

Computer Science Postdocs – Best Practices

Anita Jones and Erwin Gianchandani

Introduction

In recent years, academic departments, industrial research laboratories and government agencies have appeared to offer dramatically increasing numbers of postdoctoral positions in computer science and engineering [CRA 2011]. In particular, data from the Computing Research Association's (CRA) annual Taulbee Survey indicate that the numbers of recent Ph.D.s pursuing postdocs following graduate school soared from 60 in 1998 to 249 in 2011 (three-year rolling averages), an increase of 315 percent during this period. Because research organizations are suddenly channeling many more young researchers into these positions, it is incumbent upon us as a community to have a clear understanding of the best practices associated with pursuing, hosting, and nurturing postdocs. The intent of this white paper is to articulate these best practices for the several constituencies involved. We make recommendations for the expectations for a postdoc, the duties of the advisor who directly supervises the postdoc, and the responsibilities of the host organization. We also suggest a supporting role that the Ph.D. advisor might play. Importantly, there are roles and responsibilities for each of these constituencies before, during and after a postdoctoral experience.

In developing this white paper, we rely extensively on a landmark study published by the National Academies, *Enhancing the Postdoctoral Experience for Scientists and Engineers: A Guide for Postdoctoral Scholars, Advisors, Institutions, Funding Organizations, and Disciplinary Societies* [National Academies 2000]. We found this report to provide the most comprehensive collection of best practices for postdocs to date – more than a decade following its original publication. We highly recommend it as a resource for deeper reading on this subject for all those interested and invested in ensuring a successful postdoctoral experience within the computer science and engineering community.

The Origins of this White Paper

In fall 2010, members of the Computing Community Consortium (CCC; <http://cra.org/ccc/>) Council – an activity of the Computing Research Association (CRA) – sought to understand the recent growth in the number of Ph.D.s in computer science and engineering pursuing postdoctoral positions following graduate school. Working under the umbrella of CRA, CCC Council members together with colleagues on the CRA's Board of Directors produced a white paper [CRA 2011] presenting *statistics about academic and industry hiring over the preceding decade, and articulating relevant issues about the postdoctoral experience*. This white paper served to engage the computing community in a conversation about postdocs – faculty, postdocs, and graduate students were encouraged to discuss the various issues within their groups, departments, and institutions, and to submit consensus views on a public website (<http://cra.org/postdocs/forum.php>).

Following months of discussions within computing departments and institutions, the CRA's Board of Directors released a consensus white paper in spring 2012 [CRA 2012], providing a statement by the community to all those concerned about the postdoctoral experience in computing. The consensus document specified *guidelines for when a postdoctoral experience is a positive one*.

Most recently, the CRA Board approached members of the CCC Council to produce the white paper here, articulating “best practices” for postdoctoral fellows, advisors and mentors, and supporting departments and institutions to increase the likelihood of a positive postdoctoral experience throughout the computer science and engineering community. This white paper describes those best practices.

What is a Postdoctoral Position?

Before delving into best practices, it is important to first define what we mean by a “postdoctoral position” or experience. A postdoc is a training opportunity in which a person who has recently completed a Ph.D. can deepen his or her expertise and research skills over a short period of time, en route to a permanent position [Jones 2012]. While *it should not be a requirement for all Ph.D. graduates*, a postdoc may accept such a position for many different reasons, including an ability to work under the tutelage of a specific expert, perhaps in a more highly regarded institution than his or her Ph.D.-granting college/university; to gain exposure in a related research area; or to change fields altogether. An individual who pursues a postdoc may have reasons for doing so that go beyond “training.” For example, he or she may wish to strengthen a research portfolio in anticipation of a competitive job search or to synchronize job search timing with that of a significant other.

Postdoctoral positions can come into being in various ways: (a) they are offered by an academic department and typically come with formal teaching duties; (b) they are offered by a faculty member and are funded by a grant; or (c) they are funded by a national fellowship or a fellowship from a foundation. In (c), the postdoctoral fellow is often free to choose the academic institution where he or she goes. Henceforth, our focus in this document is on the experience that a postdoc receives once settled in any one of these types of postdoc positions.

