It is 2 a.m., and I am studying snowshoe hares in the Yukon Territory, Canada. My study site is just outside Kluane National Park, in the beautiful boreal forest surrounded by some of the tallest mountains in North America. It’s a cold night in the middle of winter, and it’s dead silent. Although our group of researchers works in pairs, we are usually 100 m apart, and somehow in the night, I still feel isolated. All I can hear is the crunching of snow under my snowshoes. I can see every breath in the light of my headlamp as I make my way through the dark forest.

When I come upon a snowshoe hare in a trap, I transfer the animal into my handling bag, take a seat on the snow, and place the hare in my lap. Snowshoe hares are well adapted to these winter conditions and feel like little heaters on my cold hands. I take several body measurements from the hare and check its ear tag (placed earlier by another scientist). If the hare is one of our targets, I put a GPS collar around its neck. I am examining the role of food in the snowshoe hare cycle, and these GPS collars will provide valuable data on movement and habitat selection between control and fed hares. I also collect fecal samples to measure stress and physiological differences.

We do this work at night because the nocturnal hares are difficult to trap during the day. The work brings many challenges, such as navigating in the dark, doing delicate work with cold fingers, hiking while bundled up like a marshmallow, and most of all, getting ready to leave while everyone else is heading to bed. But even though the work is exhausting, I wouldn't trade it for the world. With the cold, dark, and lonely nights come adorable snowshoe hares, close encounters with lynx, and spectacular northern lights!

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We asked young scientists from a variety of fields this question: “Where are you at 2 a.m.? What do you have to do before you can go to sleep?” In addition to the many scientists who are up late finalizing grant proposals, lesson plans, and conference presentations, we heard from scientists who track nocturnal species, check specimens hourly, and meet with collaborators across the world. Read some of the most interesting responses below. Edited by Jennifer Sills
It is 2 a.m., and I am alone, at the Onsala Space Observatory, on a peninsula along the coast of Sweden. The area is fenced, with restricted access to everyone but authorized scientists and the rabbits, boars, deer, and cows that roam the fields around the buildings. I am using a telescope with a 20-m-diameter steerable dish to observe the radio regime of the spectrum of light. Because I am observing at a different wavelength than visible light, I can observe through clouds, and even during the day. I am observing at night because my source is only visible in the sky at night during this part of the year.

I sit in the control room in front of a big desk with several computer monitors showing different vital signs of the operations. Behind me is a rack space with spectrum analyzers and other equipment to interpret the signal the telescope is receiving from space. I am using the telescope to look at the carbon monoxide (CO) gas in a cloud of gas and dust that is forming stars in the outer parts of our galaxy. The telescope is set up to be sensitive to the emissions of the CO molecules in the cloud. It focuses the emission to a small instrument, a receiver at the focal point of the telescope dish. There, the photons are converted to a digital signal that we can then store and analyze on a computer. By moving the telescope around, we can see how the emission from the CO varies with position, essentially mapping it.

The observation time is rather hectic in the beginning; I have to plan everything and calibrate the instrument. Once the telescope is set to observe, there is breathing room to do some other work, get more coffee, and eat something. I have never observed with this telescope before so I have to learn how it works, how to control it, and in what order things have to be activated and calibrated. I also have to be flexible and ready to make adjustments throughout the observations to get the most out of my time with the telescope. Observations are exciting because we are collecting light that has traveled tens of thousands of years to reach us, but it is also exhausting. I hope that by doing this work, I will contribute to the understanding of how stars and planetary systems, perhaps much like our own Sun and Solar System, are formed.

It is 2 a.m., and I am alone, dipping Eppendorf tubes of fruit flies into liquid nitrogen and shaking them until the flies’ heads pop off. The tubes sizzle as they crust over with ice crystals. A moment ago, the flies were asleep in a pitch-dark incubator; now, they are bobbing around in a swirling mist of freezing liquid. I reach into the liquid with a long pair of tweezers, fish the tubes out and shake them vigorously. The flies’ heads ricochet like little pinballs against the walls of the tube, making a flurry of hollow-ringing clinks. Every hour, I have to collect 20 frozen heads from which I extract genes. By measuring the gene products in the flies’ heads as the clock ticks by, I am peering into the actions of the same genes that control our nightly rest.

