

Chapter 1

Getting Started

***ethics**—the study of the general nature of morals and of the specific moral choices to be made by the individual in his relationship with others. the rules or standards governing the conduct of the members of a profession.*

***moral**—of or concerned with the judgment principles of right and wrong in relation to human action and character. teaching or exhibiting goodness or correctness of character and behavior.*

***right**—conforming with or conformable to justice, law or morality. in accordance with fact, reason or truth.*
—The American Heritage Dictionary

1.1 WHY STUDY ETHICS AND COMPUTING?

SINCE you have begun reading this book, you are likely about to devote considerable effort to the study of ethics and computing. In this chapter, I try to set out answers for the why, what, and how questions of this study:

Why study ethics and computing?

What topics are relevant to this study?

How is the material best studied?

The *Why?* question comes first because the answer should set the context for answering the other questions. Why should you study ethics and computing? I assert that there can be just one worthwhile reason:

The goal of studying “ethics and computing” must be to cause you to become a more ethical person, particularly in your career as a computing professional.

If the goal is anything less than this, then the effort spent in this study is wasted!

This statement of the goal for your efforts may seem bold. Perhaps you are tempted to the knee-jerk response of “it isn’t *me* that needs to improve *my* ethics.” But if you are honest you know that you are far from perfect in your ethical knowledge, judgment, and behavior. Every

person can improve their own personal ethics and do a better job of encouraging ethical behavior in those around them. Once you decide that you want to improve yourself on the ethical dimension, studying this book should help you to realize that desire. If for some reason you do **not** desire to improve yourself ethically, studying this book will at least make you more aware of the ethical norms and expectations that apply to computing professionals.

Also, note that the statement of the goal mentions “person” first and “computing professional” second. There is a reason for this. It is hard to see how one can cultivate ethical behavior as something that is switched on only in your professional life, and is left in neutral in your personal life. It seems more likely that your professional ethics will be closely related to your overall personal ethics.

Our second question is, what topics are relevant to the study of ethics and computing? It should be clear that we do not mean to study all of the field of ethics or all of the field of computing. Our focus is on the practical intersection of these two fields; that is, on studying what constitutes ethical behavior for professionals in information systems, computer science, and software/computer engineering. A prerequisite for success in this study is to have good critical-thinking skills. For this reason, I have included a chapter on critical thinking as the second chapter in this book. The critical-thinking chapter is followed by chapters that address core topics in ethics and computing. The following

list of questions should illustrate the range of topics involved in this study.

- What context do professional codes of ethics provide for decision making?
- What ethical and legal issues are involved in computer “cracking” and security?
- How does concern for privacy interact with concern for law enforcement and commerce?
- What are the professional responsibilities in developing safety-critical systems?
- What is the professional responsibility to “blow the whistle” on unethical behavior?
- What are the ethical and legal issues surrounding protection of intellectual property?
- How has the computing industry faced up to issues of use of natural resources?
- What are the standards for ethical interaction with others in the workplace?
- How should ethical concerns interact with how you manage your career?

With some idea of the topics to be covered, the third of the three questions to address in this section is, How is the material best studied? To a large degree, the teaching style of this book is structured around three basic premises. The first premise is that it is useful to get into detailed, real-world case studies as soon as the basic issues of a topic are introduced. The depth of each topic is explored through the various case studies contained in the text, reprints, exercises and worksheets. The second premise is that active learning is better than just reading. For this reason, there are lots of exercises and worksheets included in the book. You should do as many of these, especially the worksheets, as time will allow. You will cheat yourself out of much of the learning experience if you skip doing the exercises and worksheets. The third premise is that it is often useful to read original papers by authors who have distinguished reputations. This can expose you to different viewpoints and styles, and give you a sense of historical context. Reprinted papers that fall into this category include the one by Ken Thompson in the “Cracking and Computer Security” chapter, and those by David Parnas and Nancy Leveson in the “Safety-Critical Systems” chapter.

Two points deserve special emphasis with regard to how to study the material. The first point is that you must learn to suspend your initial reaction and think carefully and completely about a topic or issue. This is the critical-thinking aspect of your study. Without the exercise of strong critical-thinking skills, your study may reduce to a sequence of automatic “Yes!” and “No!” responses that simply reflect whatever initial prejudices you brought to the topic. Conscious application of critical-thinking skills will help you to internalize lessons that may include changes in your own personal ethical framework.

The second point is that you must learn to imagine your-

self in the roles of the various persons in each case study. You should try to imagine how you would want to react when you unexpectedly find yourself in a similar situation. This is important. When you are unexpectedly confronted with an ethically challenging situation, and have not previously thought of how you would want to respond, there will be tremendous pressure to take the “path of least resistance.” You could find yourself signing off on software that has not been tested as called for, agreeing to keep some important safety problem quiet “for the good of the company,” using intellectual property that you know was not legally obtained, or taking any of a variety of other actions that you would regret later. On the other hand, if you have thought deeply about a related situation beforehand, and established in your own mind what an ethical response would be, you are much less likely to give in to the pressures of the moment.

1.2 A FUNDAMENTAL PREREQUISITE

For your study of ethics and computing to make sense, it is necessary to accept the existence of good and evil. Most people share a similar informal understanding of these terms. If you need definitions, the American Heritage Dictionary defines “good” as “having positive or desirable qualities” and “evil” as “morally bad or wrong; wicked” [1]. These definitions appropriately suggest abstract concepts that are polar opposites. (If the terms “good” and “evil” are too strong for your taste, perhaps because of strong theological connotations, then substitute the terms “right” and “wrong.”)

Why have we digressed into discussing the terms good and evil? The answer is simple. If you accept that concepts of good and evil exist and have meaning, then you can consider how these concepts apply to various decisions, actions, and outcomes. This is necessary in order for our study of ethics and computing to have any substance. In particular, we want to be able to discuss how good and evil relate to decisions, actions, and outcomes that **you** are potentially involved in.