If done right, a postdoctoral experience can advance an individual's career: it can sharpen research skills, insight and knowledge; provide the opportunity to build a more robust record of publications and conference presentations; and enlarge the group of peers and prospective collaborators who know and respect the postdoc's work.

That said, *a postdoctoral experience also comes with certain drawbacks that must be seriously weighed.* Postdocs in academia are paid at a rate that is substantially lower than colleagues with roughly comparable education and experience (e.g., junior tenure-track faculty and colleagues in industry). In some universities, postdocs are not considered employees and therefore are provided fewer or lesser benefits in areas such as health care, retirement, access to childcare, and access to wellness centers. And because a postdoctoral position is taken

shortly after completion of the Ph.D. degree and usually for a short period of time (up to a few years) – often at a time when many wish to start families – health, careers, and marriages may suffer. For instance, relocation is more difficult for women and men who are nurturing a young family, and delaying the bearing of children can have significant health implications for women.

Much more detail about the benefits and drawbacks of a postdoctoral position is available in a previous CRA white paper [CRA 2011].

Best Practices

In this section, we define a set of best practices for postdocs themselves, advisors, host organizations, and the Ph.D. advisor. We focus on the core requirements and expectations for each individual. This summary is not comprehensive, and we recognize that every individual situation has unique characteristics. However, we believe following these best practices – and reviewing additional resources on this topic (see Bibliography) – will provide a pathway to a successful postdoctoral experience for all constituencies involved.

Postdocs – Have high expectations and protect your interests.

Because the computer science and engineering community has had far less experience with postdoctoral positions than other science and engineering disciplines, it is especially important that the postdoc in this discipline *knows what to expect, takes responsibility for his or her own career, and gently insists that best practices be followed* [Sweeney 2012], both when applying and interviewing for a postdoc, and once in the midst of one.

The primary purpose of a postdoctoral experience is not to serve as a holding pattern while an individual seeks a permanent position in academia, industry, government, or elsewhere. Rather, as noted by the National Academies' study [National Academies 2000], a postdoctoral position seeks *“to extend and deepen the postdoc’s scientific and technical abilities, either in the field of the doctorate or a different field.”* Put simply, the postdoctoral experience should provide the postdoc with an opportunity to enhance his or her research experience, become a truly independent thinker and researcher, become known throughout his or her community by virtue of publishing and presenting his or her results at professional meetings, and advance his or her career by networking with colleagues. Depending upon the research laboratory, industrial postdocs also should have opportunities to become involved with company strategy sessions and trained in business technical presentations. Indeed, these are the attributes that should be paramount when an individual seeks and fulfills a postdoc.

Before committing to pursuing a postdoctoral position, *an individual should understand what he or she expects to gain from investing time (up to a few years of professional life) within such a position.* The postdoctoral experience is not currently – and should not become in the future – a requirement following completion of a Ph.D. dissertation regardless of one’s long-term career interests. For example, university hiring committees should perform the requisite analysis and hire individuals fresh out of Ph.D. programs; quality research is frequently evident at graduation without the assurance given by a few more publications. Nor is it in the best interests of the individual, advisors, host organizations, or the community as a whole for any one Ph.D. to

pursue multiple postdocs over many years. Rather, a graduating Ph.D. student should consult with his or her Ph.D. advisor long before the dissertation defense to understand the landscape of career possibilities, requisites for each path, and whether a postdoc – and which one (e.g., in academia, industry or government; with whom; and so on) – is appropriate and beneficial in the context of the student’s intended career [Austin and Alberts 2012]. To this end, an initial best practice is that each prospective postdoc must be knowledgeable about why (or why not) it is appropriate to pursue a postdoc in the first place; electing to pursue one is not a decision that should be made lightly or considered the “default” choice for all Ph.D. graduates.

When an individual is seeking a postdoc, he or she should *consider the purpose of the postdoc*. Every individual is unique. As noted previously, some choose to pursue a postdoc to receive training from a particular expert. Others wish to expand their research interests and skill sets. Still others desire a short-term holding pattern to synchronize with a significant other. But there are two characteristics that are consistent for everyone: the recent Ph.D. graduate should ensure the future postdoctoral position will enable him or her to (a) acquire the experiences necessary to advance his or her career, and (b) contribute to the intellectual advancement of the program of his or her advisor through research accomplishments, personal growth, and interaction with others [National Academies 2000]. In other words, a postdoc should ensure the postdoc environment will not be one in which he or she will be solely at the discretion of the advisor; rather the postdoc must seek out an environment (and an advisor/mentor) that will afford him or her the flexibility necessary to develop into an independent thinker, making significant intellectual contributions to the research program — all the while honing his or her own professional development.

