Improving Academic Mentoring Relationships and Environments

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Mentoring, and being mentored, is important at all stages of a person's career.

Origin of Mentoring[1]

The Greek poet Homer describes Odysseus, king of Ithaca, as having a loyal friend and advisor by the name of Mentor. While Odysseus was away fighting in the Trojan War, Mentor became a trusted teacher, coach, counselor, and protector of Odysseus' son Telemachus. Thus, the word "mentor" used today derives from Homer and reflects a process where the mentor guides and protects another.

Over the past few decades, the issue of mentorship has risen to the forefront in business, academia, and elsewhere. Mentoring is valued as a part of the culture of many organizations, and formal programs are developed to leverage the increases in job satisfaction and productivity that mentoring produces. In the university academic environment, the first thought of mentorship involves a faculty member and students, which could include undergraduate and graduate students, and in some cases, high schoolers. However, important mentoring opportunities extend also to faculty-postdoc relationships and to senior-junior faculty interactions. Indeed, one can easily argue that the academic mentor-mentee relationship should not conclude with a signed thesis, with a faculty appointment, or with tenure but rather should develop, evolve, and perpetuate over the course of a career.

Purpose of This Article

Nearly all members of the Acoustical Society of America (ASA) find themselves in a mentoring relationship during some part of their careers, and, indeed, they are encouraged to mentor at ASA meetings (e.g., Blackstock, 2015; Bent, 2016). Although most members do their utmost to make the mentoring relationship effective and satisfying, often the relationship would benefit from both the mentor and mentee giving more deliberate thought and consideration to what leads to the most effective relationship (e.g., Pfund et al., 2006).

Thus, the purpose of this article is to describe how mentoring relationships may be improved in academic environments and how both mentors and mentees should think about this very important relationship. We describe the principles of mentoring and the characteristics of mentors and discuss mentoring issues specific to undergraduate and graduate students, postdocs, and junior faculty members. We draw on both best practices in the literature and our own experiences in mentoring and in being mentored. The body of literature regarding mentoring is increasingly broad and deep; we highlight only a few references to provide a starting point

[1] *We dedicate this article to our mentors who not only helped us shape our careers but also our scholarly lives and how we mentor our students and colleagues. In particular, ANP wishes to dedicate this article to William N. Tavolga, who passed away in May 2017 at the age of 95. Bill was a consummate mentor and extraordinary scholar, and his legacy lives on through those he mentored.*

for the reader interested in learning more. Our hope is that readers, both current and prospective mentors and mentees, will benefit from improved and lasting mentoring relationships.

There are several caveats to this article. First, our focus is on academic mentoring because that is our area of experience and knowledge. We recognize, however, that many ASA members work in government, industry, and other types of organizations that also have mentoring expectations. However, we also realize that although the basic principles of mentoring are the same everywhere, there are approaches to mentoring that vary across different professions. Thus, the editor of *Acoustics Today* (ANP) invites readers to suggest articles for future issues of the magazine about other mentoring environments or that members offer letters to the editor to discuss mentoring in their workplace.

Second, although basic mentoring principles are the same, approaches to mentoring, even within academia, vary substantially between disciplines and particularly between lab sciences (STEM and most of the disciplines represented in the ASA) and the arts and humanities. For example, ASA mentors often have labs and both see and interact with their mentees daily. In the humanities, mentor-mentee interactions are generally far less frequent, perhaps monthly or even less frequently. Thus, expectations and interactions are far different than those in STEM.

Finally, one of the things that we have discovered is that even within a particular discipline, there are often differences in mentoring approaches in different countries. As one example, in the United States, programs supported by National Institutes of Health (NIH) and the National Science Foundation (NSF) are required to expose trainees to issues that are broadly referred to as Research Ethics (which includes mentoring). In contrast, this idea is not at all common in Europe. Many other aspects of mentoring vary as well and often country by country.

What is Mentoring?

It is important to understand what is and is not meant by mentoring. The literature uses several helpful descriptors (see National Academy of Sciences, 2009), some of which are listed in **Figure 1**. These descriptors illustrate the many ever-changing hats a mentor must wear for the mentoring relationship to evolve as a student progresses. At the heart of mentoring is a sustained interest by the mentor in the long-term development of the mentee, not solely in the completion of some set of tasks. In many senses, particularly in the academic environment, the title of mentor far outlasts the academic degree or next appointment.