Doesn’t everyone automatically agree that concepts of good and evil exist? Actually, no. The framework of “ethical relativism” asserts that good and evil are defined only relative to a particular individual, at a particular time, or in a particular society. In this framework, there are no standards or rules of behavior that can reasonably be applied at all times and in all places. Motivation for this framework comes from the observation that what is considered ethical varies over time within one culture, as well as across different cultures at the same point in time. This observation is certainly correct. For example, at earlier times in the United States, slavery was legally sanctioned, women did not have the right to vote and child-labor practices were essentially unregulated. While these things have all changed in the United States, they are still prevalent

in various other cultures around the world.¹ But the fact that different people, societies, or times have endorsed different behaviors as ethical does not prove the absence of absolute ethical standards. It proves only that human beings find it difficult to discover, acknowledge, and adhere to absolute ethical standards. Since ethical relativism denies the existence of universal ethical standards, it leads toward each person deciding for themselves what is moral. With each person's judgment as valid as another person's, there is no right and wrong, only different. The result is moral anarchy. For these reasons, the theory of ethical relativism has received severe criticism. The article by McFarland at the end of this chapter gives a more detailed critique of ethical relativism.

Our study of ethics and computing is explicitly based on the assumption that standards of right and wrong can and do exist. This does not mean that all such standards of right and wrong are known to, or accepted by, all people. Nor does it mean that it will be easy to decide the right and wrong of each situation you encounter. The real world often presents situations in which every available alternative appears to involve some degree of wrong. In fact, these are the situations in which your need for a strong personal ethical foundation is greatest.

1.3 ETHICAL THEORY AND PROFESSIONAL ETHICS

Ethical theory is the study of ethics at a conceptual or philosophical level. *Applied ethics* is aimed at the everyday life of the typical person, while *professional ethics* is aimed at a person engaged in the practice of a particular profession. The study of the theory of ethics is naturally the most general, but in being the most general, it is also necessarily less specific in the details of its application. The study of applied ethics is meant to result in more specific guidelines for use in real-world situations. Of course, the emphasis on specific real situations naturally results in relatively less emphasis on general theories. The study of professional ethics addresses the details of situations and issues that arise specific to some profession, but that might be irrelevant to some other profession.

Our study of ethics and computing is clearly a study of professional ethics. We do not attempt any history, survey, or comparison of ethical theories, even only the "major" and/or "modern" theories. These topics are appropriately the subjects of other books. For those who are interested, MacIntyre provides a short historical perspective on the development of "western" ethical philosophy [8]. Wilkens

provides a short, readable critique of the popular incarnation of a number of different ethical systems [15].

Professional ethics can be different from general ethics to the extent that professional ethics must take into account:

- relations between practicing professionals and their clients,
- relations between the profession and society in general,
- relations among professionals,
- relations between employee and employer, and perhaps most importantly,
- specialized technical details of the profession.

While the context for our study is the computing professions, the basic underlying ethical issues are really not specific to, or generated by, computing technology. I can think of only one ethical issue that might be considered as "new" in the sense of being generated by the development of computing technology. This is the question: How much decision making should be entrusted to a machine? But aside from this question, the core ethical issues are typically as ancient and as simple as basic greed and dishonesty. This is true because a computer is just a tool that lets people solve larger problems faster than they could manually. In this view, the presence of the computer cannot generate new ethical concerns. However, computers may shift the level of practical concern on some ethical issues. Consider the issue of privacy of communications between individuals. The letter carrier has always had the potential to open any envelope and read any letter. But in practice, opening and reading *all* letters is impossible due to the magnitude of the manual effort involved. However, much personal communication now takes place in computer networks. In a computer network, it becomes quite conceivable that literally every communication could be automatically scanned for certain words or phrases. Thus, while the core issue of privacy is not new, computers have turned a mostly theoretical concern into a real one.

1.4 GUIDANCE FOR LIVING ETHICALLY

Since ethical behavior is often in conflict with short-term self-interest, you should not expect ethical behavior to be an easy habit to develop. It is not something that, like a set of facts or equations, you can learn simply from reading a book. (Even this one!) Reading can help you learn about things like codes of ethics and resolutions of particular ethical conflicts, but ethical behavior is a way of life. As such, it is best learned through experience; that is, by continually living ethically yourself. A relevant quote attributed to Aristotle is: *We are what we regularly do. Excellence therefore is not an act, but a habit.* More than "book knowledge" is required to learn to live ethically. It requires that you have a deep desire and conviction to live ethically.

¹For example, around the time this is being written, news accounts have discussed slavery in the Sudan, treatment of women in India and China, and child-labor practices in many countries that manufacture goods sent to the United States.

Fairburn and Watson observe that the primary factor leading us to stray from what we know to be correct ethical behavior is our tendency toward compromise in favor of our own short-term self-interest [5]. Some level of self-interest is perhaps necessary for survival. But an obsession with any particular worldly appetite (money, food, sex, praise, power, etc.) can ruin your life. Fairburn and Watson suggest three steps toward better ethical behavior:

1. Have high standards of ethical conduct.
2. Boldly live with the belief that this is the way to conduct yourself even though you may be giving up more immediate gains.
3. Serve a larger purpose—truth, reason, customers, society, the community, human advancement, God.

Thus the core themes of guidance for living ethically are relatively simple. Most people in most situations can reasonably easily determine what would constitute ethical behavior. But this behavior is quite often in conflict with what we perceive to be our own short-term self-interest. So we are tempted to rationalize and compromise. Therefore, living ethically requires the courage of strong convictions and a substantial degree of self-discipline. The presence or absence of strong ethical convictions and self-discipline is by nature pervasive throughout your life—at work or at play, in your personal or professional life.

As a last motivational quote for this section, consider the following description of the type of person needed in the world today-

The world needs men [and women]. . . who cannot be bought; whose word is their bond; who put character above wealth; who possess opinions and a will; who are larger than their vocations; who do not hesitate to take chances; who will not lose their individuality in a crowd; who will be as honest in

small things as in great things; who will make no compromise with wrong; whose ambitions are not confined to their own selfish desires; who will not say they do it “because everybody else does it”; who are true to their friends through good report and evil report, in adversity as well as in prosperity; who do not believe that shrewdness, cunning, and hardheadedness are the best qualities for winning success; who are not ashamed or afraid to stand for the truth when it is unpopular; who can say “no” with emphasis, although all the rest of the world says “yes.”

