Faculty interviews—traps and tips

The year was 1995, and I was a postdoc working to develop a low-temperature near-field scanning optical microscope to study exciton charge and spin transport in nanostructures. It was my third year of the appointment, and I had some nice results that got me an invited talk at the APS March Meeting and a half dozen faculty interviews.

Like nearly all faculty candidates, I was forced to think about what I wanted to do with my career in the longer term as an independent researcher. The optical techniques I had developed were still new to me and significantly different from my PhD research, which was on sliding charge-density waves and their nonlinear dynamics, so it felt natural to consider what other systems I could investigate using similar approaches. I decided to focus on spatiotemporal behavior of ferroelectric materials. But beyond that, I had only a vague idea of what I was going to do. I had never done any actual research with such materials, although I had read many papers on them, which at the time involved trekking to the library at night to read journal articles printed on real paper.

Unfortunately, I had the deeply mistaken notion that I could get by in a faculty appointment interview with a cursory plan of attack and assuring the recruiters that I would "figure it out" along the way. Not surprisingly, I bombed interview after interview. The talks usually went OK, but when it came to a discussion of my research plan, I struggled to provide details. By the time the 1995 APS March Meeting came around, I had already botched five interviews. I attended the meeting with dread, knowing that my remaining interview, and possibly my last chance to become a professor, was scheduled for the following week.

Like most of the others, my interview at the University of Pittsburgh was a two-day affair, with the first day reserved for my seminar and a few meetings and the second day filled with one-on-one discussions, where I would inevitably be questioned about my research plan. The seminar went well, but I went to sleep with a slight irritation in my throat. The next morning, my voice was gone. I had a full-on case of laryngitis.

My future colleagues at Pitt were exceedingly kind and understanding. Instead of being peppered with questions, I was served soothing herbal tea with honey. I distinctly remember gazing helplessly at two of the faculty search committee members as they discussed my fate, right in front of me. Maybe they thought that since I couldn't speak, I also couldn't hear what they were saying. One of them really wanted to ask me about the details of my proposed research program. The other was defending me, saying sympathetically, "Oh, I'm sure he has a good plan."

And that's how I got my faculty offer at the University of Pittsburgh.

I have participated in many faculty searches over the past 25 years, and I am confident that my 1995 self would not have been selected by any of those committees. The two-talk format is commonplace nowadays. Faculty give one talk based on prior research and the other focusing on their "five-year plan." I do understand why the hiring process is structured that way: Faculty hires constitute a huge investment, and search committees need to be convinced that the successful candidate can build an independent research program with clearly articulated themes and initial projects.

Here's my advice to faculty who populate search committees: Remember that a successful research career can span 30–40 years. When you are evaluating the research plans of your candidates, consider rewarding those whose ideas border on the adventurous. A balanced portfolio, mixing high-certainty paths with those that have less certain outcomes, is likely an indicator of your future colleague's long-term success. And when you hire that person, make sure that they get the support they need to be successful.

My advice to postdocs interviewing for faculty positions is to not follow the path I did. Formulate your research plan, and be ready to articulate and defend it. At the same time, be aware that it is easy to get trapped in your own expertise "polaron." The early stage of your career will be when patterns are set in motion. By the time you receive tenure, it may be hard to maneuver away from what is "expected" by your colleagues, the broader community, and yourself. I have tried to avoid that trap: Since joining Pitt, I have ventured into several new areas of research in which I initially had no prior exposure. Did I make rookie mistakes in the beginning of those adventures? Every time. But as an outsider, I eventually brought new insight and perspective into those fields.

So once you get the job, look up and look around. You might be inspired by a paper you read or a talk you heard at the March Meeting, and you might come up with an idea or research direction that seems much more interesting and compelling than your initial plan. Don't be afraid to embrace those ideas, change course, expand your horizons, and work in areas in which you are not an expert. Both you and that field will be better off because of it.

Jeremy Levy
(jlevy@pitt.edu)
University of Pittsburgh
Pittsburgh, Pennsylvania

No uncertain terms

Three words—forecast, projection, and prediction—in scientific terms are similar, but they have distinct implications in specific contexts. I find it concerning when I read research papers, announcements by government agencies and modelers, or popular science coverage that use the terms incorrectly. Such misuse may cause misinterpretations. And in the worst-case scenario, the correct meanings may be dismissed and the incorrect meanings enforced. It is the responsibility of scientists to correctly and appropriately use scientific terms and to interpret and communicate them with caution.