Figure 1. *Some of the roles of an academic mentor.*

In academia, the closest relationship a student will likely have with a faculty member is with a research advisor and supervisor. But research advisement is not necessarily mentorship. Included in **Figure 1** are "advisor" and "coach," both of which are part of mentoring and are necessary cogs in the development "machinery," but they are not adequate synonyms. Advisor and coach are roles that are focused on completing tasks and changing behavior to develop skills that enhance productivity. The role of advisor or coach inherently ends with graduation or when the necessary skill has been acquired. The mentor, on the other hand, views completed tasks or acquired skills within a framework of broader development of the individual.

In the context of graduate education, Columbia University (https://goo.gl/lTHCfU) reminds us of the importance of establishing a constructive mentoring relationship and not underestimating the role that the faculty member plays both now and in the future:

> *The relationship between a mentor and a graduate student is the most influential relationship in the student's career. Effective mentors are much more than advisors or teachers. They are role models, consultants, problem solvers, and supporters. They provide timely and constructive feedback, career guidance, professional contacts, [are] sources of information about research grants and fellowship and job opportunities, and letters of recommendation throughout your professional career.*

Benefits of Mentoring

Mentoring is far more difficult than advising; it requires more time, energy, and an emotional investment by the mentor.

Figure 2. *Areas of mentoring benefits for the mentor (**blue**), mentee (**red**), and both (**purple**), leading to benefits for the organization and future mentees.*

Is it worthwhile to deliberately work to become an effective mentor? Thankfully, the documented benefits of mentoring are numerous. There are clear benefits to the mentee, the mentor, and the "organization," which could variously mean the research, academic program, university, research sponsors, future employers, and future mentees.

Some benefits derived from academic mentoring are summarized in **Figure 2**, with the different colors depicting those derived by the mentee, the mentor, and both parties. The benefits to the mentor range from increased stimulation and satisfaction to enhanced leadership skills, while the mentee develops maturity, confidence, and autonomy and learns to more deeply reflect about learning experiences. Both mentor and mentee learn more effective communication skills and benefit from enhanced learning and productivity in a positive work environment, which improves overall morale and can result in lasting friendships. Future mentees, just beginning their progression, are positively impacted by the established mentoring culture.

Principles of Mentoring

There are many effective mentoring styles but all have common underlying principles. We review classes of mentoring environments, identify the stages of a mentoring relationship, describe characteristics of effective mentors, and summarize the roles of mentors and mentees. Understanding mentoring principles helps current and prospective mentors and mentees evaluate their past and present experiences with mentoring and think purposefully about how to improve relationships.

Mentoring Environments

There is no single framework for effective mentoring. Different research problems and mentee learning styles (Honey and Mumford, 1992) are conducive to different mentoring environments, four of which are shown in **Figure 3**. Ultimately, it is beneficial for the faculty member to think deliberately about which type of mentoring environment might be optimal for a given situation or student to best aid in his or her overall development.

Traditional mentoring is most common and involves a one-on-one relationship between a faculty mentor and a student, whereas peer mentoring could be a more advanced student mentoring a novice or a senior faculty mentor mentoring a junior faculty member. A faculty member mentoring a new postdoc may begin as a traditional mentoring relationship that evolves into a peer-mentoring experience. Team mentoring can also be effective. This could be an involved thesis committee on a collaborative research project, where the various research mentors bring different expertise and perspective to the mentoring relationship.