Charles Swindoll, *Living Above the Level of Mediocrity*, [11]

1.5 CASE STUDY—*Goodearl and Aldred v. Hughes*

The case study presented here involves *whistle blowing*. Whistle blowers are people “who . . . make revelations meant to call attention to negligence, abuses, or dangers that threaten the public interest. They sound an alarm based on their expertise or inside knowledge, often from within the very organization in which they work . . .” [4]. Whistle blowing is the subject of an entire chapter later in the book, but it is useful to have a short introduction and example here. Common examples of situations that lead to whistle blowing are when an employee discovers that their company is knowingly supplying an unsafe product to customers, or when someone discovers that tax dollars are being wasted in a fraudulent or flagrant manner. The particular incident discussed here combines both of these concerns. The description of this incident is adapted from [3]. A time line for the events in this case appears in Figure 1.1.

This case study involves the (lack of) testing of micro-electronic chips supplied to the military to be used in weapons systems. The particular chips involved are called

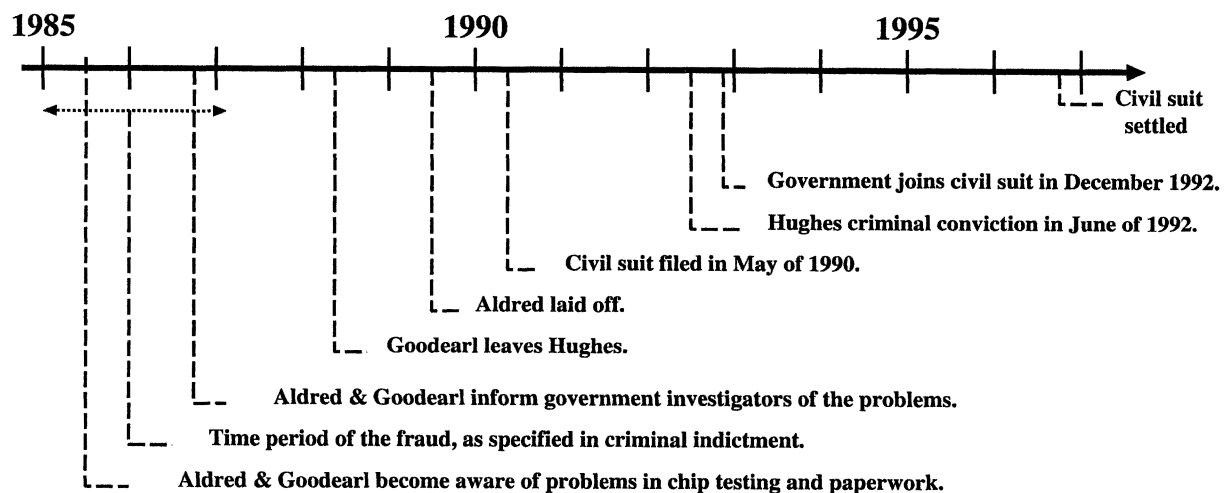


Fig. 1.1 Major events in the Goodearl and Aldred versus Hughes whistle-blowing case.

“hybrids” because they combine analog and digital logic on the same chip. It is standard practice to test chips in various ways before they are delivered to the customer. A contract to supply chips to a customer may state that various tests **must** be done and the results certified before the chips are to be delivered.

The False Claims Act (31 U.S.C. 3729-31) is a federal law that allows an individual to file a civil suit against a business that defrauds the federal government. The False Claims Act states that a whistle blower may receive between 15 and 25 percent of the recovered funds if the government chooses to participate in the suit. If the government decides not to participate in the suit, the whistle blower may receive between 25 and 30 percent of the recovery, plus legal fees and expenses.

1.5.1 The Cast of Characters

The Micro-electronic Circuits Division of Hughes Aircraft is located in Newport Beach, California. This division manufactured hybrid chips that were supplied to the United States military. The particular chips in question were used in about 75 different weapons programs, including aircraft, missiles and tanks. The results of chip failures in the field could be varied. One scenario that was suggested was that faults in a hybrid chip could cause failure in the radar that a fighter plane uses to direct its weapons! (See Figure 1.2.)

Margaret Goodearl and Ruth Aldred were employees at the Hughes Micro-electronic Circuits Division at the time that the chip-testing fraud occurred.

Donald Anthony LaRue was a shop foreman who also worked at Hughes.

1.5.2 The Sequence of Events

Between 1985 and 1987, Hughes shipped hybrid chips to the U.S. military without performing all of the tests that were required by their contract. Employees were told to omit tests, shorten tests, falsify documents, and otherwise contribute to and cover-up fraud in certifying that chips had passed tests that they in fact had not passed. This resulted in “false claims” being submitted to the government for the chips that were delivered, making Hughes open to criminal charges of fraud and to a civil suit under the False Claims Act.

Goodearl and Aldred’s attorney, John Phillips, stated that “When they [Goodearl and Aldred] became aware of the problems with testing procedures at the plant, they tried to bring the matter to the attention of upper management. But they were told to keep quiet and warned that they might get fired if they didn’t do so” [14]. It was also alleged that the whistle-blowers were “harassed by means of racial and sexual slurs and verbal comments, in addition to physical gestures and menacing postures,” and that one day when Goodearl left work she “found a butchered



Fig. 1.2 F-16 fires an AGM-88 HARM missile. An F-16 Fighting Falcon from the 416th Flight Test Squadron Edwards Air Force Base, Calif., fires an AGM-88 HARM missile during testing. The F-16 is one of the weapons systems in which the hybrid chips were used. Testimony at the criminal trial indicated that chip failure in the field could cause pilots to be unable to aim their weapons. (U.S. Air Force Photo, photo by Tom Reynolds, www.af.mil/photos).

pig's head in a brown paper bag on the hood" of her car [6].

In 1988, Aldred felt that her job had been stripped of real responsibility and she left Hughes. In 1989, Goodearl was laid off from her job at Hughes.

Goodearl and Aldred also informed government officials about their concerns over the falsified chip testing. But they felt that government officials were moving slowly, if at all, to do anything about the incident. Then Goodearl and Aldred found out about the False Claims Act.

The two women filed civil suit against Hughes under the False Claims Act in 1990. The government then joined the civil suit in 1992.