It is always desirable to *arrange a personal meeting with the advisor and also to talk with current and former postdocs who have worked with the prospective postdoc advisor*. Some questions to consider asking when choosing an advisor, as noted by the National Academies’ report [National Academies 2000] and extended below to encompass the industry perspective:¹

- What are the advisor’s expectations of the postdoc?
- Will the advisor or the postdoc determine the research program?
- How many postdocs has the advisor had, and where did they go afterward?
- What do current and past research group members think about their experiences?
- Will the advisor have time for mentoring? Or should I seek out other mentors?
- How many others grad students, staff, and postdocs now work for this advisor?
- How many papers or conference proceedings are being published? Where?
- What is the advisor’s policy on travel to meetings? Authorship? Ownership of ideas?
- Will I have practice in grant writing? Teaching/mentoring? Oral presentations? Review of manuscripts?

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- Can I expect to take part of the project away after the postdoc? Specifically for a postdoctoral position in industry, will any software artifacts, data, or results be accessible for future enhancement or subsequent publication after the postdoc position concludes? Are there any intellectual property policies that might prevent publishing either for a short while (e.g., to await patent filings) or forever (e.g., trade secrets)?
- How long is financial support guaranteed? On what does renewal depend?
- Can I count on help in finding a position?
- Will the advisor have adequate funds to support the proposed research?

Once in a postdoctoral position, the postdoc has the right to:

- Have a written commitment that clearly states the terms of appointment, appropriate compensation, and benefits (note that this is one issue that postdoc unions are beginning to address);
- Serious mentoring and support in career planning and finding a succeeding appointment;
- An environment comprising a variety of researchers – other postdocs, faculty, and senior researchers – with interaction that furthers his or her research skills;
- Opportunities to learn about a variety of positions – academic and non-academic – that could inform long-term career thinking and planning; and
- Opportunities to enhance his or her scientific skills, such as public speaking, leadership (of research teams), teamwork, teaching, and mentoring.

In addition, it is very important for the postdoc to be exposed to authoring research proposals and reviewing the research of others (i.e., peer review, either for a journal, a conference, or for a funding agency, etc.) – or other activities that develop skills that are relevant for the postdoc's future career objectives.

One set of “core competencies” that postdocs might seek to attain, as established by the National Postdoctoral Association, is found in [NPA 2009a] and [NPA 2009b]. Additional factors contributing to a successful postdoctoral experience are discussed in [Sweeney 2012].

As a general rule, a postdoc should *be proactive about inviting and taking the opportunity for open and frequent communication with his or her advisor and/or mentors*. In addition, should problems arise in the research environment, the postdoc should feel comfortable raising them with his or her advisor. In industry, where annual performance evaluations are common, there may be an opportunity for the postdoc to provide written feedback on the advisor. If problems persist, the postdoc should have unfiltered access to others within the host department or organization without fear of punishment or retribution – and leaders should step in when situations warrant, as described below.

In summary, the postdoc must take responsibility for his or her own career, especially at this time of transition from a training position to an independent position.

A Successful Postdoctoral Experience ²

The elements of a successful postdoctoral experience are as variable as the postdoctoral population. For one unabashedly upbeat postdoc on a fellowship (we'll call her Sue), these elements included early preparation, supportive colleagues, a fascinating research topic, the opportunity to learn time management and self-reliance, and an effective mentor.