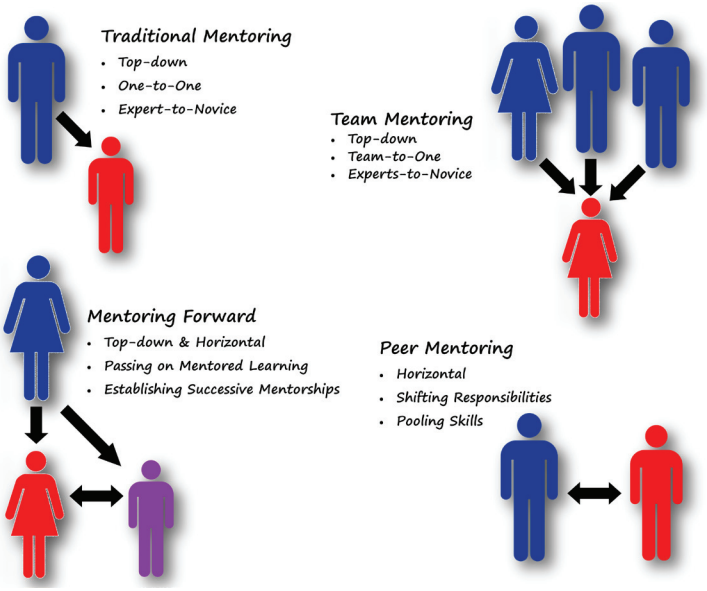

Figure 3. *Illustration of different mentoring environments. Adapted from Byrne and Keefe (2002).*

So, one goal of purposeful mentoring might be for the mentor to help evolve a traditional one-on-one relationship into a team approach where the mentee has access to multiple experts. The remaining mentoring environment in **Figure 3**, referred to as "Mentoring Forward," is a hybrid between

the other three environments. Mentoring forward involves a faculty member who mentors a graduate student or postdoc, who then peer mentors a novice student. Unlike straight peer mentoring, however, the faculty member is also actively involved in mentoring both the advanced and novice researchers but perhaps on a less frequent basis. Mentoring forward helps to establish a strong culture of mentoring in a collaborative research environment and helps the more experienced mentee develop as a mentor. Mentoring forward would work in any environment but is particularly valuable in a large research group where the faculty member may not be able to interact with every student as often as might be desirable. In effect, mentoring forward assures that younger/newer students have someone to turn to on a regular basis but can still interact productively with the faculty member.

Stages of Mentoring

It is important that the mentor and mentee recognize that there are natural stages in the mentoring relationship so that they can think purposefully and effectively communicate about how to maximize the relationship benefit and navigate transitions. Although these stages may be called by different names in the mentorship literature with somewhat different meaning depending on the type of mentoring occurring, the four stages (Kram, 1983) of mentoring are referred to here as Initiation, Cultivation, Separation, and Redefinition.

During Initiation, which could last several weeks or months, the mentor and mentee are introduced, begin two-way communication, clarify values and needs, and set specific goals and a clear vision for reaching those goals. Taking time during Initiation to set a strong foundation by communicating values and vision is important for the next and longest phase, Cultivation.

In Cultivation, the mentee acquires knowledge and experience and develops an improved understanding of his/her present role as it fits within the broader scope of long-term personal and professional development and associated career path. As part of Cultivation, the structure of the mentoring relationship is further defined in terms of meeting frequency and identification of key responsibilities, mutual expectations, and needs. Measures of success and progress are defined and tracked. During Cultivation, the mentor plays many of the roles described in **Figure 1** as he/she helps the mentee overcome obstacles to reach goals, evaluates the quality of work, guides progress, and so forth. Regular performance reviews during Cultivation are ideal to help motivate the mentee, provide direction, and refine intermediate and long-term goals. The mentee should also be given opportunities to offer feedback on any concerns regarding the mentoring environment. This feedback helps foster two-way communication and resolve conflicts.

Separation is the intended result of a mentoring relationship that occurs with the development of the mentee and accomplishment of established goals. During Separation, regular communication is especially important because it is often tied to simultaneous defense or dissertation deadlines, manuscripts being submitted, job searches, and moves. The stress felt by both mentor and mentee can be reduced if the primary objectives that form the foundation for the mentoring relationship are clearly established during Initiation and revisited and redefined as necessary throughout Cultivation. This helps eliminate potential conflict about when a student is "done" and the mentoring relationship is ready for Redefinition.

Redefinition consists of moving from an expert-novice relationship to something closer to a peer relationship depending on the initial and final status of the mentee. Thus, Redefinition will be different with an undergraduate moving to a different institution for graduate school versus a postdoc who has now become a colleague. In some cases, we remain mentors only in the sense that having been around longer or having reached a bit farther, we are able to actively support the mentee in his/her long-term professional development. After Redefinition, references may be given or nominating letters written by the mentor long after the initial mentoring has concluded. The benefits of a mentoring relationship are such that if Initiation, Cultivation, Separation, and Redefinition are successfully navigated, both the mentor and mentee continue to reap benefits long after the initial objectives of the mentoring relationship have been accomplished.