In addition to the civil suit, there was a separate criminal trial against Hughes for the fraud. In the criminal trial, Hughes was convicted in 1992 of criminal conspiracy and fined \$3.5 million. Goodearl and Aldred were witnesses in the criminal trial, along with others. Shop foreman Donald Anthony LaRue was charged along with Hughes in the criminal trial. In a comment typical of those directed toward whistle-blowers, it was claimed that LaRue had told Goodearl that she "was not part of the team" [9]. However, LaRue was acquitted in the criminal trial, as he had apparently been pushed to meet production quotas by higher level management.

Hughes lost the civil trial in 1996. This time the settlement was just over \$4 million. Under the terms of the False Claims Act, 22% of the civil settlement, or approximately \$900,000, went to the whistle-blowers Goodearl and Aldred. Hughes paid an additional \$450,000 for the legal costs involved in Goodearl and Aldred bringing the civil suit.

1.5.3 Conclusions and Questions

In terms of the legal resolution, it is tempting to say that Goodearl and Aldred "won" and Hughes "lost." However, this may not accurately describe the situation for Goodearl and Aldred. Their lawyer [Phillips] argued that, "The re-

ward is good but not that much considering what they've gone through. We feel good that they will be able to get on with their lives, but it's a long difficult road for anyone who wants to go against their employer with the False Claims Act" [6]. Remember that Aldred and Goodearl left their jobs with Hughes in 1988 and 1989, and the civil suit was not completed until 1996. Aldred was temporarily on welfare before finding a new job in 1991. Goodearl and her husband were forced to file for bankruptcy, and their marriage eventually broke up. Goodearl then moved to Washington, D.C. and worked as a housekeeper. With all of this in context, it is perhaps not so easy to say that Goodearl and Aldred "won."

The incident described here is reasonably typical of the "successful" cases of whistle-blowing. The whistle blowers lost their jobs, went through great turmoil in their personal lives, and were unable to find similar work. Then, after a number of years, their actions were finally vindicated through court decisions. In less successful cases, the whistle-blower may be intimidated into silence or may be worn down and eventually give up.

The dilemma for the whistle blowers is that they discover information that potentially places them in a "no-win" situation. If the management in the company will not address the problem, then the employee is faced with deciding either (1) to become silent and let the problem go on uncorrected or (2) to "blow the whistle" and live with the resulting disruption in their professional and personal lives. It is in some ways a classic case of either giving in to immoral activity in order to preserve monetary benefits or standing up against immoral activity in spite of the cost.

To repeat part of a quote from the previous section, whistle blowers must be people ". . . who cannot be bought . . . who put character above wealth . . . who will make no compromise with wrong . . . who will not say they do it "because everybody else does it" . . . who are not ashamed or afraid to stand for the truth when it is unpopular . . ." [11].

Points to Remember

- You will face a variety of ethically challenging situations in your career.
- Productive use of your knowledge about ethics requires that you accept personal responsibility for your actions.
- Your ability to consistently make appropriate ethical choices will be helped by not focusing on your own self-interest.
- Your ability to consistently make appropriate ethical choices will be greater if you have carefully considered ethical issues before they confront you in the workplace.
- Situations that present a continuing ethical challenge can wear you down. To the extent possible, avoid such situations.

WORKSHEET—"Urgency of Ethical Standards Intensifies"

Read the article by Michael McFarland that is reprinted from *Computer* magazine at the end of this chapter. Then answer the following questions.

1. It is suggested that ". . . if George chooses not to authorize release of the system, it would be done anyway without his approval. So, his sacrifice would have no practical effect." What effects, "practical" or otherwise, could come from George's refusal to authorize release of the system, even if it is then done anyway without his approval?
2. Briefly explain the "two fallacies about ethical knowledge" that McFarland describes.
3. Briefly outline the analogy with Physics that McFarland uses to explain how "ethical knowledge is a dynamic reality."
4. What are the four "meta-ethical principals" that McFarland explains as required in order for an ethical argument to be valid?
5. What is *utilitarianism* and what are the problems that McFarland identifies in it?
6. Reread the description of George's dilemma in the second paragraph of the section "Ethics as a social activity." How accurate is this description? Will you sometimes find yourself in such a situation?

WORKSHEET—“Anatomy of a Fraud” (part 1)

Read the short article titled “Anatomy of a Fraud” that ran in *Business Week* on September 16, 1996. Then answer the following questions.

1. What is Kurzweil Applied Intelligence’s area of business?
2. What is an *initial public offering*?
3. What are *receivables* and why were “soaring receivables” a “telltale signal” of the fraud?
4. Who were the direct victims of the fraud?
5. How does the article suggest that the fraud got started?
6. How were the auditors fooled?
7. What was Murray’s role in the fraud?
8. What was Campbell’s role in the fraud?
9. What was Bradstreet’s role in the fraud?
10. What was the role of the “low-level staffers” in the fraud?

WORKSHEET—“Anatomy of a Fraud” (part 2)

Read the short article titled “Anatomy of a Fraud” that ran in *Business Week* on September 16, 1996. Then answer the following questions.

1. Who did the legal system treat most appropriately in the incident? Who least appropriately? How would you change their punishments?
2. What do you see as the main temptation that Bradstreet succumbed to? How can you go about trying to avoid similar temptations?
3. What can you do to avoid becoming a “low-level staffer” who willingly (even enthusiastically) gets caught up in such a fraud?
4. Debra Murray turned herself in, gave detailed testimony against a person that she had worked with for nine years, and pled guilty to charges relating to her own role. Was it out of noble or selfish motivation? If you found yourself involved in a similar incident, would there be a better way to handle it?
5. Make a list of the positive comments that were made about Bernard Bradstreet’s moral character by people who knew him. Would your colleagues’ comments about you be this positive? more? less?

WORKSHEET—Child Pornography on the Internet

Read the reprinted article from *The Tampa Tribune* titled “Internet pornographer draws long sentence.” Then answer the following questions.

1. What was the size of “. . . what investigators believe is the nation’s largest documented case of Internet child pornography?”
2. What sentence did Robert Wallace Hudson receive? Is it appropriate, too short, or too long? Why? If they were found guilty, what sentence should the adults in the videos receive?
3. What would you do if you noticed pornographic images on someone else’s computer when you were using it? That is, if you found yourself in the position of the consultant hired by Hudson?
4. During the trial, Hudson’s defense argued that he “. . . found the child pornography on his hard drive . . . but he did not put it there.” Is this at all believable? Do Hudson’s comments at sentencing essentially admit that this defense was a lie?
5. Hudson was quoted as saying “I’m not as evil as they paint me to be.” So, just how evil do you think he is?
6. Does the Internet make the problem of child pornography any better or worse? How? What measures could you suggest to combat the problem of child pornography being exchanged on the Internet?
7. Is the commercial use of images such as those made (in)famous in Calvin Klein advertising likely to have any effect on the problem of child pornography? What kind of effect? Why?

