PERCSS Reference Library

General

- Bibliography for Responsible Authorship and Publication Practices
  - **Online Ethics Course, University of Montana**
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  - **ORI Introduction to RCR**, Nicholas Steneck, PhD
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Authorship & Publication

- Copyright
  - Internal Resources
    - About Copyright - Frequently Asked Questions
    - Copyright - Protected vs. Unprotected Works
    - Copyright Portal - WUSTL Libraries
    - WUSTL - Faculty Guidance for Copyrights
    - WUSTL - Resources on Copyright Law
  - External Resource
    - Summary of U.S. Copyright Law
- Bibliography for Responsible Authorship and Publication Practices
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Collaborative Research

- Collaboration Agreements
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      National Institute of Health (NIH)
    - Research Collaboration Agreement Form
      Howard Hughes Medical Institute
- Social/Behavior Collaborations
    - International Collaboration in Behavioral and Social Sciences
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- Bibliography for Understanding Research Conflict of Interest
    - Ethical Guidelines for Managing Conflicts of Interest, AcademyHealth
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    - Financial Relationships and Interests in Research Involving Human Subjects: Guidance for Human Subject Protection, Department of Health and Human Services
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      https://members.aamc.org/eweb/upload/Protecting%20Patients,%20Preserving%20Integrity.pdf

- ** Other AAMC resources available via: https://www.aamc.org/advocacy/research/283242/conflictofinterest.html
- Report on Individual and Institutional Conflict of Interest, Association for American Universities
  http://www.aau.edu/policy/COI_reports.aspx?id=10094
- Shared Responsibility, Individual Integrity: Scientists Addressing Conflicts of Interest in Biomedical Research, The Federation of American Societies for Experimental Biology
  http://opa.faseb.org/pdf/FASEB_COI_paper.pdf

Data Ownership, Acquisition, Sharing, and Management

- Examples of Dubious Science
- Intellectual Property Policy
- Research Integrity and Data
- Statistics and Outliers
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- Assessing Potential Mentors
- Creating and Maintaining and Individual Development Plan
- Types of Mentors
- Bibliography for Mentor-Trainee Relationships
    - **A Guide to Training and Mentoring in the Intramural Research Program**, National Institute of Health (NIH) https://www.training.nih.gov/mentoring_guidelines
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- History of Peer Review
- Peer Review Guidelines – Examples

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Research Integrity

- Authorship on Scientific and Scholarly Publications, Policy for
- Authorship and Publication Resources
- Research Integrity Policy
- Research Integrity and Data
- Bibliography for Research Integrity
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COPYRIGHT - PROTECTED VS. UNPROTECTED WORKS

From Copyright Office Basics at the United Stated Copyright Office.

Copyright protects "original works of authorship" that are fixed in a tangible form of expression. The fixation need not be directly perceptible so long as it may be communicated with the aid of a machine or device. Examples of types of works that are generally protected and unprotected are below.

Works Protected by Copyright

Copyrightable works include the following categories:

- literary works
- musical works, including any accompanying words
- dramatic works, including any accompanying music
- pantomimes and choreographic works
- pictorial, graphic, and sculptural works
- motion pictures and other audiovisual works
- sound recordings
- architectural works

These categories should be viewed broadly. For example, computer programs and most "compilations" may be registered as "literary works", maps and architectural plans may be registered as "pictorial, graphic, and sculptural works."

Works NOT Protected by Copyright

Several categories of material are generally not eligible for federal copyright protection. These include (among others):

- Works that have not been fixed in a tangible form of expression. *Examples include choreographic works that have not been notated or recorded, or improvisational speeches or performances that have not been written or recorded*
- Titles, names, short phrases, and slogans; familiar symbols or designs; mere variations of typographic ornamentation, lettering, or coloring; mere listings of ingredients or contents
- Ideas, procedures, methods, systems, processes, concepts, principles, discoveries, or devices, as distinguished from a description, explanation, or illustration
- Works consisting entirely of information that is common property and containing no original authorship. *Examples include standard calendars, height and weight charts, tape measures and rulers, and lists or tables taken from public documents or other common sources*

ABOUT COPYRIGHT - FREQUENTLY ASKED QUESTIONS

****DRAFT DOCUMENT AS OF 3.17.09****

The information provided in this synopsis is not intended to serve as legal guidance or advice. Authors are encouraged to consult the General Counsel's Office for advice on specific issues or situations.

