

## The Qualities and Impacts of a Great Mentor—and How to Improve your own Mentoring

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*The following talk was given at a special session celebrating Prof. F. S. Chapin III's contributions to ecology, entitled: "Growing our Understanding of Life on Earth: Reflections on the Scientific and Training Legacies of Terry Chapin, from Physiological Ecology to Earth Stewardship" at the Annual Meeting of the Ecological Society of America in Portland, 7 August 2012.*

Most of the presentations in this session have or will focus on Terry's direct contributions to science—the new perspectives, the advances in our understanding of ecology. Here, my coauthors Val Eviner, Sarah Hobbie, and I want to focus on Terry's indirect contributions to science through his mentoring of the next generation of ecologists. Our core message paraphrases the popular song entitled "It ain't what you do, it's the way that you do it. . ." It's not just what Terry's done; it's the *way* that he's done it.

Mentoring, like teaching, is a core activity for many scientists (and in related ways for many other professions), and yet few of us have had any formal training in either. Most of us plod along, subconsciously drawing on our own experiences of being mentored, and "learning by our mistakes." Formal reflections on the goals of mentoring, and how it can best be achieved, are extraordinarily rare in the literature, and yet mentoring is a fundamental process in the training of scientists (and others). But it is also much more, and here we aim to divert your thoughts away from the hard science for a few moments and to spark your interest in the process and value of mentoring. We hope that this topic will be of just as much interest to the mentees in the room, since it should provide useful insights into the process that they are going through. We will address the following question: "What can we learn from reflecting on Terry's mentoring qualities that will help us to improve our own mentoring skills?" Thus, there are two strands: a consideration of Terry's contribution, and in addition a more generic consideration of the mentoring process and how each of us can optimize it.

### What is a mentor?

The term originates from one of the earliest and most seminal pieces of literature of all time—Homer's epic poem *The Odyssey*. *The Odyssey* describes the triumphant 10-year journey of Odysseus back home from his victory at the Battle of Troy. Mentor is a character in the story who is entrusted by Odysseus with the care and education of his son back home. In fact, at one point this character becomes transformed into a vehicle of the goddess Athena so that she can appear on Earth and give guidance to his son. This point is significant, because it suggests that Mentor has substantial female as well as male attributes, and as you shall hear shortly, good mentoring undoubtedly involves traits of both genders. It is also interesting that the word *odyssey* has been formally incorporated into the English language, and

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is defined as “a long series of wanderings or adventures, especially when filled with notable experiences, hardships etcetera” (*Random House Dictionary, Unabridged*, 1993). Can it be pure coincidence that such a definition provides an excellent description of a typical Ph.D. “journey”? A mentor, then, is a counsellor, teacher, or guide who provides experienced and trusted advice (*Oxford English Reference Dictionary*, 1996). The word “mentor” is fundamentally linked to the word “pedagogue”; literally someone who walks along with the student to his/her place of learning as Socrates is reputed to have done. Accordingly, it was education by self-learning (facilitated by mentors) that Oscar Wilde was thinking of when he declared: “Nothing that is worth knowing can be taught.” In other words, one must learn for oneself, but one can be guided in the process. As lecturers, and as mentors, our ultimate goal is to help students develop themselves from being dependent to independent learners. In its fundamental essence, then, a great mentor is a guide who facilitates self-learning by his/her students.

### What are the important qualities of a great mentor?

We took several approaches to addressing this question. We surveyed Terry’s former and current Ph.D. students and postdocs, asking them about their experiences in being mentored, and their strategies as mentors; we reviewed several of the principal writings on scientific mentoring; we asked Terry himself what he thought, from his perspectives as a mentor, and as a mentee; and we reflected on our own experiences of being mentored.

We posed the following questions in our survey of Terry’s graduate students and post-docs, and received over 30 thoughtful and detailed responses.

1. What qualities do you think Terry displayed which have been most helpful in developing your :  
(a) science, (b) personal development?
2. What lessons did you learn from your experience with Terry that have influenced how you approach mentoring?
3. If, since departing from Terry’s lab, you have been mentoring others, what qualities do you think you have displayed that have been most helpful to them in their development as:(a) scientists, and (b) as mature human beings?