- **Early preparation:** Even as a graduate student, Sue began building ties to the research group where she wanted to go as a postdoc. “To get the most out of an experience, you have to offer something. I did my graduate work in systems modeling; I wanted to work with a group in computational biology, and I was able to show them that I had something to contribute. I began doing some projects with them while I was in graduate school, so the transition was fairly smooth. One reason to do a postdoc is to expand one’s field of study, and it’s best to lay the groundwork early.”
- **Supportive colleagues:** “I didn’t always know where I was going, but it was fairly easy to seek out good advice and constructive criticism both in my own institution and elsewhere. A big challenge, and a difference from graduate school, is that you’ve got to start putting together your own professional network of collaborators and friends with whom you’re going to be building your career. It’s a good habit to spend time every week meeting new people, networking, looking at people who are successful to see how they do it.”
- **A topic of interest:** “I loved my work, and this is one reason it was successful. I published multiple conference papers during two years as a postdoc, including one in AAAI. I got to work on a variety of problems without getting stuck in something too narrow. I was fortunate enough to have a great deal of freedom. I could follow my intellectual curiosity, and that allowed me to be very productive. I had the opportunity to propose my own research and get it funded.”
- **Learning self-reliance:** “I spun my wheels for the first few months, trying to figure out what to do first, but there were some advantages to that experience. If you’re going to be an independent researcher, sooner or later you’ve got to learn to fly the plane. When I was a grad student, I used to do all my own instrument work, because my time was cheap and there wasn’t anyone else to do it. When I became a postdoc, I was paid more and I had technical staff. I had a big adjustment in mindset about organizing better and making the wisest investments of my time.”
- **Effective mentoring:** “I saw my advisor several times a week. He wasn’t very involved with my research, but what he did was right for me. He was always supportive, gave me a long leash, and made sure I got to give talks at important

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conferences. He did this for all his postdocs – made sure that certain doors were unlocked. What you do with that advantage, once you go in that door, is your business. Again, you’re the one who’s going to fly the plane. In the end, I was fortunate enough to be hired by the same institution where I did my postdoc.”

- Broad exposure to the research community: “I had an opportunity to engage with the broader research community for the first time, i.e., beyond my advisor’s research group and beyond our department and institution. For example, my advisor encouraged me to present at multiple major research conferences in my area of work – and consequently I was able to have deep and stimulating discussions with senior leaders in the field who came to my work and are now collaborators of mine. My advisor also encouraged me to serve as a reviewer for journal articles and grant applications, thereby learning about the work of others in my area – and providing me with new insights for my own research horizons.”

Postdoctoral advisors – Earn the title of “mentor.”

The postdoctoral advisor (not the Ph.D. advisor) is the supervisor of record. But the best advisors are much more – they become *effective mentors and assume responsibility for guiding, challenging, and championing their postdocs*. They do so because they see the relationship with a postdoc as one of *mutual benefit*: just as the postdoc is motivated to exchange skills and hard work for guidance and entrée into the professional world, the advisor stands to gain from the training, energy, and enthusiasm of the postdoc who makes it possible for the advisor’s research program to advance [National Academies 2000]. Indeed, in the best situations, the postdoc becomes a long-term and valued colleague and potential collaborator of the advisor following completion of the postdoctoral experience [National Academies 2000].

Creating a productive mentoring relationship takes considerable time and effort on the part of both the advisor and the postdoc. As with most professional relationships, it requires a *mutual respect and trust*. Often an advisor’s lack of time can give rise to neglect or misunderstandings. It is therefore essential that the advisor be attentive to the needs of the postdoc throughout the experience. Open channels of communication are a requisite: the advisor should provide an environment in which the postdoc is encouraged to come forward with questions, problems, or other concerns. Moreover, the advisor should make clear that there are others within the host department or organization who would be supportive if the need arises, and must not retaliate if the postdoc takes a particular concern to those individuals.

From a supervisory standpoint, the advisor must make clear his or her expectations for the postdoc, and must in return learn and understand the postdoc’s own expectations for the experience. Once these are specified, the advisor, in conjunction with the postdoc, should *devise an “individual development plan” tailored to the postdoc’s professional objectives* (e.g., whether the postdoc wishes to pursue a career in academia or industry means that somewhat different experiences are appropriate), the knowledge and skills base of the postdoc, and the activities of the host advisor and research group [Austin and Alberts 2012]. Of key importance is selecting a research problem that has the potential to allow the postdoc to *accomplish*

