MENTORING STATEMENT

Avi Rodal, Brandeis University, based on my statement for the 2018 NINDS Landis mentoring award

My objective as a mentor is to deeply know the strengths and interests of each of my trainees, and to use this knowledge to help them make exciting scientific discoveries and to achieve their individual career and personal goals. This approach is best not only for my trainees but for my entire research program - I believe that good mentoring is the most effective tool I can deploy in my group to drive challenging and rigorous science. The hyper-competitive scientific culture that surrounds us has spawned the philosophy that intensive mentoring is not necessary for top trainees (because "cream rises to the top"), and further that it is a waste of time for those who will never make the cut (often narrowly defined as an academic research career). I strongly believe that we waste precious human capital with this attitude. Good mentoring helps trainees achieve diverse careers while at the same time pushing forward the frontiers of science with their research. Further, everyone benefits from an investment in mentoring, from the most precocious trainees who would do even better if they were nurtured, to those who have less experience or are underdeveloped in some areas.

Sharing and actualizing a career development plan. I support the career plans of my trainees, in or out of academia or bench science, and tailor their projects and activities to meet their individual goals. We start career development planning from the very beginning of each trainee's time in the lab. I have a formal meeting with each person in my lab at least once a year to update their individual development plan (IDP), focused on long-term career goals rather than short-term scientific goals. Preceding our IDP meeting, my mentee reflects on personal, career, and experimental achievements (retrospective) and goals (prospective) by filling out a custom IDP questionnaire. During the meeting, we develop a specific actionable plan to meet these goals for the next year and beyond, including work in the lab, course work, and experiences outside the lab. For example, one postdoc's goal was to secure a faculty position at a primarily undergraduate university, integrating teaching and research. I mentored her in supervising undergraduates in my lab, and also in developing and teaching a project lab course to a small group of Brandeis undergraduates. This plan was instrumental in securing a tenure-track position. I also use my trainees' career plans to help guide project direction. For example, one student's goal is to manage a microscopy facility. We have incorporated diverse microscopy and image analysis approaches into her project, and she is responsible for managing and training users on several of the lab microscopes. Finally, I actively promote my people at their career transitions by helping them create strong applications and by reaching out to employers to advocate for them.

Leading by example. My lab currently consists of 4 postdoctoral fellows, 2 Ph.D. students, 2 technicians, and myself, and I intend to keep my lab at this size. A cornerstone of my mentoring approach is to get into the trenches with my trainees and show them my own method. I am (and plan to indefinitely remain) active at the bench and microscope, either doing proof-of-concept experiments for future projects, or collaborating with my trainees on specific parts of their projects (with their permission). This serves three important purposes – First, I stay adept at techniques in the lab and teach them to others, and my trainees teach me any new techniques that they develop. Second, it is a great way to get to know my trainee's strengths, weaknesses, and scientific passions at the bench, so that I can nurture and extend their individual talents. Third, I use this collaborative experience to model and openly discuss every step of experimental design, execution, analysis, data management and interpretation at the highest level of rigor. I have these discussions in public, at the fly bench and in group meetings, so that we can "shine the light" on our work, get feedback, and maintain transparency. This extends to manuscript and grant writing; these are widely shared with the whole lab (not just the authors) at every stage of development, and I welcome constructive and critical input into our ideas and writing.

Fostering project ownership and intellectual independence: In addition to daily interactions out in the lab, deep-diving intellectual collaboration on each project occurs in my weekly one-on-one meetings with each mentee. My trainees select their projects by brainstorming and putting together a list of different starting directions on their own, and then narrowing them down with me using a "decision tree" with preliminary experiments to determine the most exciting avenue to pursue. This often forms the foundation of a fellowship application. After a project has begun, I teach them how to come to our weekly meetings prepared with their data in figure format, their own interpretation of the week's results, and potential next steps ready to discuss. I encourage my trainees to follow up on their ideas, even if I am skeptical about them, since this is the only way to learn. I am delighted on the occasions when their instincts turn out to be right, and mine are not! In these ways, I promote independence and project ownership by letting my trainees lead the way, while providing frequent feedback on their ideas. My trainees also use their unique interests and goals to steer their projects in exciting new directions – e.g., one

student attended a course to plan for her next career phase, but brought back an unexpected experimental approach that provided major insights into her project.