Overall, the most important and frequent feature highlighted by almost every respondent was that Terry *leads by example*. He leads in the sense that he demonstrates to those around him professional excellence, intelligence, creativity, scholarship, dedication, a real joy in doing science, and a commitment to broad thinking and to innovative fundamental as well as applied ecological research. In addition, almost every response highlighted at least one of the following aspects of his connectedness to mentees and colleagues: patience, kindness, integrity, sincerity and friendliness. Many respondents felt that Terry creates an environment that is supportive, stimulating, and open-minded. One student wrote: “It’s an environment that expects the best of everyone, but knows that to reach one’s best, and to push the boundaries of science, there will be plenty of confusion and fresh starts along the way.” In particular, Terry is open to learning from everyone around him. Thus one of the characteristics of his mentoring style is that, with careful guidance, he allows his advisees to steer the direction of their science according

to what excites them. Terry maintains the attitude that he will learn as much from his students and post-docs as they will learn from him. At the same time, he always sets high expectations for his advisees. Another respondent reflected, “When Terry believes that you are capable of the best, it’s hard not to try and rise to the occasion. Terry showed all of us that it’s possible to be successful while being humble. One can be serious in actions, while not taking oneself too seriously in words or appearances. For Terry, actions and deeds speak for themselves.”

#### What can the literature on mentoring contribute to answering our question?

Given the importance of the topic, it is quite extraordinary just how little information is available. Some excellent guides have been produced (e.g., National Academy of Sciences 1997, Gray et al. 2008, University of Michigan 2011), but it seems that the principal widely circulated publication is an article entitled “*Nature’s* guide for mentors” (Lee et al. 2007). This article highlights many generic traits of good mentors, such as enthusiasm, availability, being hard-working and inspiring, encouraging skill development, as well as many of the personal characteristics that we identified in our survey. In addition, it includes a useful set of self-assessment questions aimed at encouraging reflection on one’s mentoring, and at identifying areas for improvement. On the basis of what we have learned from our survey and reflections, we have substantially expanded the scope of that self-assessment exercise to provide a more complete perspective on the fundamental features of good mentoring (Table 1). We hope that this will be a particularly useful tool for anyone interested in analyzing and improving their mentoring skills. Some features are clearly more easily addressed than others, but at the very least, recognition of one’s strengths and weaknesses should lead to greater self-awareness that is likely to be beneficial. Nevertheless, all that having been said, it may come as no surprise to learn that Terry has told me that he has never done such an activity, and describes his strategy for mentoring as “unconscious, and evolving”!

#### What are Terry’s reflections on mentoring and being mentored?

Here, in Terry’s words, is his strategy:

I think of students and postdocs as colleagues with both common interests that make us want to work together, as well as skills and knowledge that are different from mine, so we both have things to gain from effective interactions. On issues such as developing research questions, study design, and methodology, we *both* need to bring whatever ideas, questions, and critical thinking we might have to the discussion.... By the time most students graduate, I am usually learning much more from them than the other way around. I particularly like the opportunities to do field work together, both because it is usually fun, and because there are usually lots of chances to explore ideas about science and life.

There are several features of Terry’s response above that add to the traits already highlighted from the survey and the *Nature* article, and that resonated with us. First is the notion of coevolution. Both mentor and mentee can be developing new understanding. This mutually beneficial relationship is most likely when the mentor creates an atmosphere where the mentees can develop their ability and self-confidence to the point that they can bring new ideas and perspectives, and when mentors are open-minded to novel and challenging ideas. Second, the time shared over field work and the wide-ranging discussions and sharing of perspectives on science and life can be extraordinarily beneficial.

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Here are Terry's reflections on what he gained from his own mentors. Four people stood out. There was a high school chemistry teacher who taught using the Socratic question-and-answer approach. There were undergraduate field botany courses that were so good that Terry switched his major from economics to biology. (There's just one example of how profound an influence a good mentor or teacher can have.) Terry writes "In grad school, Hal Mooney taught me the necessity of being *independent* in working out questions, methods, and making my own decisions, while being an important safety net and a brutally honest reality check at critical times in the thesis process." (There's a trait that we consider fundamental in a good mentor—the willingness to make the hard—even unwelcome—suggestions.)

Terry continues "I still look forward to his feedback and opinion about important questions of how and what science to do." (There's the mentoring for life issue identified in the *Nature* article.) In reflecting on his wife's contribution, Terry concludes "Finally, Mimi has always been my most important mentor. She has also helped me find a reasonable (well sort of) balance between professional and personal stuff; it has always been tough for me to keep the bigger picture of "life" in mind in setting priorities, and Mimi is good at helping me see this bigger picture without telling me what to do."