WORKSHEET—Prioritizing Concerns about Ethical Problems

1. What are the three most important ethical problems that confront you as a student pursuing your education?
2. What are the three most important ethical problems that you expect to confront you as a professional in your career?
3. What are the three most important ethical problems that confront our society in general?

ADDITIONAL ASSIGNMENTS

1. **Theodore R. Johnson.** Theodore R. Johnson is not someone you have likely heard about. He worked for United Parcel Service and never earned a big salary, but he invested wisely. When he turned 90, he decided to give \$36 million of his \$90 million fortune to various charities [10]. Report on how he made his money, who he gave it to, and why.
2. **Inaki Lopez.** In 1993, Inaki Lopez left General Motors Corp. to join Volkswagen. A number of GM executives followed him in switching companies. GM filed suit against VW. Look into the details of this incident. Do you believe Lopez is a positive role model for corporate executives? Does he have the type of reputation you would want to have?
3. **Lawrence Adler.** Lawrence Adler admitted paying a friend to take the SAT exam for him [7]. Report on as many of the specifics of this incident as you can. What is your impression of Adler, the Educational Testing Service, and the judge who heard Adler's case?
4. **The FBI sting at NASA.** The FBI's Operation Lightning Strike was a sting operation at the NASA Johnson Space Center. One corporation and nine individuals were charged as a result of the investigation [12]. Report on as many details of the sting operation and the subsequent charges as you can find.
5. **The U.S. Navy/Solar Turbines Incorporated incident.** The U.S. Navy contracted for \$55 million with Solar Turbines Incorporated to develop new equipment. But it appears that some people at the Navy did not want the new technology and developed a strategy to "let Solar Turbines spend so much of its own money on RACER that it would finally throw in the towel" [13]. Report on as many details of this incident as you can find out, especially the roles of the officials involved on the U.S. Navy side.
6. **Arrest for threatening stories on the Internet.** Jake Baker was a student at the University of Michigan who posted a story to a "sex stories" Internet mail group. The story would have been X-rated in any interpretation, as it described the rape, torture, and murder of an individual. In this instance, Baker actually named a real person. Baker was arrested and charged with interstate transmission of a threat [2]. The punishment is up to five years in prison. Look into this case and report on the final decision and your opinion about Baker as an individual.

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STANDARDS

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Urgency of ethical standards intensifies in computer community

Michael C. McFarland

The past several months, George, an electrical engineer working for an aerospace contractor, has been the quality control manager on a project to develop a computerized control system for a new military aircraft. Early simulations of the software for the control system showed that, under certain conditions, instabilities would arise that could cause the plane to crash. The software was subsequently patched to eliminate the specific problems uncovered by the tests. After the repairs were made, the system passed all of the required simulation tests.

George is convinced, however, that these problems were symptomatic of a fundamental design flaw that could only be eliminated by an extensive redesign of the system. Yet, when he brought his concern to his superiors, they assured him that the problems had been resolved, as shown by the tests. Anyway, to reevaluate and possibly redesign the system would introduce delays that would cause the company to miss the delivery date specified in the contract, and that would be very costly.

Now, there's a great deal of pressure on George to sign off on the system and allow it to be flight tested. It has even been hinted that, if he persists in delaying release of the system, the responsibility will be taken away from him and given to someone who is more compliant.

George faces a serious moral dilemma. On the one hand, he feels the pressure to comply with his superiors' orders not only to protect himself and his family from the possible loss of his job but also out of loyalty to his company and deference to the judgment of his superiors. On the other hand, as an engineer and par-

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ticularly as a quality control manager, he feels responsible for the reliability of the system and the safety of those using it. In his professional judgment, he is not confident the system is safe, so he does not feel it would be justified to say it is.

What makes the situation so difficult for George is that he must choose between conflicting duties: loyalty to self, family, employer, and superiors versus the obligation to tell the truth and to protect others from harm. The situation is complicated by the fact that, even if George chooses not to authorize release of the system, it would be done anyway without his approval. So, his sacrifice would have no practical effect.

This is a hypothetical case, but not unlike those many engineers face.¹⁻³ In particular, as society becomes more and more dependent on computers in critical applications in such areas as defense, transportation, medical care, and banking, computer scientists and engineers increasingly find themselves encountering difficult ethical dilemmas. These involve not only the reliability and safety of computer systems but also computer security and privacy, ownership of programs and data, the impact of computers on the workplace and education, and the

implications of artificial intelligence research.

How people in the industry handle these dilemmas has implications far beyond their own success and peace of mind; it will affect the welfare of everyone who depends on computer systems in any way. There is, therefore, a growing concern about ethical standards among computer professionals. Many feel we need to work out guidelines on the ethical issues facing the profession. Establishing a set of standards that is accepted and shared by the whole profession is important not only because it can help those facing difficult ethical decisions to make reasonable and fair judgments that serve the best interests of everyone involved, but also because of the sense of support and solidarity such standards can give those making the decisions, making it easier for them to carry through on those decisions with courage and confidence.

The purpose of this article is not so much to propose a set of standards for the profession — we still have much to do before we get to that point — but to provide background material on ethical standards in general. I will discuss where ethical standards come from, how they are arrived at, and how they can be promoted

and applied. I hope this will help prompt a wide-ranging discussion within the profession in general and the IEEE Computer Society in particular that will result in a consensus on a set of standards for the profession.

Two fallacies about ethical knowledge. Ethical standards must be based on some apprehension of what is right and wrong, of what ought to be done, and of what ought not to be done. The first question we must consider, therefore, is "What is ethical knowledge and where does it come from?"

There are two fallacies about the status of ethical knowledge that we must discuss before we can consider what it is. The first and the most prevalent today is called ethical relativism. It holds that there is no objective, shared ethical truth that is knowable by everyone and to which everyone can be held accountable. In this view, each individual is responsible for his or her own ethical judgments and makes them according to his or her own perceptions. This is akin to saying, "What you feel is right, is right for you." No one else has any justification for criticizing it.