What is Copyright?
Copyright is a legal term, indicating that the creators of an original work have the right to control the copying, distribution or modification of that work. It is important to remember that copyright does not apply to ideas— it only applies to the words and pictures used in a work.

An author obtains copyright of the work as soon as it is fixed in a tangible form of expression. What this means is the work must be recorded (that is, "fixed") in some fashion— for example in a printed document, or on a computer disc which can be read by a machine to show the document. A seminar can be copyright if (1) a videotape was made or (2) the text of the seminar was written down. However, an improvised seminar, which is not recorded, is not covered by copyright. For more information, see Copyright— Protected vs. Unprotected Works.

The copyright is granted as soon as the work is fixed in a tangible form of expression. No special act is required to register it. However, it may be a good idea, if you have written an extensive, unpublished summary that you send to other scholars, to include a notice such as "unpublished material copyright Month Day, 20xx by Your Name Here."
Sometimes you cannot obtain copyright yourself. For example, if you are hired to write a particular article by a company (a "work for hire"), then the company would hold the copyright.

Details of copyright protection differ in different countries, so this discussion applies to the USA.

How long does a copyright last?
In the United States, the work is automatically protected from the moment of its creation and is ordinarily given a term enduring for the author's life plus an additional 70 years after the author's death.

What good is it to have copyright?
The advantage of holding copyright is to protect your particular words and pictures. For example, if you publish a paper and give the copyright to a publisher, then you would not be able to take a figure from the paper and use it in a review. If you retain that right, you are free to use the figure again. In strict terms, if you copy a methods section from one published paper and insert it into a new manuscript, you will be violating copyright (unless, of course, you have retained the right to reuse writing from the older paper). If another author wishes to use a figure you have published, that person has to ask the copyright holder (either you or the publisher) for permission. In general, a publisher will require that the author give permission, but the publisher would not be required to do so if it held the copyright.

Is copyright "all-or-nothing"?
Copyright is a bundle of various rights and you can retain specific rights to your work when submitting the work for publication. It is possible, and often very desirable, to keep at least some rights to your published work. In practical terms, you might retain the right to use figures from a published paper (authored by you) in another paper. You might retain the right to send copies of a published paper to

anyone who asks. You might retain the right to post a copy of the published manuscript on your personal web site. Many publishers automatically grant you specific rights; others require that you sign over all rights to the publisher. You are encouraged to review the publisher's publication agreement form before signing to confirm what rights authors are granted by the publisher. To retain rights that are not granted by the publisher, you can include an addendum along with a publisher's publication agreement form.

Where can I look for additional information?

The Becker Medical Library provides additional information and resources related to copyright. Please visit the Copyright Resource Guide for access.

For more frequently asked questions about copyright, please visit http://www.copyright.gov/help/faq/.

EXAMPLES OF DUBIOUS SCIENCE

There are many forms of dubious science. Pseudoscience is really not research at all, but wishful thinking or fantasy, which is often presented in scientific-sounding language, but contains none of the critical work and thinking of science. Junk science consists of poorly designed and analyzed research projects that are usually performed to provide some support for an non-scientific goal (such as a political, cultural, or legal agenda). Public science occurs when the researcher may be properly skeptical but members of the public or the press over-interpret the significance of the results. Current examples include the Mozart effect and facilitated communication. A description of these phenomenon is available under Examples of Public Science.

Wishful science is another distinct form of dubious science. Irving Langmuir analyzed several early "cases where there is no dishonesty involved but where people are tricked into false results by a lack of understanding about what human beings can do to themselves in the way of being led astray by subjective effects, wishful thinking. or threshold interactions." He chose to call this phenomenon pathological science.

Langmuir on Pathological Science

Irving Langmuir was an eminent physical chemist (1881-1957), who won the Nobel prize for Chemistry in 1932. In 1953 he delivered a seminar at the General Electric company research laboratory. In his talk, he gave several examples of research projects which had produced astonishing results but which were completely erroneous. He chose examples which were not fraud, perpetrated by the scientist, but simply examples of poor and uncontrolled experiments. This seminar was transcribed, and appeared as an internal report for the GE laboratories.

The following is an excerpt from the transcript of his seminar given December 18, 1953:

These are cases where there is no dishonesty involved but where people are tricked into false results by a lack of understanding about what human beings can do to themselves in the way of being led astray by subjective effects, wishful thinking or threshold interactions. These are examples of pathological science. These are things that attracted a great deal of attention. Usually hundreds of papers have been published on them. Sometimes they have lasted for 15 or 20 years and then gradually have died away.