Teaching experimental design and rigor: My main driving philosophy is to *let the data lead the way*, and to avoid the pitfalls of making the data fit a preconceived model. To this end, I encourage my trainees to design experiments that distinguish between multiple hypotheses, and demonstrate my excitement when the data lead us in an unexpected direction. When the project gets to a point that a model is emerging, I encourage my mentees to do an experiment that challenges the hypothesis. Often, they resist doing this experiment in fear of letting go of their favorite model, and I find it helpful to share examples of how overcoming this fear has led past mentees in exciting (or at least more productive) directions. I use a number of explicit strategies to teach experimental rigor. I emphasize in-depth understanding of techniques, including analysis and statistics. We blind and replicate our experiments (if possible by multiple lab members) to catch inadvertent errors early and before they affect our thinking. When we discuss experimental design, or look at new data, I teach my mentees to explicitly identify controls, and to document how reagents were validated. We also have a well-established lab data curation system so that every experiment is recorded in a paper or digital lab notebook, and matched by date or experiment number to digital data (primarily microscope images) backed up on a university server. This allows me to call up any raw data in my office while we are discussing results, to cross-check the trainee's conclusions, and to suggest alternative analyses. Finally, my trainees receive feedback from the entire group at our weekly group meetings. Group meetings include data presentations, journal club (including of preprints, for which we send lab comments to the authors), workshops where we teach each other new approaches and techniques, and communication exercises such as practice talks and elevator pitches.

Teamwork: Many of my mentees work in teams (for which we mix up one-on-one and team meetings), with careful consideration to career stage as well as personality. I take care that ownership of parts of the project is clear, and benefits the careers of all involved. When possible, I deploy a full-time technician to work on the team to help keep momentum high. Undergraduates bring special enthusiasm and energy to each team, and have contributed to many of our papers. Further, I actively mentor my graduate students or postdocs in their own mentoring of their undergraduate trainees. This layered team approach makes the science more fun and efficient, fosters an environment where trainees learn how to ask for and provide help to each other (especially relevant for trainees who want to teach and/or be PIs), and importantly enhances rigor and reproducibility. This is because team members design and interpret experiments better when they teach or explain them to each other, and replicate findings using independent hands and approaches.

Teaching communication to scientists and the public: Strong communication is a priority in my lab. Graduate students and postdocs are expected to write their own manuscripts and fellowship proposals over a period of many months, with extensive step-by-step guidance and feedback from me, in particular on the clarity of the figures and prose. Drafts are passed around the lab, both for feedback and to show new students how experienced editors can improve writing. All of my trainees present their research several times a year, either to the Brandeis community in our postdoc seminar series or graduate student "pizza talks", and also at national and international meetings (each trainee attends at least one/year). I encourage my trainees to use our Brandeis-wide Science Communication lab to critique and improve their writing and presentations. I also strongly promote science outreach by my trainees, both for communication skills development as well as to support education and public policy. The lab does an "elevator pitch" exercise in our group meeting, for donors, and as a classroom exercise for undergraduates, and makes a group trip to local schools. These events are *organized and led by lab members*, and I use these opportunities to mentor my trainees in leadership, communication, and teamwork.

Normalizing work-life balance and kindness in the practice of science. I feel strongly that trainees must learn strategies to maintain a sustainable and healthy balance between their scientific careers and personal lives, and part of really knowing my mentees is to appreciate them as complex people with lives beyond the lab. I promote this balance by taking 'the long view' in my treatment of each trainee, rather than focusing on short-term progress that may be delayed by factors in or out of the lab, and most importantly by *helping people learn to evaluate themselves in the same long-term way*. I emphasize that having a life outside of lab, relationships, attention to health, and raising children are all compatible with a successful career. I model this in my own life, and actively combat the all too common view that only people who sacrifice *everything* outside of science can succeed in science. Similarly, I model kindness in my interpersonal interactions, especially in the lab where I hold a position of authority. In addition to rigor, ethical practice of science requires respect for all the different stakeholders and their needs, especially trainees, who feel they are at the bottom of the totem pole. Ultimately, the most productive, truthful and exciting scientific culture is one where expectations are high and people feel valued, and that is the environment that I am striving to create and sustain.