

ADVICE TO MID-CAREER RESEARCHERS

Selected Statements on the Academic Enterprise

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I start with a disclaimer: I do not think it is my business to tell others what to do. Rather, how we choose to think and act are our personal responsibility. This said, I am happy sharing my observations and views and, in that sense, giving advice. Others may consider this as input when deciding on how to think and act.

In the following, I will comment on a variety of topics that are relevant to our practices as academics. When preparing this document, I first noted down a list of candidate topics. Then I eventually chose a selection of those for inclusion.

Be nice. I recommend being nice to others or at least trying to. We all have different backgrounds and are formed by different experiences, and what does not make sense or seem reasonable to one person may make sense or look reasonable to others.

Let me give an example to illustrate this statement. You might have attended a talk where a young scientist presents research that you think is problematic. The research may make inappropriate assumptions, it may make claims that are not substantiated well, it may ignore some related work, or it may simply be presented poorly. In such a situation, it is easy to get offended and to hang the presenter out to dry! But why? The person has likely tried their best and may think that the research and presentation are fine or at least the best possible, given the circumstances. In this situation, it is best to politely ask the presenter whether, e.g., it is possible to clarify specific assumptions or to comment on the relation to another line of research. This way, it is possible to flag to the presenter or knowledgeable participants in the audience that something perhaps needs to be looked further into, and the presenter is given the opportunity to argue for their research and clarify any misunderstandings. It is also possible to talk with the presenter after the presentation. This can all be done in a supportive and constructive manner.

A key point to realize is that one can be nice without lowering one's standards. Often, when one has

something critical to say, it is best said one-to-one. And if you can include positive remarks as well, the person you criticize is much more likely to listen, and you have been effective and have not wasted your time. There are times when it is best to simply move on and leave it to others. Choose your battles carefully.

Overall, being nice is good for the community as well as for oneself.

Understand that research is a social activity. There are many aspects to this observation. Growing up as a scientist, I benefitted tremendously from being part of a community, including getting new ideas, insights, directions; being able to form collaborations; and obtaining letters of recommendation. Being located at a small university in a small country, I realized early on that I had to engage in community efforts. For example, I served on many program committees and in a variety of other roles at conferences and beyond. I also attended both the top conferences in my general area and specialized conferences that aligned with my specific research focus. I recommend that you find a community and then invest in being part of it.

Another aspect is that the world is surprisingly small. People you meet once, you will often meet again, even if you did not think so at the time. This is yet a reason for being nice.

At the smaller scale of specific research collaborations, our research is also a social activity. Certainly, my collaborators keep me going...and keep me very busy. At this level, it is important to be responsible and supportive. This way, your group of collaborators will grow. So, it is not good to frequently be missing in action – busy with something else – when the real work needs to be done. Collaborators see through that and eventually move on. This leads to the next topic.

Say no, sometimes. I do not know about you, but I sometimes find it hard to say no. But I am at least getting better at it. It is hard to say no when presented with a

concrete opportunity that one finds meaningful, and when it will be months into the future before something must be done. But, of course, choosing to do something means that there is something else that one cannot do, either work-related or outside of work. Yet, that “something else” is vague, and the calendar looks relatively open months from now. And saying yes will be good for your career. It is easy to say yes – the hard part of delivering only comes later.

I was talking with a colleague about this recently. The colleague made the point that one should ask oneself: Would I still say yes if I had to do the work this or next week, rather than some months from now? If the answer is no, say no. As I agree that it is an illusion that we will somehow have an open schedule some months from now, this is a very good point. Sometimes, saying yes too often can even jeopardize one’s ability to deliver on what one has already said yes to.

This brings me to the issue of providing service to the scientific community. We should all provide such service. Given this, it is best to provide service where it matters the most. This is often where the quality standards are the highest. An important part of service is to be part of program committees and to review for journals. I like to distinguish between four categories of reviewers: (i) those who say no, (ii) those who say yes and do the work in a timely fashion, (iii) those who do not deliver on time, but eventually do deliver, and (iv) those who disappear or keep saying that they will deliver but never do. Since reviewing is volunteer work and since we are all busy, there should be some flexibility. But being often in category iii and, certainly, category iv is not good for anybody. Reviewers in these categories cause unnecessary problems, and the reviewers risk getting a bad reputation. Why spend the time and hurt your reputation in the process? It does not take more time to do timely reviewing.