something novel, with plans for the postdoc to publish and receive appropriate recognition for his or her work in a way that is timely and generally consistent with respect to the postdoc's search for a next (ideally permanent) position. In other words, postdocs in computing should not be considered glorified software engineers or programmers. The individual development plan should also provide for the postdoc to learn (or enhance) research skills, such as presenting papers in writing and orally, authoring research proposals, reviewing the research documents of others, networking with research peers at technical meetings, etc. In those cases in which it is reasonable for a postdoc to be involved, he or she should be given opportunities to participate in his or her organization's hiring of other professionals to learn how peers are evaluated. Perhaps most significantly, the individual development plan is something that should be revisited frequently – at least several times a year to ensure adequate progress, satisfactory completion of goals, and continued growth of the postdoc. (For more details about an individual development plan, including a web application that aims to guide early-career scientists through a confidential, rigorous process of introspection to create a customized career plan, see [Austin and Alberts 2012].) Indeed, postdocs need regular feedback on the quality and direction of their work, including written evaluations with some consistent regularity [National Academies 2000].

The advisor should be attentive to the needs of the postdoc who is striving to become a better researcher – and colleague. Most postdocs need *some* guidance, especially in the early stages of their postdoctoral experiences. They do not, however, need (or desire) micromanaging. The advisor's goal is thus to allow the postdoc to grow toward independence and a relationship that becomes a collaborative one. To this end, the advisor should set the research framework: the advisor should introduce the postdoc to potential collaborators and influential colleagues, ensure the postdoc has adequate resources for the research program, and advise against being trapped in a narrow or unpromising line of work [National Academies 2000]. Inherently, every postdoc will possess a different base skills set and require a different kind of nurturing.

The advisor should take the lead in discussing *ethical standards* early and often, especially with new postdocs and with postdocs from countries in which ethical standards may differ [National Academies 2000]. In particular, it is critically important for advisors and postdocs to discuss issues of authorship, plagiarism, conflicts of interest, etc., both to avoid misunderstandings and to provide appropriate training of the postdoc for the long term.

Advisors should also take responsibility for guiding the postdoc in his or her search for a next position. No advisor wants to lose a productive research group member, but every advisor must be cognizant of his or her primary objective when mentoring a postdoc: *to help the postdoc advance quickly and appropriately to the next step*. As an established researcher, the advisor is in the best position to aid the postdoc. The advisor can help the postdoc acquire the necessary skills to advance, determine when the postdoc has attained such skills, strategize with the postdoc about next steps (e.g., to which universities or other research organizations should the postdoc apply given his or her track record to date), introduce the postdoc to colleagues who might be prospective employers, and steer the postdoc through the application and interview process. In the competitive job market, hiring committees will expect of the postdoc more evidence of independence and more community recognition than that of

a new Ph.D. Importantly, while it is not common for industrial heads or directors to help their employees find next positions, industrial advisors should be more ready to do so for postdocs; alternatively the postdocs should find one or more mentors, possibly their Ph.D. advisor, to help with this.

For additional guidance on mentoring, see [CRA-W 2000], [CRA-W 2011], and [Noor 2012].

Finally, it is important to reinforce that the advisor must be proactive and thoughtful in pursuing a set of interactions with the postdoc that earn the advisor the title of “mentor.” If the advisor cannot serve the role of a full-fledged mentor, then he or she or the host research organization should identify an effective alternate, or several, for the postdoc, rather than leaving the postdoc isolated without such support.

Host organizations – Provide a supportive environment for the postdoc’s enrichment.

With more young research talent accepting postdoctoral positions today than ever before, it is the responsibility of each research organization that offers these positions to ensure that the short-term (typically up to a few years) postdoctoral experience delivers high value to the postdocs. Much of this responsibility falls to the individual advisor, but when a department, center or institution hosts more than a few postdocs simultaneously, that *host organization should take ultimate responsibility to ensure that each postdoc is properly supported.*

As many science and engineering disciplines have a long history of supporting postdocs (much longer, in fact, than computer science and engineering), many institutions (particularly universities) today have *institution-wide policies, practices, and infrastructures* that will usefully extend to postdocs in computer science and engineering. However, some universities and industrial organizations that are hosting large numbers of postdocs for the first time should seriously consider their responsibilities and develop the necessary policies, practices, and infrastructure. Additionally, individual computing-related departments or centers that are located within larger institutions must be sure that they take ownership of those issues that are not covered by institution-wide measures.