Characteristics of Mentoring

The different roles of a mentor, potential frameworks for a mentoring relationship, and its four stages have been described. In considering the desirable traits of a mentor, the different mentor strengths and varied mentee needs could produce a nearly infinite list. However, Allen and Poteet (1999) surveyed former mentees to find which mentor characteristics they most valued. The various descriptors in **Figure 4** reveal that the mentee is interested in having a mentor who cares about the mentee's development, who is willing to patiently listen, who can give and receive feedback, and who can be trusted to be objective and to share. Surprisingly few descriptors, "knowledge of field," "leadership qualities,"

"motivated," and "self-confident," have to do with the mentor's position within his/her field of expertise. The study illustrates that mentees are as interested in having a mentor who expends as much effort on behalf of others as in acquiring additional knowledge. Interpersonal skills (not covered as part of a regular graduate curriculum!) appear to be at least as important as productivity.

Figure 4. *Desirable mentor characteristics. Adapted from Allen and Poteet (1999).*

Mentor and Mentee Responsibilities

To this point, we have focused primarily on the mentor in describing the mentoring relationship. We think it is also critical to review key responsibilities of both mentor and mentee together. It is the responsibility of the mentor to be genuinely interested in the long-term achievement of the mentee's potential and not only during the cultivation phase of the mentoring relationship. The mentor should be willing to go out of his/her way to help the mentee be successful at any stage. The mentor strives to fill the roles in **Figure 1** while attaining the characteristics described in **Figure 3**. True mentorship rests in selflessness.

Equal responsibility rests with the mentee. The mentee must be willing to be challenged, pushed, and evaluated at every step of his/her development. A mentee should acknowledge and respect the efforts of the mentor to help him or her excel, which should serve as a powerful motivator to work hard to achieve agreed-upon objectives, receive constructive criticism, and provide feedback to the mentor. Studies have shown that novice mentees are often ill-prepared to receive the benefits of a mentoring relationship; perhaps this situation can be partially ameliorated if prospective mentees understand at the outset the key elements and benefits of mentorship.

Mentoring Across the Academic Spectrum

We have discussed various principles of effective mentoring, but we recognize that mentorship is more art than science and the most effective mentoring occurs when environments and roles are adapted to mesh mentor strengths and mentee needs. However, we have also learned through experience that mentoring is not only important at every academic step but that it that benefits from thinking and discussing what constitutes good mentoring and being a good mentee at each stage. In this section, we describe mentoring issues that are more specific to the different stages of academia. We begin with the most common scenario for ASA members, that of mentoring a graduate student. We then proceed to undergraduate student, postdoc, and finally junior faculty members.

Graduate Student Mentoring

An incoming graduate student is met with a number of changes that might be a total paradigm shift from his/her undergraduate experience: courses are fewer but more demanding, teaching and/or research assistantship responsibilities must be balanced with coursework, compensation is often not hourly, externally funded research is associated with strict deadlines, and the amount and level of writing required has dramatically increased. Many graduate students struggle with the transition.

During Initiation, it is important that the mentor and mentee agree on a vision for the mentee's development while completing research and a set of expectations about how to achieve that vision. Short-term goals help the student develop into a semi-independent researcher, but it is helpful if the mentor understands that the mentee is unfamiliar with this mode of operation and that his/her likely frame of reference, an undergraduate education, was not like this. Thus, an evaluation and a "reboot" of vision, expectations, and goals is often necessary after several weeks of the student navigating this new environment. Not laying out or revisiting clear expectations and objectives can lead to the somewhat-humorous-but-all-too-real situations that are the subjects of academia-themed comics (e.g., https://goo.gl/nZ1Njp).

During the Cultivation phase of a graduate degree, the mentor would do well to encourage the establishment of a meaningful graduate committee that can help expand the student's network of mentors. Frequent evaluations and measurable milestones are essential for timely progress. The mentor must help identify the required skills that are lacking in the student and help him/her overcome deficiencies. One

of the common deficiencies is an inability to write at the level required to publish one or more refereed articles, which is usually the goal of an advanced degree in the fields of study associated with acoustics. An advisor might mark up a thesis to the point of rewriting it for the student, whereas the mentor might go through draft after draft, teaching technical writing principles along the way, to help the student develop into a strong writer.