This view, of course, is consistent with the observation that intelligent people of good will can hold quite different views on important ethical questions. It also harmonizes well with the great value our culture places on freedom — freedom in the sense of noninterference.

The problem with ethical relativism is that, if applied consistently, it makes it impossible to ever critique another person's behavior. If someone thinks it is right to sexually abuse children, to rob and shoot a taxi driver, or to break into private files on a computer system, that is the individual's decision. It is not for us to decide what is right for that individual.

When the issue is put this way, it is evident that, while ethical relativism may be attractive in individual cases, especially where it seems to spare us painful confrontations on ethical issues, it is simply not tenable as a fundamental ethical principle. If it were taken seriously, there could be no ethical standards and thus no civilization.

Another related view that is seemingly less extreme but in fact just as dangerous is cultural relativism. This states that societies or cultures can come to a consensus on ethical standards that they can impose on their members but that these standards are arbitrary. There is no basis for saying that one set of standards is superior to another.

This view has all the problems of ethical relativism but, if anything, is worse because it operates on a greater scale. If a particular society, for example, decides

that it is right to hold people of another race or religion in slavery or to kill them, they are justified in doing so. If we accept cultural relativism, there is no objective basis for opposing such a position.

This form of relativism, often hidden in such cynical phrases as "might makes right" and "the winners write history," must also be rejected. It may allow for the formation of standards, but there is no way of insuring that they have any relation to good. In particular, there is no guarantee of protection for those on the fringes of a society.

In view of the dangers of ethical relativism, it would be nice if we could show that ethical truth is somehow given, as a set of rules or principles that we simply have to look up somewhere. But, of course, we know that there is no commonly accepted source that contains the answers to all our ethical questions.

Even within religious or political traditions that have authoritative statements of ethical rules or principles, such as the Ten Commandments or the Bill of Rights of the US Constitution, it is by no means clear or undisputed what the status and meaning of these texts are and how they are to be applied in all cases. They are important sources of moral wisdom, authoritative for some, but not the definitive answer to every moral problem. Nor is there any philosophical system that offers a clear answer to every dilemma. So, how can there be objective ethical truth if it is not "out there" waiting for us to find it?

I think an analogy with natural science is helpful here. Physics long ago gave up the view that the truth about the structure and dynamics of the universe is an objective reality that exists apart from our asking about it and that can be fully grasped through the mechanical application of known principles. Rather, what is knowable about the physical universe is something dynamic that takes form through our inquiry and experimentation. As much as we know about it, we certainly have not grasped it all and never will.

But that does not mean that there is no truth that can be known about the physical world or that the truth is something completely arbitrary that we invent. If that were true, all science would be in vain, and all attempts to understand physical phenomena would be useless.

Yet, scientists go on experimenting and constructing theoretical models in the belief that these activities can deepen their understanding of the phenomena they study. Their theories may never be complete, but that does not mean that they are useless or arbitrary.

If some theoretical breakthrough should reveal that gravity is not an independent force but part of a larger scheme,

everything that past theories of gravity have taught us would not be invalidated. The planets would still move as they always have. It would not be that our previous theories were false, only that they did not give the full picture.

In the same way, ethical knowledge is a dynamic reality, neither totally within our grasp nor totally beyond it. Ethics has its own discipline and its own methodology, just as the physical sciences do. Ethical knowledge emerges from experience and reason, from action, and from reflection on that action.

While they are still provisional and periodically challenged, the principles we have built up over thousands of years have taught us a great deal about how to apprehend and realize the human good. Even if they are someday superseded because we come to a deeper understanding of ethical truth, they will not cease to be useful. Therefore, it is worth learning how to apply them.

Metaethical principles. We do not have a methodology that is precise enough to settle all ethical disputes, but we do have ways of distinguishing sound ethical arguments from fallacious ones and deciding on issues where there is a clear choice between what is right and what is wrong.

There are four conditions that any ethical argument must meet to be valid:

- (1) It must be consistent with the facts.
- (2) It must be reasonable and logically consistent.
- (3) It must be based on sound principles and uphold the highest good.
- (4) It must be universalizable. That is, if an argument asserts that action *X* is justifiable in situation *Y*, then it must also assert that *X* is justifiable in every situation *Z* that does not differ from *Y* in any way that is morally significant.

The first two conditions are obvious enough, but nevertheless must be emphasized because many ethical arguments fail precisely because they do not respect the facts or do not hold together logically. The third condition requires that we be able to identify and prioritize various human goods and values. In general, this is a very difficult and controverted task, about which I will have more to say later.

Nonetheless, there are many cases where the priority is clear. For example, if someone injects a destructive virus into a computer program because he feels it is more important to show his technical expertise and impress his friends than to respect the needs of those who will lose valuable time and data because of the virus, we can say with some assurance that that is not a valid justification.

The fourth condition provides the most significant and powerful test for ethical arguments. First of all, it insures that ethical standards are applied fairly. I cannot assert that there is one rule for me and another rule for everyone else or that one set of standards applies to one group and a different set to another group that only incidentally differs from the first. For example, I cannot claim that I am justified in copying commercial, copyrighted software without authorization unless I am willing to accept the implications of everyone copying software without paying — which would mean either outrageously overpriced software or the end of commercial software altogether.

Similarly, I cannot claim that it is right for me to misrepresent products or break contracts when they are not to my advantage unless I am willing to accept others lying to me or breaking contracts that give me an advantage over them. This principle always forces us to ask the question, "How would I feel if that were done to me?"

The fourth condition also provides us with a powerful means of testing the validity and applicability of proposed ethical principles or rules of thumb by testing them on a wide range of cases and analogies until we find their limits or see them fall apart. For example, out of concern for the protection of personal information in a large database of credit records, we might propose the rule: "It is wrong to allow any use of personal information in a database without the subject's consent." But then we would have to test the universalizability of this rule by asking whether there are ever situations where we should allow the use of personal information, whether in a database or not, without the subject's consent. Of course there are, for instance in helping to track a dangerous criminal or in investigating cases of child abuse. Therefore, the rule is not universalizable as it is, and we must either reject the rule or, more likely, modify it to allow certain exceptions, such as matters of public safety. But trying to generalize the new version of the rule might show the need to define more clearly which matters of public safety are serious enough to justify the release of public information, who is to decide, and so on. Much ethical argument involves the testing and refining of rules by applying them to analogous cases.