In the past, there were few postdocs in computer science, and they were predominantly hired by individual advisors with little involvement of the larger research organization (we will call this the “department” for the remainder of this document). Nurturing of the postdoc was almost entirely in the hands of the advisor in the past.

But today, with some computing-related departments anecdotally reporting more postdocs than graduate students, it is essential that they put in place (complementary) policies, practices, and infrastructure that provide for the short- and long-term wellbeing of every postdoc. First and foremost, the department should *ensure that each postdoc has an advisor as well as a mentor.* Often this happens naturally, as it is the advisor who invited the postdoc to come to the department – and he or she intends to fulfill the role of a mentor. Regardless, the department has the responsibility to check in periodically with its advisor-postdoc pairs to verify that each advisor is providing effective mentoring. The department should encourage the writing of an individual development plan for each postdoc as discussed earlier. When it becomes apparent that the mentoring is inadequate or insufficient, the department should take action,

perhaps by offering the advisor constructive guidance and then, for situations in which the problem persists, insisting on a complementary additional advisor/mentor. In these cases, the department must follow up with the advisors and postdoc regularly to ensure productive and worthwhile relationships are manifested. The department should insist on periodic (at least once a year, but perhaps even more frequently than that given the short-term nature of the postdoctoral experience) *honest, written evaluations of each postdoc* by the advisor, mentor (if different), and any key collaborators.

An important practice is to *establish policies on such matters as titles, expected terms/durations, and institutional status* [National Academies 2000]. Departments should seriously consider entitlements to be afforded to postdocs, and recognize that they should provide benefits somewhere between those of full-fledged faculty and graduate students. Importantly, there is evidence that different institutions consider postdocs differently. For example, many universities do not allow postdocs to be listed as principal investigators (PIs) or co-PIs on grant proposals, but there are some that do. The same university may treat postdocs who are supported by the grants of their research advisors differently from those who are funded through fellowships awarded to them: the latter may receive higher stipends, coupled with health and other benefits. These sorts of variances can create class systems among postdocs themselves, leading to grievances and long-term consequences of the postdoctoral experience – and departments should therefore guard against them as much as possible by ensuring the quality and consistency of their training programs [Leshner 2012].

Of particular significance for the computer science and engineering community, given the long underrepresentation of women in the field, are *rights for equal pay for equal work* among men and women, as well as *options for maternity (or paternity) leave*. The latter is especially salient given that the postdoctoral experience often comes at a time when individuals are interested in starting families. Departments should encourage candid conversations about these issues between advisors and postdocs, and should provide mechanisms for each advisor and postdoc pair to achieve an appropriate balance between work continuing at a reasonable rate of activity (especially when funded by a grant or otherwise accompanied by specific deadlines) and necessary humane values and preferences.

Similarly, departments should offer *provisions to help foreign students adapt to the U.S.*, including support for cultural adaptation, visa applications, banking, taxes, and so on. (This may not be necessary for foreign students who previously received their Ph.D.s within the U.S.) Often the main institution in which the department is embedded offers services to assist foreign students. For situations in which this is not the case, the department should ensure that these resources are made available.

Each postdoc should have a supportive set of colleagues among tenure-track faculty, other postdocs, and research faculty who provide the postdoc with *rich and frequent intellectual interaction*. The department or host laboratory should ensure that venues – some of which may be informal – for this interaction are available. There are a number of creative ways to create such venues for intellectual interchange:

- periodic meetings within the laboratory of the mentor;

- periodic lunches or teas with researchers from across a broader group of researchers than those in the mentor’s lab; and
- informal meetings in which, among others, postdocs present their work and receive feedback from colleagues.

Besides these, each postdoc should present their research at least once every year to department colleagues. At a very basic level, postdocs should be “introduced” to their departments, included on all applicable lists and websites, and provided with the same informational resources as others (e.g., research faculty, graduate students, etc.) in their departments.

The department should provide thoughtful, robust career guidance, including *exposure to alternative career paths*, e.g., industrial, government, non-profit or startup positions, as well as bridging to other fields in which computer science and engineering has a substantive role to play. In some cases, a career office, postdoctoral office, or postdoctoral association might provide courses or one-on-one counseling for how to write a curriculum vita, prepare slides for a job interview presentation, etc.