It is natural during Separation that the student and faculty member both feel a level of anxiety. The mentor should find a student to replace the mentee and may have concerns about the quality of work. The mentee may feel the mentor is being unfair in requiring so much work and may feel anxious about the search for employment. The mentor helps in this phase by having clearly defined goals all along the way, by ensuring that two-way communication is occurring, and by providing as much support as possible in the job search. He/she can offer advice on careers, job requirements, typical salaries, and the interviewing process. Taking time to discuss with the mentee issues related to his/her future helps demonstrate to the mentee that the mentor truly has his/her best interests at heart and that the suffering associated with completing a thesis and manuscript drafts is a natural but necessary part of development.

Undergraduate Student Mentoring

The expectations for meaningful undergraduate student mentoring vary widely by department and university. Faculty members at a small private college may be expected to spend more time in a traditional mentoring environment than those at a large research institution (Whiteside et al., 2007), where undergraduate student mentoring may be exclusively carried out by graduate students and postdocs. Likewise, the anticipated outcomes of a mentoring relationship vary widely. In some programs, a senior thesis or capstone report that results from a mentored research or learning experience is required. In other cases where there is no research expectation, only the highly motivated undergraduate students find their way into faculty members' offices to pursue a mentored learning experience.

When mentoring undergraduate students, the mentor must keep in mind that this is often the students' first experience with mentoring. They are often, as we indicated previously, ill prepared to benefit from the faculty members' time and attention. This does not mean that undergraduate mentoring is not worthwhile or without benefit but that it may take more time in Initiation than in Cultivation. Consequently, expected outcomes must be kept realistic, particularly if meaningful technical writing is involved. From our experience, success in mentoring undergraduates can be attributed to mentee motivation, the formation of mentoring forward and team-based mentoring environments where students benefit from having access to multiple mentors at all academic levels, and the establishment of a culture where there is an expected scholarly product of an undergraduate research experience. Once undergraduate students understand their potential and the expectations, they can be mentored to work on par with many graduate students and to become highly sought-after graduate students and employees.

Postdoctoral Scholar Mentoring

Mentoring of a postdoc is a unique situation in which the individual undergoes a significant transition from near-student to peer during the experience. The NIH and NSF describe a postdoc as an individual who engages "in a temporary period of mentored advanced training to enhance the professional skills and research independence needed to pursue his or her chosen career path" (https://goo.gl/qPjPux).

Because of the need for the mentor to carefully consider how he/she will establish an effective mentoring environment, NSF proposals that include postdoc funds require the development of a postdoc mentoring plan, such as that described by the National Postdoctoral Association (https://goo.gl/2Tm4Hr). This mentoring plan generally includes expectations of the mentee and the mentor and should include not only training in research but also opportunities for the postdoc to develop other skills that are appropriate for his/her future career plans. For someone planning to enter academia, the plan should include opportunities for mentored teaching, writing grants, working with undergraduates, and even getting opportunities for limited service roles.

The postdoc situation is also unique in that there is no anticipated time frame for completion of a clear outcome like a thesis. Scholarly goals and timetables are left up to the postdoc and mentor to set together. Thus, it is imperative that during Initiation, the mentor and mentee establish a mutual vision for a successful postdoc experience and set clear goals for the Cultivation phase and that these goals be reviewed and revised on a regular basis. Moreover, the plan may include a discussion as to what Separation may involve when a job opportunity becomes available and, during Cultivation, what Redefinition may look like if there are long-term plans to continue collaborating.

Junior Faculty Mentoring

The expectations most universities have of a new assistant professor are often daunting (e.g., Sorcinelli, 2000; Berberet, 2008). He/she is expected, among many things, to obtain funding, conduct research, publish papers, teach undergraduates and/or graduate students, mentor graduate students (and possibly postdocs), train undergraduates, advise, serve on various department committees, possibly participate in campus-level activities, and provide service to the scientific community.

The trouble is that, very often, the new assistant professor will have been prepared for very few of these roles. Indeed, even when the individual is trained to do excellent research, he/she may not have had opportunities to set up a lab, hire (and fire) personnel, organize a lab group, etc. And, although the new faculty member may have been a teaching assistant, very often there has been no formal training in pedagogy.

Because new assistant professors lack much of the skill set required or at least have had few opportunities to practice much of the skills, the academic position often becomes overwhelming and the faculty member may suffer and possibly fail. Thus, many institutions, faced with the possibility of failure by an assistant professor in whom they have invested a good deal of startup funds and time, have begun to realize that requiring mentoring of junior faculty by more experienced senior colleagues is imperative to help ensure success and granting of tenure. These mentoring efforts include new faculty programs, online resources (e.g., https://goo.gl/RVgnHG), and the assignment or selection of a senior mentor.