Now, the characteristic rules are these:

Symptoms of Pathological Science:

1. The maximum effect that is observed is produced by a causative agent of barely detectable intensity, and the magnitude of the effect is substantially independent of the intensity of the cause.
2. The effect is of a magnitude that remains close to the limit of detectability; or, many measurements are necessary because of the very low statistical significance of the results.
3. Claims of great accuracy.
4. Fantastic theories contrary to experience.
5. Criticisms are met by ad hoc excuses thought up on the spur of the moment.

6. Ratio of supporters to critics rises up to somewhere near 50% and then falls gradually to oblivion.

The text of the seminar has been posted here.

After Langmuir's seminar, there have been other examples of pathological science, including "infinite dilution" and "cold fusion"

More information on pathological science is available on Wikipedia.

EXAMPLES OF PUBLIC SCIENCE

Public science occurs when the researcher may be properly skeptical but members of the public or the press over-interpret the significance of the results. Current examples include the Mozart Effect and facilitated communication. For more on other forms of dubious science, visit Examples of Dubious Science.

The Mozart effect

compiled by Sandra Hale, PhD

A brief history of the alleged "Mozart effect"

1993: Nature publishes a study by Rauscher et al. that presents data and claims to show that listening to a Mozart Sonata for 10 minutes prior to taking a subtest from the Stanford-Binet test of intelligence lead to a 9 point "increase" in IQ scores (when compared to listening to nothing or listening to "progressive relaxation" instructions).

1993 – 1998: Many studies published … but not all were published in prestigious or high-profile journals. Many studies failed to find evidence for the "Mozart effect". In fact, despite being repeatedly refuted and de-bunked, the influence of the version that first appeared in the media ran deep and long.

By 1998, however, researchers were starting to write about how much the false generalization to infants and the belief that the alleged "Mozart effect" was based on solid science was ingrained into the public consciousness. Some even commented that the reason this alleged effect was so heartily embraced by the public is because the public is always hoping to find a "quick fix". So, in a state that has relatively low-quality public education, planning on giving a classical CD to every mother of a new child in order to enhance the child's mental abilities, would be a lot cheaper than improving the public education system. No matter why we can't let go of this "myth", it is always interesting to know how such myths enter the scientific literature.

The following excerpt on the "Mozart effect" is taken from a one-page commentary in an online journal, "Commentary", published in 1998, the title of the commentary is "IQ since the Bell Curve" written by Christopher Chabris (who was a Harvard Ph.D. candidate at the time he wrote this commentary).

THIS PAST January, Governor Zell Miller of Georgia asked his legislature for enough money to give a cassette or CD of classical music to every newborn child in the state. The governor cited scientific evidence to support this unusual budget request. "There's even a study," he declared in his State of the State address, "that showed that after college students listened to a Mozart piano sonata for ten minutes, their IQ scores increased by nine points." And he added: "Some argue that it didn't last, but no one doubts that listening to music, especially at a very early age, affects the spatial-temporal reasoning that underlies math, engineering, and chess."

The so-called "Mozart effect" is one of the most publicized recent examples of our ongoing preoccupation with intelligence, a subject that not only refuses to go away but continues to raise whirlwinds of controversy. …….

The Mozart effect was first shown in a study by Frances Rauscher, Gordon Shaw, and Katherine Ky that was reported in the British journal Nature in 1993. It is difficult to determine their experimental procedure with precision--their article was less than a page in length--but the essentials appear to be as follows. Thirty-six college students performed three spatial-ability subtests from the most recent version of the Stanford-Binet intelligence test. Before one of the tests, the students spent ten minutes in silence; before another, they listened to ten minutes of "progressive-relaxation" instructions; and before still another, they listened to ten minutes of Mozart's Sonata for Two Pianos in D Major (K. 448). The subjects performed the tests in different orders, and each test was paired with equal frequency against each listening option. The results, when converted to the scale of IQ scores: 110 for silence, 111 for relaxation, and 119 for Mozart.

"Mozart makes you smarter!" said the press releases as new classical CD's were rushed to market. A self-help entrepreneur named Don Campbell trademarked the phrase "The Mozart Effect," published a book by the same name, and began selling cassettes and CD's of his own, including versions designed specially for children. Frances Rauscher testified before a congressional committee and gave many press interviews.

