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Department of Materials Engineering
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4. Ethics and Research

There are two major ethical issues related to research:

- honesty in approaching the research problem and
- honesty in reporting the results.

The first relates to a state of mind essential to successfully performing research. This state of mind includes avoiding preconceived notions about what the results will be, being open to changing the hypothesis when such action is warranted by the evidence, and generally ensuring that an objective frame of mind is maintained.

Results must also be accurately reported. Once an experiment or test has been performed, the results of the experiment must not be overstated, but rather an accurate assessment and interpretation of the data must be given. The environment that most researchers work in fosters temptations and rewards for overstating research results. Academic researchers must publish significant research results in order to get tenure at their universities. If an experiment isn't working out, it is tempting to "massage" the results to achieve the desired outcome. Even for researcher in industrial environments or faculty who are already tenured, the quest for fame or the desire to be the first with new results can be overwhelming and can lead to falsification of data. Often, the pressure to get a new product to market leads the test engineer to "fudge" data to qualify the product.

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It is important to note the distinction between intentional deception and results or interpretations that are simply incorrect. Sometimes, results are published that, upon further research, turn out to be incorrect. This situation is not an ethical issue unless a clarification of the results is never presented. Rather, this issue indicates that great care must be taken before results are initially reported. It is also important to ensure that proper credit is given to everyone who participated in a research project. Rarely is research performed by a single investigator working alone in her laboratory. Generally, there is participation by other people who should be acknowledged for their contributions such as discussions or guidance, construction of experimental apparatus, or substantial help with performing experiments or interpreting data.

It is tempting to think that fraud and deception in research are rare and only perpetrated by lower-level scientists, but this perception is decidedly untrue. There are many examples of well-known and even Nobel Prize–winning scientists who have had lapses of ethical judgment with respect to their research. For example, Robert Millikan was a physicist from the University of Chicago who won the 1923 Nobel Prize in physics for experiments that measured the electrical charge of the electron. Studies of Millikan's unpublished data indicate that he excluded 49 of the 140 experimental observations from the paper that he published. However, in the paper, he stated that the published work contained all of the data. Inclusion of these data probably wouldn't have changed his conclusions, but would have made the result seem less certain and the experiment not as clearly definitive.

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4.1 Analyzing Ethical Problems in Research

How can ethical issues relating to research best be analyzed? Perhaps the easiest means to determine the best ethical course in performing research and experiment is to consult the codes of ethics of the engineering professional societies. All of the codes include language requiring engineers to be honest in reporting the results of work and assigning credit for work done. For example, the code of the American Institute of Chemical Engineers states that "members shall treat fairly all colleagues and coworkers, recognize the contributions of others," and "issue statements and present information only in an objective and truthful manner." These statements apply equally well to all professional activities of an engineer, including research, experiment, and testing

Several ethical theories can be used to analyze issues involving research. Utilitarianism or rights and duty ethics can be applied to research, but it is perhaps easiest to examine research issues using virtue ethics. One of the virtues is honesty. Honesty facilitates trust and good relations between individuals, whereas dishonesty leads to doubts and misgivings about others. People rarely want to associate with those who they feel don't behave fairly and can't be trusted. Making false claims about the results of experiments is certainly a form of dishonesty. We should seek to enhance virtues such as honesty within ourselves and others, so virtue ethics clearly tells us that the inaccurate reporting of experimental results is unethical. Likewise, not giving credit to everyone who has participated in a project is dishonest, and virtue ethics indicates that this practice is unacceptable.

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4.2. Ghostwriting of Research Articles

A great deal of attention has been focused in recent years on conflict of interest in research. At its best, research is supposed to be unbiased, and results should be reported truthfully. Since researchers are human, it is sometimes difficult to maintain the detached and open attitude that is required. Nowhere is this more difficult than in pharmaceutical research. Much of the research on new drug therapies is funded by the federal government through agencies such as the National Institutes of Health (NIH). However, a substantial fraction of the research taking place in universities is funded by pharmaceutical companies, leading to substantial concerns about bias in performing research and reporting of the results. In response to this, most research papers in this area explicitly mention that a pharmaceutical company is funding the work, or disclose any conflicts that the researchers performing the work might have. A new area of ethical concern has arisen lately with reports of "ghostwriting" of research articles by pharmaceutical companies who sponsor the research.

A 2009 article in The Chronicle of Higher Education described two cases where researchers incorporated significant amounts of material written by employees of drug companies into their own research papers. In one of these cases, it appears that Design Write, a company hired by a pharmaceutical manufacturer, provided a university researcher with extensive background information for the literature review in the paper and drafted a summary of the researcher's existing data. The final paper that was published did not acknowledge the contributions made by Design Write to the work.

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The Chronicle article also cited a study presented at a medical conference that indicated that at least 11% of the articles published recently in The New England Journal of Medicine, a very prestigious medical journal, had substantial and often unacknowledged contributions from ghostwriters. What are the ethical issues here? Most significant is the potential for introduction of bias into a research article when the author has substantial financial ties to the drug industry. In writing a research paper, the author makes decisions about what data to include and what to omit, how to present the data, and what conclusions should be presented. If one of the main contributing writers is paid directly by a drug manufacturer who has a stake in the outcome of the research, the objectivity of the reporting of the research is called into question. An ethical issue also arises when someone who made significant contributions to the writing of the article is not acknowledged. Many people, including a U.S. senator, are calling for an end to this practice, and are urging NIH to develop stronger guidelines and new enforcement mechanisms to prevent ghostwriting of research articles in the future.