We think this statement on balance is at the core of our overall analysis. Mentoring is not just about the science training, it is a training in how to live life and interact with other people in a humanitarian way. In summary, a great mentor teaches us *by example* not just to be better scientists, but also to be better people. Furthermore, mentors don't do it alone. The community of people around them (family, other mentees, as well as colleagues) are critical to the process.

## Conclusions

One. Mentoring entails a personal as well as a professional relationship that involves a wide range of traits. By recognizing those traits, and reflecting on our own abilities, we can all improve our mentoring (see Table 1).

Two. There are many benefits. For example, mentors benefit from the new ideas and perspectives of mentees, and from the extended family of departed mentees that creates potential new science collaborations, and provides new sources of future students. But surely the greatest benefit is the mentor's contribution to society by enhancing the maturity and personal development of his/her mentees. A Ph.D. is, after all, a doctorate in philosophy.

Three. There is general consensus across our survey and the *Nature* article on the key generic features of good mentoring (Table 1).

Four. You can be successful in science, *and* be a fine human being. Terry has proven that one can be a great scientist and at the same time extraordinarily generous with resources, ideas, and time to colleagues and students. He is a role model in that he clearly has not been "just out for himself," but realized early on that he could make even greater contributions by promoting the careers of others, particularly junior scientists. Hence the major theme: 'It's not just what Terry has done, it's the *way* that he's done it.'



On behalf of all your mentees, Terry (all of those graduates, post-docs, technicians, as well as science collaborators and colleagues—and not forgetting the numerous undergraduates who have worked with you), it has been a great honour and pleasure to have experienced your guidance. Our survey and this analysis clearly indicate that you will leave a legacy not just for science but also for society.

Thank you all for listening, but most of all, thank you Terry.



Table 1 (on next page). Self-assessment: Are you aware of these fundamental features of good mentoring? Which features should you focus on most to be a better mentor? (modified from Lee et al. 2007; \* Indicates added features).

Fig. 1. Terry Chapin at work, rest, and play

Activity/Strategy	Question/Task	Example/ Answer	How could you improve on this feature of your mentoring?
*Showing leadership	As a mentor, what do you think are your best leadership qualities ?		
Being availability	Give an example of a strategy you use to make yourself available to students or staff		
Promoting self-directed learning	As a supervisor, where do you lie on the scale from 'micro-manager' to 'completely hands-off'?		
Teaching through questions	Describe how you last used Socratic questioning to guide a mentee's thinking		
*Showing enthusiasm for science	Describe an example of when you last communicated the joy you experience in doing science?		
Assisting skills development	Describe steps you take to develop the critical thinking, writing, and presentation skills of your students or staff		
*Being open-minded and creative	When was the last time you did some 'out of the box' thinking that connected different science ideas or people of different expertise in ways that benefitted a mentee?		
Building a scientific community	Describe a deliberate strategy you use to build an interactive, scientifically developing 'sense of community' in your research group		
Networking	Describe your strategies for introducing students/staff to the network of scientists in your research area		
*Utilising collaborators and close colleagues	What is your best example of a student benefitting from access to your collaborators or close colleagues?		
Appreciating individual differences	Give an example of an incident that illustrates your acknowledgement of individual difference within your research group		
*Displaying humour	Give an example of an incident where you caused someone in your group to laugh		
*Showing connectedness	Give an example of an incident where you showed empathy to someone in your group		
Celebrating	When and how did you last celebrate a worthy achievement by a student or staff member?		
Building a social community	Describe a deliberate strategy you use to build social cohesion in your group		
*Being conscious of mutual learning	List 3 of your principal mentees, and give examples of the science you have learned from each		
*Giving 'hard', even unwelcome advice	Describe an incident where you gave a mentee good but 'hard' advice (that was unlikely to be appreciated, at least initially)		
*Coevolving	Give examples of how your mentoring strategy has changed through your time with an individual graduate student, and over the course of your career?		
Mentoring for life	What proportion of your past students are you in regular contact with?		

## Acknowledgments

Many thanks to Jill Johnstone and Michelle Mack for organizing the session, to Jill Johnstone and Dave Hooper for the use of the photographs, and to all of the Chapin lab mentees who took the time and effort to respond to our survey.

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