What was wrong with this picture? The article in Nature did not give separate scores for each of the three Stanford-Binet tasks (necessary for comparative purposes), and it used dubious statistical procedures in suggesting that listening to Mozart enhanced overall "spatial IQ" or "abstract reasoning." Nor did the researchers analyze separately the first task done by each subject, to rule out the possibility that prior conditions may have influenced the Mozart score. Finally, they claimed that the effect lasted for only ten to fifteen minutes, but gave no direct evidence; since the subjects were apparently tested only immediately after each listening episode, there was no way to see how this interval was calculated.

IN AN attempt to reproduce the finding that classical music enhances "abstract reasoning," Joan Newman and her colleagues performed a simple experiment: each of three separate groups comprising at least 36 subjects completed two separate subsets of Raven's Matrices Test (a good measure of g) before and after listening to either silence, relaxation instructions, or the Mozart-effect sonata. All three groups improved from the first test to the second, but by the same amount; in other words, Mozart was of no particular help. In another experiment along the same lines, a group led by Kenneth Steele asked subjects to listen to ever-longer strings of digits and repeat them backward; it, too, found no benefit from prior exposure to Mozart. Other independent tests reported similar failures or equivocal results.

In response to these experiments, Rauscher and Shaw have considerably narrowed the scope of their original findings. They now concede that the post-Mozart increase in spatial performance occurred on just one of the three Stanford-Binet tasks, while on the others, varying the listening condition made no difference. According to their revised estimate, only "spatiotemporal" tasks, which require the transformation of visualized images over time, are affected by complex music, not spatial ability or reasoning in general.

Unfortunately, however, neither Nature nor any journal of similar stature has given space to the follow-up experiments, most of which have been reported in Perceptual and Motor Skills or other low-prestige journals that many psychologists never read. And the media have of course moved on, leaving the babies of Georgia with state-sponsored gifts and the public with the vague idea that if ten minutes of music can "make you smarter," then IQ cannot signify very much.

Fortunately, within a few years (at least by 2001), it became clear just how loud and clear the scientific community had heard the answer: AAAS developed a website called Science Netlink which uses the alleged "Mozart effect" to teach students to be skeptical and to understand the value of replication (especially systematic replication).

Facilitated Communication

compiled by Eric D. Herzog, PhD

FC is a communication strategy used by people without functional speech. A facilitator helps the person communicate through hand motions and position.

Wikipedia: Facilitated communication has been controversial since its first recorded use in Australia in 1977. There are two main reasons for this. First, some people previously believed to be severely cognitively impaired generated communication with facilitation which, if valid, raised major concerns about the validity of the current methods of assessing the intelligence of people without speech. Second, the involvement of a second person, the facilitator, in the communicative process raised obvious questions as to who was generating the communication. Initial efforts to resolve questions of authorship focused on testing communication aid users. This added to the earlier controversy as the opponents and proponents of facilitated communication disagreed with each other's methodologies and results. Following considerable media coverage, both positive and negative, in the early 1990's, and the publication of many journal articles, again, both positive and negative, some large professional organizations including the American Psychological Association (1994) adopted negative statements on the technique and some large disability organizations including TASH (1993) adopted positive statements on the technique.

American Psychological Association Statement on Facilitated Communication

August 1994

On the recommendation of the Board of Directors, Council voted the following resolution on facilitated communication:

Facilitated communication (FC) has been widely adopted throughout North America in special/vocational education services for individuals with developmental disabilities who are nonverbal. A basic premise of facilitated communication is that people with autism and moderate and profound mental retardation have "undisclosed literacy" consistent with normal intellectual functioning. Peer reviewed, scientifically based studies have found that the typed language output (represented through computers, letter boards, etc.) attributed to the clients was directed or systematically determined by the paraprofessional/professional therapists who provided facilitated assistance. (Bligh & Kupperman, 1993; Cabay, in press; Crews et al., in press; Eberlin, McConnachic, Ibel, & Volpe, 1993; Hudson, Melita, & Arnold, 1993; Klewe, 1993; Moore, Donovan, Hudson, 1993; Moore, Donovan, Hudson, Dykstra & Lawrence, 1993; Regal, Rooney, & Wandas, in press; Shane & Kearns, in press; Siegel, in press; Simon, Toll & Whitehair, in press; Szempruch & Jacobson, 1993; Vasquez, in press; Wheeler, Jacobson, Paglieri

& Schwartz, 1993). Furthermore, it has not been scientifically demonstrated that the therapists are aware of their controlling influence.