Balance continuity and renewal. It is an important consideration to put effort into finding and maintaining a productive balance between continuity and renewal in one’s research. The right balance surely varies from person to person, and sometimes one needs to go with the flow. Transitioning too infrequently can render one’s research uninteresting, and transitioning too frequently can compromise quality and depth.

I started out working on temporal databases, and this line of research remained my focus for a decade. Then I got involved in a project on spatiotemporal databases. This led to work on the indexing of spatiotemporal data, where I was able to build on what I had learned from working on the indexing of temporal data. We also started to see the contours of the mobile revolution that led to roughly everybody having a mobile phone. Thus, I transitioned to working primarily on data management and query processing for what we called “moving objects.” Later, motivated by the proliferation of geo-textual content, spatial keyword querying became a primary activity. This was subsequently replaced by work on the use of spatial trajectories, which continue to proliferate, for a variety of purposes, including vehicle routing. The latest main activity, motivated in large part by the growing Internet of Things and the deployment of sensors throughout industry and society, is time-series analytics, where neural technologies play a key role.

Each time I made a transition, I was able to build on what I had learned from my previous research. And the transitions often occurred because of, or as part of, collaborations with colleagues.

Find unexplored territories. The life of a researcher working in an overpopulated area is a difficult one. Towards the end of when I worked primarily on temporal databases, the literature contained numerous proposals for temporal data models and query languages. Proposing a new one was an uphill battle. One needed to compare to many existing proposals, each with at least one very strong proponent. It was increasingly difficult to do something substantially different and better, let alone convince reviewers of this.

The life of a researcher working in an unexplored territory is comparatively easier. One does not need to implement and compare with a proliferation of existing proposals, and the prospects for performing novel and impactful research are much better.

When I worked in temporal databases, we were dealing with two temporal aspects of data: when the data was true in reality and when the data was recorded as current in the database. Such data could be true from some time in the past until the current time, *now*. Likewise, data was part of the current database state from when it was

inserted until it was deleted or updated. These temporal aspects could be viewed as two-dimensional regions that grew continuously over time. We had worked on the indexing of such data and then saw, as mentioned already, the contours of a mobile Internet of users capable of continuous movements. This led to the question of how we could index moving objects. This, in turn, led us, and other members of the community, to a territory where objects could move continuously rather than being stationary. Here, we needed new solutions for indexing and query processing, e.g., for range and nearest neighbor queries. It was indeed a new territory full of new challenges. For starters, everything that had been done for static points, we could consider doing for moving objects. It was an exciting time.

Later, combining text with spatial data, including moving objects, again opened a new territory, as did the use of trajectory data in transportation and other urban applications, including for routing, where data from fixed, in-road sensors was previously the primary or only data source. Finally, with tens of zettabytes of streaming data being generated annually by IoT devices, there are unmet challenges to value creation from time-series data at scale.

Seek flow. When I was younger, I worked late and got up late when possible. My rule was that I should get to the office no later than noon. I would work until dinner. After dinner, I would go back to the office and work until, say, 3 a.m. Early in my career, I spent four sabbaticals with Rick Snodgrass at the University of Arizona, and I have fond memories of the many late nights working in the lab. I liked Led Zeppelin (I still do), and I remember putting on a CD (yes, we had CDs) to listen to specific songs. Then I would continue working, only to realize at some point that no music was playing without having any memory of having listened to the songs I wanted to listen to. When working those nights, time and everything else often disappeared, and only the work was in focus. I have had the same kind of experience before and after these sabbaticals. I found, and still find, this to be very relaxing, almost therapeutic. I later learned that this phenomenon is called flow and has been studied extensively by psychologists, although I have yet to read about it. Still, I recommend trying to find flow.

Oh, I still end up working late, although I do it from home. This is often because I have said yes to too much and because of the social nature of conducting research!