Ethical principles. The methodology sketched in the previous section gives us a way of testing and applying ethical principles, but it does not tell us what those principles are. In this section, I will consider some of the principles that have commonly been found to be important.

The principle of utilitarianism states

that, in any given situation, that action is right which produces the greatest net good, that is, the greatest preponderance of good over evil. This assumes that all goods and evils can be quantified in some way and compared on the same scale.

Utilitarianism is probably the ethical principle engineers are most comfortable with. It is the underlying basis for cost-benefit analysis, for example, where all of the consequences of competing strategies are given dollar values, and the strategy with the highest net gain is chosen.

Utilitarianism does have many attractive features. Surely, if we have any ethical obligation at all, it is to do good and avoid evil. Utilitarianism takes that fundamental truth and tries to build a precise calculus around it. Once a method of quantifying goods and evils has been chosen, the system gives definite answers to ethical questions, which is very appealing.

The most difficult ethical choices are those that involve choosing between competing goods or the acceptance of certain evils to avoid others. Utilitarianism offers a definite and seemingly unbiased way of making those choices.

Nevertheless, few ethicists accept utilitarianism as totally adequate in itself.^{4,5} There are a number of reasons for this. First, utilitarianism is not as objective as it might appear. Any particular utilitarian calculus contains hidden value judgments, especially in the way the consequences of actions are quantified. For example, how much is a human life worth? \$100,000? \$1,000,000? \$1.98? Who decides?

The method we use for assigning value to human lives embodies some very important judgments about the relative worth of different human beings. If, for instance, we decide to value human beings based on their potential economic productivity over their lifetimes, as some have proposed, we are saying that the elderly and those who are severely handicapped are worth less and deserve less protection and support than others. That conclusion is highly debatable, to say the least, and can lead to severe abuses. Of course, we must make judgments about the relative importance of competing values; that is what ethics is all about. But these decisions must be acknowledged for what they are and worked out openly, not hidden in some supposedly "objective" system.

The second problem with utilitarianism is that, in its pure form, it says nothing about how benefits are to be distributed. Therefore, it does nothing to promote fairness or justice. For example, a cost-benefit analysis might indicate that it is most beneficial overall to place a coal-fired power plant for a major city in a rural

area, next to an Indian reservation. There, it would be closer to the sources of coal and would inconvenience far fewer people than it would were it built in a more urban or suburban location. The impact of the plant on the Indians — the strip mining and the pollution that would go with it — would be far more severe than it would be on a more urban or suburban population since the Indians depend much more on the land and nature in general for their economic and spiritual life. But since there are so few of the Indians, the benefits outweigh the costs.

The problem, of course, is that this solution is extremely unfair. Almost all of the benefits of the plant go to a majority urban population that already possesses a disproportionate amount of wealth and power, while those who are already impoverished and discriminated against are forced to bear most of the costs.

The third problem is that, even if utilitarianism were acceptable in theory, it could in practice never adequately account for all the consequences of a possible course of action. For example, it might seem in a particular case that telling a lie would have very little in the way of negative consequences and might bring great benefits. If lying were allowed in every case where it seemed beneficial, however, it would seriously weaken the foundation of trust that society needs to function. It would also weaken the integrity of the one who practices deceit.

Consequences such as these are difficult to foresee and impossible to quantify. For these and other reasons, most ethicists feel that utilitarianism in itself is not an adequate basis for ethics. At the very least, there must be some principle that recognizes an obligation to justice in the distribution of benefits and burdens.

Furthermore, it is generally held that there are some types of actions that are wrong in themselves, so that there is an obligation to avoid them. These include killing or harming innocent human beings, lying, and stealing. Some would argue that these are rules of thumb that can be derived from a consideration of the long-term consequences of the actions in question, while others take them to be fundamental obligations in themselves.

In our culture, these obligations are most often formulated in the language of rights. Every human being is acknowledged to possess certain rights — to life and the means necessary to sustain it, to freedom, to respect, to self-realization, and so on.

The existence of these rights creates obligations in others not to interfere with them. However these obligations are accounted for, in practice there is a great deal of agreement about their content.

The real problems occur when these obligations come into conflict, for example when the only way someone can protect the life of another is by lying, or when the exercise of one person's freedom interferes with the freedom and self-realization of others.

Often such conflicts are settled when, through careful reflection on experience and on the relative importance of the values at stake, people formulate norms or guidelines that minimize or avoid the conflict and distribute the burdens as fairly as possible. These norms often emerge through a long process of argument, testing, and revision, but eventually, as they prove to be sound and workable, they come to be widely accepted as binding on those subject to them.

This is the case, for example, with professional norms, such as those that define the obligations doctors have toward their patients and the obligations lawyers have toward their clients and the legal system.

Ethics as social activity. Returning to George's ethical dilemma, it is clear enough that, if a technical analysis does indeed show that the control system poses a significant risk to the lives of pilots and others and that the risk is avoidable, the company has an obligation to redesign the system. But that does not solve George's problem. Whatever choice he makes will involve some significant evil.

The problem is that he is trying to act ethically in an unethical environment. This does not absolve him of the responsibility of doing what is right as best he can, but it does mean that whatever choice he makes will not be satisfactory. It also means that he will suffer for things that are not his fault.

The social structures George operates in have failed him by not giving him the

support he needs. There are a number of reasons for this:

- There are no clear guidelines to define the responsibilities of George and his coworkers and superiors with regard to the safety of the system. His superiors can argue that as long as the system has passed the required tests, they have fulfilled their responsibilities.

- There is no incentive for George or his company to behave ethically, that is, to make every effort to ensure the safety of the system. In fact, there are strong disincentives in the way the contract is structured.

- There is no structure or procedure that allows George to make his concerns known. If his superiors refuse to consider his concerns, there is nowhere he can go without appearing disloyal to his company.

- The burden of the decision is unfairly placed on George. He will pay a high price no matter what he does, while it is really the responsibility of the whole company to guarantee the safety of the system.