Consequently, specific activities contribute immediate threats to the individual civil and human rights of the person with autism or severe mental retardation. These include use of facilitated communication as a basis for a) actions related to nonverbal accusations of abuse and mistreatment (by family members or other caregivers); b) actions related to nonverbal communications of personal preferences, self-reports about health, test and classroom performance, and family relations; c) client response in psychological assessment using standardized assessment procedures; and d) client-therapist communication in counseling or psychotherapy, taking therapeutic actions, or making differential treatment decisions. Instances are widely noted where use of facilitated communication in otherwise unsubstantiated allegations of abuse has led to psychological distress, alienation, or financial hardship of family members and caregivers. The experimental and unproved status of the technique does not preclude continued research on the utility of facilitated communication and related scientific issues. Judicious clinical practice involving use of facilitated communication should be preceded by the use of fully informed consent procedures, including communication of both potential risks and likelihood of benefit.

Facilitated communication is a process by which a facilitator supports the hand or arm of a communicatively impaired individual while using a keyboard or typing device. It has been claimed that this process enables persons with autism or mental retardation to communicate. Studies have repeatedly demonstrated that facilitated communication is not a scientifically valid technique for individuals with autism or mental retardation. In particular, information obtained via facilitated communication should not be used to confirm or deny allegations of abuse or to make diagnostic or treatment decisions.

THEREFORE, BE IT RESOLVED that APA adopts the position that facilitated communication is a controversial and unproved communicative procedure with no scientifically demonstrated support for its efficacy.

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RESEARCH INTEGRITY AND DATA

The steps involved in obtaining, analyzing, and interpreting data are critical in assuring the validity and accuracy of your research. Ethical conduct requires researchers to accurately represent the information conveyed within the data. Problems may arise when a researcher believes in an interpretation more than the data.

It is unethical to alter, create, or steal data to provide false support for an interpretation. Unfortunately, some researchers violate these standards. The most serious violations are defined as research misconduct and carry serious professional, personal, and social consequences.

Information on the types of research misconduct involving data is below. For more information on research misconduct, please visit the Research Integrity Resources section of the PERCSS Reference Library.

Falsification

DEFINITION: manipulating research materials, equipment, or processes, or changing or omitting data or results such that the research is not accurately represented in the research record.

Data falsification most often occurs when analyzing data. Examples include inappropriate exclusion of observations, inappropriate control groups, or inappropriate statistical tests (among other actions). The intent is to deceive the audience into believing that the data are more reliable or significant than they really are.

Examples of misconduct:

Hao Wang: http://ori.hhs.gov/content/case-summary-wang-hao

Phillippe Bois: http://ori.hhs.gov/content/case-summary-bois-philippe

Data fabrication

DEFINITION: making up data or results and recording or reporting them.

Data fabrication can arise at any point during the course of a study, but two common places are at the start and at the end. In some cases, researchers make up data instead of obtaining it according to their experimental design. In other cases, actual data is replaced with false observations. The intent is to deceive the audience into believing that you have acquired data that, in reality, you have not.

Examples of misconduct:

Marc Hauser: https://ori.hhs.gov/content/case-summary-hauser-marc

Mona Thiruchelvam: http://ori.hhs.gov/content/case-summary-thiruchelvam-mona

Plagiarism

DEFINITION: the appropriation of another person's ideas, processes, results, or words without giving appropriate credit.

Data plagiarism occurs when researchers present another researcher's data as their own. The intent is to deceive the audience into believing that the author has obtained the data and that the data were obtained under conditions set by the experimental design.

Examples of misconduct:

Pratima Karnik: http://ori.hhs.gov/content/case-summary-karnik-pratima

Jayant Jagannathan: http://ori.hhs.gov/content/case-summary-jagannathan-jayant

ASSESSING POTENTIAL MENTORS

Once you have identified potential mentors, the next step is to learn more about the individuals themselves. It is important to be proactive and to talk directly with the potential mentor during this assessment.

Qualities to consider in potential mentors

- Expertise in the skills you need to learn
- Willingness and ability to devote time
- Professional reputation
- Communication skills and rapport
- Management style
- Available resources

Talk with other trainees

You may also investigate the potential mentor's track record by talking with previous and current trainees about their experiences to assess whether or not these trainees feel as though their needs have been and are being met.