"Forecasts" of the COVID-19 pandemic have been offered by agencies, institutions, and teams around the world. As this issue of Physics Today goes to press, the COVID-19 Forecasting and Mathematical Modeling webpage, via the US Centers for Disease Control and Prevention (CDC), each week provides four-week "forecasts" for COVID-19 hospitalizations and deaths.[1] (Case forecasts have not been posted since December 2021.) The results presented include both the ensemble forecasts and the independent ones that the ensemble numbers are based on.

Obviously, huge uncertainties are associated with those forecasts. The CDC's hospitalization and death forecast pages state that "models make various assumptions about the levels of social distancing and other interventions, which may not reflect recent changes in behav-

ior." Thus the possible scenarios may not necessarily be probable because of unpredictable factors such as national policies and human behaviors.[2] The CDC case forecast page states, "While they have been among the most reliable forecasts in performance over time, even the ensemble forecasts have not reliably predicted rapid changes in the trends of reported cases, hospitalizations, and deaths. They should not be relied upon for making decisions about the possibility or timing of rapid changes in trends."

To forecast is to calculate some future events or conditions, usually as a result of study and analysis of available pertinent data. A forecasted event is a probable occurrence. The term is frequently used in reference to the weather—which is forecasted on the basis of correlated meteorological observations. If a weather forecast shows that it is going to snow tomorrow, that means snow is a rather probable weather condition for the next day. And whether it will snow tomorrow does not in the least depend on how humans behave or politicians debate.

The way the CDC and many groups use the term "forecast" may cause confusion among the public, policymakers, and decision makers, leaving the wrong impression that a COVID-19 forecast is comparable to a weather forecast. In fact, "projection" is a more appropriate term to use with COVID-19 data. A projection offers only a conditional possible response that depends on the validity of the assumed future scenarios.

To help explain the distinction between projection, forecast, and prediction, consider three sample sentences:

1. The weather forecast by the Bureau of Meteorology shows that it is going to snow tomorrow. (The forecast is a probable occurrence.)

2. The team's projection shows that the world population will rise to over 11 billion by 2100. (The projection tells conditional possibilities.)

3. Astronomers can make accurate predictions about when an eclipse is going to occur. (The prediction is an inference with certainty.)

I have seen the term "projection" used correctly by COVID-19 modelers. A good example is modeling work from October 2021 reporting projections of how population contacts during the end-of-year holiday in Mexico City would potentially affect future pandemic outcomes, including infections, deaths, and hospitalizations.[3] Some may argue that the term "prediction" should be used for COVID-19 modeling. But that would not be appropriate because a prediction implies an inference with certainty and does not convey the conditional possibilities implied by projection.

Confusion between those two terms is by no means rare among scientists working in climate science, as revealed in a survey.[4] Unfortunately, in a recent paper reporting the relationship between coastal carbon sequestration and climate change, the authors state that they "go beyond recent soil C stock estimates to reveal global tidal wetland C accumulation and predict changes under relative sea level rise, temperature and precipitation."[5] But there are large uncertainties regarding the assumptions underlying the scenarios, such as unforeseen socioeconomic and technological conditions and uncertain global population growth in the coming decades. So the term "project" would be more appropriate here because the authors are talking about a conditional possible response that depends on the validity of the assumed future scenarios.

I strongly recommend careful use of forecast, prediction, and projection in the reporting of science, particularly with regard to climate change and COVID-19. The public, decision makers, and policymakers will gradually get used to the uncertainties associated with projections.

References

1. For COVID-19 forecasts for new hospitalizations and new and total deaths in the US, see https://www.cdc.gov/coronavirus/2019-ncov/science/forecasting/mathematical-modeling.html.
2. J. Cepelewicz, "The hard lessons of modeling the coronavirus pandemic," *Quanta Magazine*, 28 January 2021.
3. F. Alarid-Escudero et al., *MDM Policy Pract.* (2021), doi:10.1177/23814683211049249.
4. D. Bray, H. von Storch, *Sci. Commun.* **30**, 534 (2009).
5. F. Wang et al., *Natl. Sci. Rev.* **8**, nwaa296 (2021).

Yang Gan
(ygan@hit.edu.cn)
Harbin Institute of Technology
Harbin, China