In this case, the problem is not primarily that individuals are acting unethically, although there may be some of that. The main difficulty is that the social structures themselves are not adequate to deal with the problem. And, when that is the case, an individual acting alone cannot hope to correct it.

Even if George, at great personal risk, should blow the whistle by taking his concerns outside the company, he might well be discredited so that his efforts will have no effect. And, he will certainly lose his job. In addition, there is a possibility that he is wrong about the safety of the system, in which case he would be hurting himself and his company for no reason.

Although this case is hypothetical, it is not implausible. In fact, we as computer professionals face many difficult ethical problems, and these problems are inextricably tied to the social systems in which we function. The problem of copying software has to do with the proper functioning of the free market, for example. The privacy issue involves massive databases and the organizations that use them, such as the FBI, the IRS, and credit card companies. There are many other examples.

Individual action will not solve any of these problems. Social problems require social solutions. Computer professionals need to act together to make sure the norms and structures that support ethical activity are in place.

Some of the things needed are

(1) Professional norms. General ex-

hortations to be good and responsible are not sufficient. There must be specific definitions of the rights and duties of computer professionals with respect to the ownership of software and data, security, safety, reliability, and so on.

(2) A forum for discussing ethical problems. Those involved in ethical conflicts or facing ethical dilemmas should have a place where they can discuss the issues and receive the wisdom and support of their peers. It would also be very helpful if there were an independent body that could investigate the claims of those like George who perceive serious threats to the public welfare.

(3) A way of adjudicating conflicts. There must be some way of making members of the profession accountable. The norms referred to in (1) will work only if most members of the profession accept them voluntarily, but there also has to be a system for protecting the members of the profession and others from those who would try to gain an unfair advantage by ignoring the norms. This system must be open and fair and must observe the canons of due process. It must be possible to bring some sanctions against those who violate the norms in an especially destructive or scandalous way.

(4) Support for members who are persecuted for ethical actions. The profession should stand up for members who are willing to take stands on ethical issues where this brings them into conflict with their organizations. This would be easier, of course, if the kind of structure suggested in (2) existed; it could help judge and mediate such conflicts.

The IEEE Computer Society is a professional organization that represents many computer scientists and engineers. As such, it is an obvious vehicle for the kind of organized activity suggested in points (1) through (4) above. In fact, there has been some activity in these areas, although to date it has been rather limited.

IEEE Spectrum has an outstanding record on investigating ethical issues, although for the most part it has avoided taking stands on these issues and has not been involved in the formulation of norms. The IEEE has a code of ethics, but the code is too general to give much guidance on the specific issues facing computer professionals.

Last year, there was a strong effort within the Computer Society Committee on Public Policy to produce a position paper on computer viruses (see *Computer*, July 1989, pp. 83-84) that included some norms. This proposed statement seems to have died, however, when it reached the society's Board of Governors for adoption.

The IEEE does have procedures for

To go further

To learn more on this subject or to get involved in this or similar issues, contact

- Ralph Preiss, Chair, IEEE Computer Society Committee on Public Policy, 12 Colburn Dr., Poughkeepsie, NY 12603.

- Computer Professionals for Social Responsibility, PO Box 717, Palo Alto, CA 94301.

dealing with accusations of unethical conduct, although these are little used and weak when it comes to providing due process.

There are a number of reasons the IEEE and the Computer Society have not done more. Engineers are generally uncomfortable with ethical issues. They feel those issues are outside their competency sphere and are not as well-defined or as susceptible to rigorous analysis as purely technical problems.

Furthermore, becoming involved with ethical problems is risky. The stakes are often very high and feelings run deep, so these issues can lead to confrontations and divisions. I also suspect that the IEEE has never quite figured out if it represents management or the working engineer, so it would rather not get involved in potential conflicts between the two.

Whatever the reasons for the reluctance to get involved in ethical issues, we can no longer afford it. Computer professionals must find a way to take common action on the issues facing the profession if they are to fulfill their responsibilities to society and to themselves. If they do not act on their own, they will find themselves subject to legislation made by people who do not really understand the issues involved.

Let us hope that the IEEE can facilitate the kind of organized action that is needed in the profession. If not, then another context must be found.

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Internet Pornographer Draws Long Sentence

BARTOW—A man convicted on 328 child pornography charges says he got in “over his head.” A judge sentences him to 45 years.

**By BILL HEERY
of The Tampa Tribune**

The former owner of a video store was sentenced Monday to 45 years in prison in what investigators believe is the nation’s largest documented case of Internet child pornography.

A jury last month found Robert Wallace Hudson, 48, guilty of 280 counts of possessing child pornography and 48 counts of distributing it.

Hudson was arrested in April after a computer consultant he had hired told police about the more than 2,000 pornographic pictures of children stored on his home computer hard drive.

The images showed children, the youngest about 6 months old, engaging in explicit sex acts.

Authorities said the children had not been identified.

They said there was no reason to believe the pictures were taken locally.

State sentencing guidelines called for Hudson to receive up to 47 years in prison. But prosecutor Brad Copley asked Circuit Judge Donald Jacobsen for a life sentence.

Lakeland attorney William Kilpatrick, representing Hudson, asked for the minimum 28-year-sentence. He said it was the first time Hudson had been in serious trouble with the law and he had no background of violence.

Hudson, who owned Front Row Video, 8219 U.S. 98 N. in Lakeland, at the time of his arrest, told the judge, “I’m not as evil as they paint me to be. I just got caught up in something and got in way over my head. I tried to get out of it. I just waited too long.”

Copley said the pictures and computer videos of grown adults engaging in sex acts with 2-, 3-, 4-, and 5-year-old children represented violence.

“I don’t see what could be more violent other than a murder scene. A child was victimized each time those pictures were sent out” on the Internet.

Authorities do not believe Hudson distributed child pornography through his business.

Hudson should have been forewarned when he was convicted in 1991 of three counts of the sale of obscene materials, Copley said.

Kilpatrick countered that those were misdemeanor charges resulting from sales at a video store and had nothing to do with child pornography.

The defense contended during the trial that Hudson found the child pornography on his hard drive, a computer disc that holds vast amounts of data, but he did not put it there.

Following the sentencing on Monday, Hudson’s wife of 15 years, Julie, said she didn’t believe the charges against her husband.

► **Bill Heery covers courts in Polk County and can be reached at (941) 683-6531.**