- Are they able to have open and constructive conversations about their work and their future with this person?
- Has the potential mentor helped them develop their professional networks to improve their opportunities in the future?
- Have former trainees become successful researchers?

Joining a research group

If you are joining a research group, you should be sure to understand the way that the research unit is organized and how training and/or mentoring will occur. You should not assume that the head of the group (or the Principle Investigator) will be your mentor. One way to learn more about the environment of the research group is by talking with previous and current members about their experiences. Questions you should consider include:

- How are members of the research group trained/mentored?
- Do current and former members of the group report a positive and successful experience?
- What are the group rules for authorship, publication, teaching, and collaborative research?
- Are there other duties of the position that are not related to doing research?

CREATING AND MAINTAINING AN INDIVIDUAL DEVELOPMENT PLAN

Success requires that you and those whom you trust objectively assess your strengths and weaknesses, your progress, and your ability to reach your goals. Creating and maintaining an individual development plan will facilitate this process.

For a comprehensive guide to creating a plan, visit Individual Development Plans for Postdoctoral Fellows, offered by the Federation of American Societies for Experimental Biology (FASEB).

Advice for creating your plan

Your mentor should help you outline and revise your development plan.

When developing your plan, take into account your current personal and professional situation and have clear, realistic benchmarks by which to gauge success (e.g. attendance and presentations at meetings, manuscripts, teaching opportunities, etc.).

Be aware of your options! What options are available? What options are germane to your career goals? What skills do you bring to each option and what skills do you want/need to gain? What are the opportunities for growth? What are the challenges?

Advice for maintaining your plan

At frequent intervals you should assess your progress toward meeting your benchmarks and assess changes in your own life that may modify your goals.

If your goals change, you may need to change your development plan dramatically.

If you aren’t meeting your benchmarks, you should ask for help from your mentor to make adjustments and/or reassess the reality of your goals.

If your goals become unattainable, it is best to recognize this fact as early as possible so that adjustments can be made in your plan or the goals themselves. Nothing is more frustrating than spending a long period of time chasing unattainable goals. Changing a path or even the overall goal should not be seen as a failure, but rather as an opportunity of finding yourself in the most rewarding career path.

TYPES OF MENTORS

Understanding the value of different types of mentoring will help you identify quality mentoring opportunities.

Formal

- Structured programs frequently match mentors and trainee
- Formats vary by program
- Generally focused on specific goals
- Provides accountability based on formal contracts between mentor and trainee

Natural

- Initiated by mentor – one person (usually senior) reaching out to another
- Implicit – usually people with much in common

Peer

- Individuals at the same level providing skill training
- Individuals in similar positions (e. g., have small children) providing support, empathy, and advice
- Individuals in similar stage of career mentoring on options and career goals

Situational

- Mentoring for a specific purpose/skill
- Generally short-term
- Common at all stages of the career

Supervisory

- Advisor as mentor and direct supervisor – "many hats"
- Not all supervisors are comfortable also being a mentor
- Possibility of conflict of interest

Trainee initiated

- Begins with an interaction with a chosen mentor – it may develop into a mentoring relationship: build bridges

THE PAST, PRESENT, AND FUTURE OF PEER REVIEW

The review of people has changed little over the years. It evaluates a candidate's qualifications and promise for a position or promotion. Almost always, reviewers are selected for some combination of three qualifications: their contributions to the applicant's field, their eminence in that general area of science, and their personal or professional knowledge of the applicant. In the past, the individual was never able to read letters (and so the review was anonymous), but more recent changes in the law have made it possible to gain access in some conditions.

The review of manuscripts started with scientific societies, for example the Royal Society of London, which published the manuscripts of oral presentations to the Society. Publications were selected by "a Committee of their members ... appointed to reconsider the papers read before them, and select out of them such, as they should judge most proper for publication... And the grounds for their choice are, and will continue to be, the importance or singularity of their subjects, or the advantageous manner of treating them, without pretending to answer for the certainty of the facts, or propriety of the reasonings..."[1]

Reviewers are now expected to more carefully examine the accuracy of the reported observations and to evaluate their interpretations. One early motive for the acceptance of peer review was the feeling that review and publication provided recognition of the importance and validity of the work.[2] The process of peer review spread relatively slowly through the world of scientific journals. For many journals the editor made decisions (with the advice of a few colleagues) until the mid-1900s.[3] Peer review was much more widely adopted after about 1950, and now most journals use it.