The department (or the overarching host organization) should provide mechanisms for a postdoc to raise concerns that they are unable to adequately address with their advisors or mentors. They should receive a fair hearing and resolution, without fear of punishment or retribution. Some organizations have *ombudspersons* for this purpose.

Finally, in larger interdisciplinary institutions with a long history of postdocs and established policies and practices, it is the responsibility of the computer science and engineering department(s) to ensure that the interests of *their* postdocs are represented anytime an issue comes up for review or discussion. Every field is different, and it is important that computing-related postdocs are treated equitably and their experiences are considered whenever decisions have implications upon them.

The postdoc’s Ph.D. advisor – Stay connected with “intellectual descendants.”

The Ph.D. advisor should engage in conversations with his or her students to consider various career options. These conversations should begin early and continue throughout a Ph.D. student’s doctoral training program, as the student’s experiences in graduate school are likely to be shaped by his or her long-term aspirations. As noted previously, not every Ph.D. graduate should pursue a postdoctoral position; the advisor should work with each student to determine his or her career paths. Importantly, if the advisor is unable to address a student’s questions or proffer guidance, he or she should work with the student to identify additional contacts or sources of information and insight.

Once a student has elected to pursue a postdoctoral position, the Ph.D. advisor – who typically regards a Ph.D. student as an “intellectual descendant” – might wish to continue vigilance on behalf of the Ph.D. student who accepts a postdoc position, as the position constitutes an additional training opportunity. The advisor should not in any way undercut new advisors and/or mentors. But the Ph.D. advisor could monitor the postdoc training experience, provide a sounding board, particularly if problems arise, and alert the host department to such problems. After all, the ideal Ph.D. advisor is a lifelong collaborator of his or her students.

Summary

Given the recent surge in postdoctoral positions within the computer science and engineering community, many Ph.D. students, postdocs, advisors, and research organizations in our field are living through the postdoctoral experience for the first time – or at a minimum, the first time in which there are many (versus one or two) postdocs in a department or laboratory. In this document, we have attempted to capture lessons from other fields and prior reports to define a set of best practices for each of these constituencies, in an effort to proactively support and enforce high standards for all elements of the postdoctoral experience. This white paper is not comprehensive. Nor have we sought to lay out the pros and cons of pursuing a postdoctoral position in any extensive detail, or be prescriptive about whether it is a good thing for the field; there is ample discussion of these items in previous white papers [CRA 2011][CRA 2012].

Instead, borrowing heavily from a National Academies' report [National Academies 2000], which we strongly recommend for further reading, this white paper sets serious expectations for three constituencies relating to the postdoctoral experience. The Ph.D. student considering a postdoc position must educate himself or herself about what a postdoc is, think through the pros and cons of accepting a postdoctoral position at each of the potential sites available, and have a clear understanding of his or her interests and what the advisor and host organization should provide. The advisor needs to be proactive and thoughtful in nurturing the postdoc. We have described the minimum required for the advisor to earn the title of “mentor”; this designation has to be earned by the postdoc advisor. And the host organization (in some combination of the department and the larger institution) needs to provide a variety of services to the postdoc. All of these postdoc constituencies must meet these expectations to ensure a successful postdoctoral experience for everyone involved.

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About the Authors

Anita Jones is University Professor Emerita and taught computer science at the University of Virginia. Professor Jones has served as Vice Chair of the National Science Board. She is a senior fellow of the Defense Science Board and was the Director of Defense Research and Engineering with oversight of the DoD science and technology program. Professor Jones is a founding member of the Computing Community Consortium (CCC).

Erwin Gianchandani is currently deputy division director for the Division of Computer and Network Systems (CNS) within the National Science Foundation's Directorate for Computer and Information Science and Engineering (CISE). Previously, he was the inaugural director of the Computing Research Association's (CRA) Computing Community Consortium (CCC), and contributed to new national initiatives in smart health and wellbeing, computational sustainability, and big data science and engineering. He holds a Ph.D. in biomedical engineering, a M.S. in biomedical engineering, and a B.S. in computer science from the University of Virginia.

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