Although beyond the scope of this article, mentoring for junior faculty is complex and has some interesting "twists," most notably that the mentor may also eventually vote on tenure for the faculty member and/or even be the person's chair. Moreover, the mentoring may often go beyond reviewing papers, observing and advising on teaching, and standard academic issues. Indeed, major issues for junior faculty are time management and balance of home and work lives. Often, the faculty member (perhaps with guidance from a chair) will select his/her own mentor(s), and a best situation is when at least one mentor is from outside the mentee's unit so there can be conversations about working within the unit itself.

Alternative Careers

Although the majority of doctoral students and postdocs have aspirations of working in academia, only a minority eventually enter an academic career track. Thus, it is essential that mentors, graduate programs, and universities provide their students with knowledge of and the ability to compete for high-quality jobs in nonacademic careers. This is, however, not trivial because many of these careers require other or additional skill sets that the mentor may not have or may not focus on while training a student to pursue academic research excellence. For example, interviewing for a position in government, industry, and a consulting firm is very different than for an academic position, and what constitutes success in an academic position may differ considerably from what constitutes success working in industry. Additionally, although clarity in written communication is paramount in nearly all science or engineering jobs, the technical memoranda common in industry differ greatly in style, length, and content from a thesis or journal article.

Mentoring students for alternative careers may require significant effort on the part of the mentor. First, the mentor should seek opportunities to directly incorporate important skills into research or coursework. For example, mentors could teach mentees to write clearly and concisely, in a style appropriate for consulting or industry. Second, if the mentor has no expertise in preparation for various careers, he/she should support the mentee in seeking out others who can provide the needed mentorship. This leads to the third point, that of assistance with networking. The interested mentor is continually expanding his/her professional network, not always for himself/herself but rather for the sake of his/her students. By taking students to conferences and including them in his/her expanding circle of colleagues and contacts, the mentor gives them access to professionals in a variety of related disciplines.

Advice for Prospective Student Mentees

Selecting a Mentor

In talking with students at various universities, it is clear that most would-be mentees select an advisor primarily based on interest in the research program. Consequently, the student mentorship experience varies widely; some happen on exceptional mentors, whereas others are in nonideal relationships that turn sufficiently toxic that the student seeks a different mentor or changes degree plans. In fact, there are simple but crucial approaches that a student can take to maximize the likelihood that his/her graduate experience will not only be productive in terms of research but that he/she will also be working in a mentored learning environment that will enable him/her to excel.

How does a graduate student (or postdoc) select a mentor? We have already highlighted desirable characteristics that go beyond expertise or amount of funding, but these and other considerations are important and they should be considered carefully as one looks at a potential mentor.

Of course, research interests are of great significance and a first step in considering who one would potentially like as mentor. After identifying research areas of interest, students are likely to seek out a potential mentor with funding but without going through the necessary steps to answer a most critical question, Will this be a likely successful mentoring relationship?

Some important questions that a student should ponder when considering a potential advisor are illustrated in **Figure 5**. Answers to these questions can be found by searching CVs and publications online and by asking questions of the faculty member and of current and former students. Although the mentee needs to tread carefully in not being too aggressive when interviewing a faculty member, diligent research will help the mentee increase the likelihood of a successful professional development experience.

For example, a potential mentor with an active research program involving students and that has led to steady publications and funding points to a foundation for a mentoring environment that will lead to strong career preparation. Funding also suggests that the mentor can provide for research needs and send the student to meetings or to visit other labs to learn new methods. Recognition is also important because it suggests that a mentor could provide introductions for their students for postdocs and even jobs.

Beyond productivity, funding, and reputation, training record and lab environment are critically important issues, best asked of former and current students (but not in the presence of the mentor!). If a potential mentor has trained several students and the students have completed their work in a reasonable timeframe, attended conferences, published papers, and found good postdocs and/or jobs, this speaks well for the potential success of the mentee.