The review of grants arose when professional societies and nongovernmental organizations (The Rockefeller Foundation, for example) began to fund research. The review has shifted from the board of the organization, which tended to focus on funding the right person,[4] to peer review, which evaluates the merits of the proposed research to be funded by government and nongovernment agencies.

New forms of peer review have been proposed or implemented, ranging from providing signed (open) reviews to attempting to conceal the identity of authors. One interesting effort is to try to make review more public, rather than soliciting reviews only from experts. For example, the journal Nature tried the approach of posting a manuscript and soliciting public comments, see *Nature Peer Review Trial and Debate*. This was tried, but not widely used. A similar effort on the part of the US Patent Office is a trial using some selected patent applications, soliciting opinions on whether the inventions are not obvious, see "Peer to Patent": A Proposal for Community Peer Review of Patents.

Finally, an effort has been made to make peer review an ongoing process, by continuing the public evaluation of published work. For example, the Public Library of Science (PLoS) journals and many science blogs invite online discussions of articles. The Faculty of 1000 (actually many more than 1000 faculty) offers ratings and brief synopses of recent publications, often including critiques or highlighting controversial findings. This will not, necessarily, replace peer review in decisions for publication, funding, or hiring but will alter the overall nature and influence of peer review as it is perceived in the scientific community.

1. 1752; quoted on page 136 of Kronick, A History of Scientific & Technical Periodicals, The Scarecrow Press, Metuchen NJ, 1976.

2. Zukerman and Merton, "Patterns of evaluation in science: Institutionalisation, structure and functions of the referee system" Minerva 9:66-100, 1971.

3. J. C. Burnham "The evolution of editorial peer review", JAMA 263: 1323-1329, 1990.

4. E. G. Conklin, "Round table conference" Proceedings of the American Philosophical Society 77:566-590, 1937.

PEER REVIEW GUIDELINES - EXAMPLES

National Institutes of Health
See NIH Guidelines for Reviewers

The NIH has a double review of grant applications. The first level of review occurs in committees with members who have expertise in the subject of the application. More than 40,000 applications are submitted to the NIH each year, and each committee (there are about 100, with 18 to 20 members per committee) reviews up to 100 applications, three times a year. Reviewers are asked to discuss the following aspects of the application in order to judge the likelihood that the proposed research will have a substantial impact:

- Significance (of the work)
- Approach (technical approach)
- Innovation (in techniques or interpretation)
- Investigator (competence to perform the work)
- Environment (existing resources to perform the work)

Written critiques are prepared by 2 to 5 reviewers, and then the committee members vote on an overall score for the proposal. Then there is a secondary level of review by an advisory council consisting of external scientists and lay members of the general public, including patient-group advocates and the clergy, which also considers social relevance and importance to the overall mission of the Institute. The agency usually follows the recommendations of the initial committee in approving grant applications.

National Science Foundation
See NSF Merit Review Criteria

The National Science Foundation uses the idea of merit as part of its peer review process. Experts in the field review grant applications submitted to NSF and evaluate in terms of the following criteria:

- the intellectual merit of the proposal
- its potential to advance knowledge
- the qualifications of the proposing scientist
- the extent to which the project is creative and original
- how the work will advance discovery while promoting teaching
- how the work will benefit society, and
- how the proposing scientists fared in prior NSF grants

Each reviewer prepares a written report, and the reports are evaluated by a committee at NSF to make the final decision.

Journal Guidelines for Peer Review
Access example journal guidelines here: Nature | Cell | PLoS One

Institutional Guidelines for Peer Review

To evaluate a person being considered for promotion, a letter from a committee or department chair might read something like this:

"Please assess the quality of Dr. X's research and the effect it has had on our current understanding in the field of ____. Please provide specific examples of the national or international reputation of Dr. X's research, professional contributions, technical contributions that others utilize (apparatus, methods or software), participation at meetings and seminars. Would you support Dr. X for promotion at your institution? We also would appreciate your evaluation of Dr. X's teaching and training."

To evaluate a person being considered for hire, a letter from a search committee or department chair might read something like this:

"Please assess the quality of Dr. X's research and the effect it has had on our current understanding in the field of ____. Please comment on Dr. X's level of independence and creativity, the likelihood Dr. X will establish a productive research program. We would also appreciate your evaluation of Dr. X's teaching and collegial skills."