us busy for three to four weeks. We bought hard drives,

and told people to take their laptops and large-screen monitors home.

To avoid contracting or spreading the contagion, we had the lab manager supply hand sanitizer and wipes at the lab entrances, instructed lab members to wash their hands thoroughly every time they came into the lab and, of course, told them to stay at home if they had any symptoms.

The final measure was to make all meetings virtual, while keeping our established routine. We do a one-on-one session with each person each week by Skype, and we hold a lab meeting once a week by Zoom. These are working seamlessly.

We were already using the online messaging tool Slack; now, we use it around the clock to stay interactive and connected. Someone snapped a picture of a broken incubator so that I could reply quickly about how to fix it. In the longer term, I plan to use project-planning apps, such as Trello or TeamGantt, to lay out tasks strategically, with expected completion dates and milestones.

But we have to be flexible with our expectations: we are two principal investigators sharing a household with our 2-year-old, so we are clearly alternating our working hours at home. And many others are in the same situation.

Rafael Carazo Salas runs a lab at the University of Bristol, UK, that investigates stem-cell differentiation. He and his wife, Eugenia Piddini, lead cell-biology labs next door to each other.

RU GUNAWARDANE COLLECT LOADS OF DATA

We've been operating under a remote-work plan since 6 March. My group of 12 people uses fluorescent tags to visualize the cellular compartments of human induced pluripotent stem cells. It takes about six months to generate a tagged cell line, so the first thing we did was to redeploy everyone to freeze several hundred different cell lines and label them carefully.

We spoke with our colleagues who do imaging about what experiments we could do in the next two weeks to collect as much imaging data as possible for people to analyse at home. We did this for genetic analyses, too.

In mid-March, senior people in the group trained the junior people over Slack and Zoom on how to analyse the genetic data. Our imaging colleagues will also teach us how to use software to start processing and analysing the imaging data. We are brainstorming other ways to cross-train people by remote meetings.

We are also building the infrastructure to store, track and search within our genetic data. We froze 300-odd genetic clones, and we have sequencing data for all of them. So, I put a couple of people who love to work in Excel spreadsheets in charge of creating a genetic database. Now, we can ask all sorts of questions about how efficient our gene editing is, and we can plot charts.

I'm over-communicating with my team, so

that people feel they can talk to me if they have a question or a problem that needs troubleshooting. In the lab, I had a 95% open-door policy for my team to share exciting data or talk with me at any time. Now, I'm logging into Slack for 12 hours each day, and they can send messages at any time.

In the past two weeks, I've been adding action items to our group Slack channel. My team members love that because it's like a group to-do list, and we all get to check boxes off and feel productive. I'll be tracking institutional-level milestones using Evernote and Confluence project-management software. The team will look at our current goals and come up with a plan for the next two months for how to achieve them.

Ru Gunawardane directs the Stem Cells and Gene Editing group at the Allen Institute for Cell Science in Seattle, Washington.

FEDERICA DI NICOLANTONIO SEE THE GLASS AS HALF FULL

We were given just 48 hours to close down the lab, and we've been managing from home for more than 2 weeks now. When we closed, we had to frantically wrap everything up, so now we're talking through tasks and priorities more carefully.

You can look at it in two ways: there's either very little you can do from home, or a lot you can do.

I'm still struggling to realize that this shutdown has happened, for real. But finally, we have time to read and write – those activities usually get done at nights and weekends.

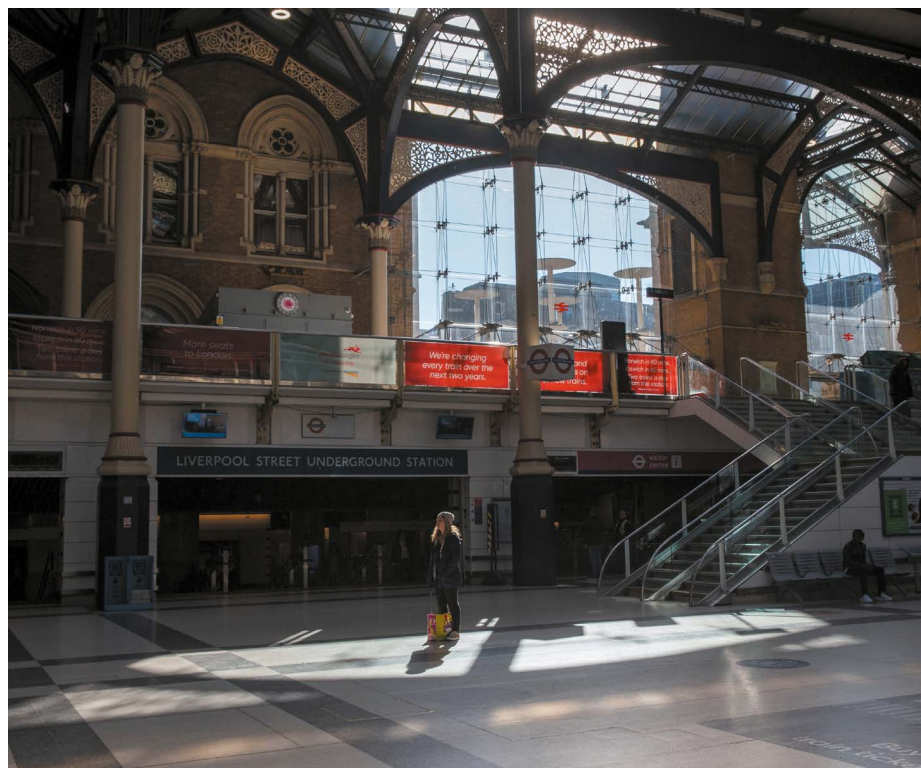
Of course, social distancing is quite dreadful, especially in a country such as ours, with a tradition of social gatherings. My personal Webex account has been my best friend, because you can just open a 'room' and people can pop in to say hello.

Take extra care to communicate with lab members who might live by themselves, are from abroad or otherwise far away from home and family. Be sure to translate any important announcements by the government or the institute into English right away. The situation and the rules and restrictions are changing every day, so it's really important to make sure this information is shared. Double-check on each other.

Federica Di Nicolantonio studies the epigenetics of colorectal cancer and mesothelioma at the University of Turin, Italy.

Interviews by Kendal Powell.

These interviews have been edited for length and clarity.



The UK lockdown has kept people out of public places during the COVID-19 pandemic.