Lab environment is a critically important issue as well. Is the atmosphere relaxed or formal, collaborative or competitive? There is no one best model, but it is imperative that the mentee ensure in advance that the environment is the kind that will be best for his/her own personality and way of working. Ultimately, the mentee must decide for himself/herself whether the mentor is going to be someone who will make

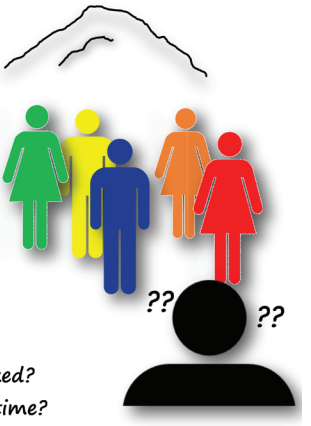

Figure 5. *Some issues to consider for would-be student mentees when selecting a mentor.*

time for the student, provide intellectual and emotional support, and assist in professional development in the short and long term. Asking questions of current and former mentees provides critical data in making a decision about working with a particular mentor.

Conclusions

Our goal has been to describe academic environments, principles, and issues related to mentoring at different stages. We have attempted to stress the importance of mentoring at all levels and hope that we have caused both the student and the academic advisor to think carefully about what it means to mentor and to be mentored. As described, the benefits of mentoring are large and lasting. The mentoring cycle—from mentee to mentor, from Initiation to Redefinition–improves academic achievement and professional preparation and establishes close-knit, supportive academic and professional communities.

Biosketches

Kent L. Gee is a professor of physics at Brigham Young University in Provo, UT. He maintains a diverse student-based research group in nonlinear acoustics, jet and rocket aeroacoustics, acoustic imaging methods, noise control, and education. He has focused significant attention on undergraduate mentoring, helping students publish articles on diverse topics in acoustics from the Rubens flame tube demonstration to aircraft Gatling guns to Balinese gongs. He is a fellow of the Acoustical Society of America and editor of *Proceedings of Meetings on Acoustics*.

Arthur N. Popper, editor of *Acoustics Today*, is professor emeritus of biology at the University of Maryland at College Park (UMD). He is a fellow of the Acoustical Society of America and the American Association for the Advancement of Science. His research focuses on vertebrate hearing, including on the potential effects of man-made sound on marine organisms. He has been involved in a broad range of research ethics and mentoring programs at UMD, with particular interest in issues related to the mentoring of junior faculty. He is also an editor of the *Springer Handbook of Auditory Research*, a series of books on the hearing sciences.

References

Allen, T. D., and Poteet, M. L. (1999). Developing effective mentoring relationships: Strategies from the mentor's viewpoint. *The Career Development Quarterly* 48, 59-73.

Bent, T. (2016). Engaging early career acousticians in the Acoustical Society of America. *Acoustics Today* 12(4), 60-61.

Berberet, J. (2008). Perceptions of early career faculty: Managing the transition from graduate school to the professional career. TIAA-CREF Institute, New York. Available at http://acousticstoday.org/ecareer.

Blackstock, D. T. (2015). Students meet members for lunch. *Acoustics Today* 11(2), 72-73.

Byrne, M. W., and Keefe, M. R. (2002). Building research competence in nursing through mentoring. *Journal of Nursing Scholarship* 34, 391-396.

Honey, P., and Mumford, A. (1992). *The Manual of Learning Styles,* 3rd ed. Peter Honey, Maidenhead, UK.

Kram, K. E. (1983). Phases of the mentor relationship. *Academy of Management Journal* 26(4) 608-625.

National Academy of Sciences. (2009). *On Being a Acientist: A Guide to Responsible Conduct in Research*, 3rd ed. National Academies Press, Washington, DC. Available at http://acousticstoday.org/conduct.

Pfund, C., Pribbenow, C. M., Branchaw, J., Lauffer, S. M., and Handelsman, J. (2006). The merits of training mentors. *Science* 311(5760), 473-474.

Sorcinelli, M. D. (2000). *Principles of Good Practice: Supporting Early-Career Faculty. Guidance for Deans, Department Chairs, and Other Academic Leaders*. Forum on Faculty Roles & Rewards, American Association for Higher Education, Washington, DC. Available at http://acousticstoday.org/eric.

Whiteside, U., Pantelone, D. W., Hunter-Reel, D., Eland, J., Kleiber, B., and Larimer, M. (2007). Initial suggestions for supervising and mentoring undergraduate research assistants at large research universities. *International Journal of Teaching and Learning in Higher Educatio*n 19, 325-330.