It is 2 a.m., and I am alone, walking into the imaging room of the lab. The lights are off and there are no windows. It would be an
excellent place to sleep if it weren’t for the humming sound coming from the large black box on the counter or the immense light emitted by the adjacent computer monitor. This black box is an advanced imaging system that can automatically count the number of live cells in a dish by using special light signals to activate a fluorescent dye added to the sample. I am counting my cells for the sixth and final time today. I load a sample in the machine and wait 15 minutes. I have many dishes of cells to count, so I repeat this process multiple times. I have to force myself to stay awake to ensure that the machine is working correctly.

I develop cancer therapeutics and thus I need to know how quickly or slowly a drug works to kill cancer cells. Therefore, I have to count the cells in the dish using this machine every couple of hours—even if it means staying up late into the night. This is a tedious task but vital to knowing whether a drug will be safe to use in patients. I can’t go to sleep until I complete my 12-hour experiment to determine whether my latest drug is working or not. If all goes well, I should see fewer live cancer cells!

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It is 2 a.m., and I am deep in discussions with colleagues in China and Europe about scientific software on Slack, Skype, and email. The laptop hums, router lights blink yellow and green in the darkness, and my family silently sleeps a few rooms away. Scientific business analysis involves collecting feedback, troubleshooting errors, and spinning up new programs to help chemists make molecules at sites across the globe. The wee hours of the morning are a great time to start these conversations, since my coworkers can begin on a problem and hand it off to me before they leave work. Everyone seems to get more done this way, despite the slight loss of sleep.

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It is 2 a.m., and I am bobbing around in a dinghy on the Pacific Ocean with two other scientists. I am wearing an orange survival suit and holding a dip net used to capture seabirds. It is dark all around us, but my eyes have adjusted and I can make out the shape of birds floating on the water nearby, as well as the horizon and bright stars mingled with thin pale clouds overhead. The water is calm and quiet except for a few small waves lapping at the side of our boat. It is quite peaceful, and the distant sound of young seabirds calling to their fathers in their characteristic “mwraaaa” serves as an organic soundtrack to our work.

Just as I start to relax, someone spots a group of birds close enough to try and sneak up on and capture. I sit up, breathe in the cold ocean air, grab hold of a boat handle, and prepare for the engine to rev and zoom up to the unsuspecting birds. The three scientists in the dinghy have to work together in perfect coordination: The driver speeds up quickly, the second person holds a bright spotlight focused on the seabird, and the third person leans over the edge of the boat with a net in hand, ready to scoop the bird gently off the water before it dives below the surface. The driver needs to balance speed and precision, slowing down at just the right moment to allow me to quickly scoop the bird into the net without injuring the bird, damaging the net, or knocking someone overboard. Good communication and a calm demeanor are very important for this small team to work together effectively.

Once we capture a bird, we attach a satellite transmitter to its back, release it, and then track its movements remotely. I am using the information from satellite telemetry to quantify seabird movements in the northern California Current. Specifically, I’m looking at the patterns of seabird associations with the Columbia River plume, a migration corridor for juvenile salmon leaving the Columbia River. We hope to determine whether predators such as seabirds affect smolt survival.

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It is 2 a.m., and I am near a stream outside Wu Fong Chi Waterfall Park in the foothills of the Snow Mountain Range in Taiwan. During the spring and summer, the air along the bank of the stream is filled with the mating calls of frogs. My laboratory assistants and I are documenting their characteristics, such as call number, duration, and amplitude. We are wearing long-sleeve shirts with lightweight long trousers and waterproof boots. Our battery-powered headlamps are fitted with red filters to avoid disturbing the frogs.

To avoid causing stress to the frogs, we record their sounds in the field instead of catching them and bringing them to the lab. Our parabolic microphone can focus on the sounds emitted by a particular frog. During mating season, each male frog maintains its own territory, so we have to move around to record the calls made by each individual frog. Poisonous snakes are everywhere along the stream. They come out to hunt frogs by localizing the frogs’ calls, and we have to be careful not to step on them to avoid being attacked. Meanwhile, mosquitoes swarm us throughout the night.

Nevertheless, the work is exhilarating. It opens our minds to nocturnal biological activities that we would never experience in the lab. We want to document the mating call in the current environment, because soon a hotel will be built near the park’s boundaries. We fear that the hotel guests’ nighttime activities could alter the mating calls of the frogs and disrupt their breeding activities. We may use these baseline data to create a mitigation plan in the future.

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Research night owls

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